9 UNDESA's Research Project: Transport and Utilisation of Natural Gas in Northeast Asia

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Abstract This paper offers an overview of the research programme "Transportation and Utilization of Natural Gas in Northeast Asia" led by the United Nations Department of Economic and Social Affairs in the 1990s. It sought practical and economic transnational gas pipeline infrastructure routes to connect Russia, Mongolia, North Korea, South Korea, Japan, and China. A group of scientists from the Chinese Academy of Social Sciences contributed to the project, with the vice-president of the academy, Teng Teng, being the team leader. The research team managed to outline five potential routes with a long-term prospect until 2020. By studying the TUGNA programme, we can grasp the original considerations of the participating countries and gain insights into the context of infrastructure development and cooperation in Northeast Asia.

Keywords Northeast Asia, natural gas, pipeline, UNDESA, Teng Teng

Introduction

In recent years, oil and gas prices have become increasingly volatile, influenced by newly proven reserves and political and military tensions. For countries with inland energy supply options, oil and gas pipelines can mitigate the problems with sea transportation. These transnational pipelines also symbolise geopolitical connections, providing channels for influence. The Russian Far East is rich in oil and natural gas, while China, Japan, and Korea form a significant consumer market. Since the 1990s, there have been numerous proposals for transnational pipelines between the Russian Far East and other countries in the region, but the first one was realised only in 2019, connecting Russia to China.

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In the 1990s, the United Nations Department of Economic and Social Affairs (UNDESA) launched the research programme "Transportation and Utilization of Natural Gas in Northeast Asia" (referred to hereafter as TUGNA), which studied the possible practical and economic transnational gas pipeline infrastructure routes to connect Russia, Mongolia, North Korea, South Korea, Japan, and China. A group of scientists from the Chinese Academy of Social Sciences contributed to this endeavour, with Teng Teng, the vice-president of the academy, being the organiser and leader of the international survey for the project.[1]

This paper offers an overview of the TUGNA project based primarily on the unpublished project symposium materials dated December 2000. These materials, held at the National Museum for Modern Chinese Scientists in Beijing, summarise the outcomes of the survey project and provide the final outline of the proposed pipeline network routes.[2] Additionally, the author conducted several interviews with Teng Teng, the leader of the survey project, in 2017 and with Qiu Tong, another project participant, in 2018. The paper starts by introducing the organiser of the project and its background and then moves on to discussing the individual country reports and the five proposed pipeline routes.

UNDESA's Research Project

Teng Teng (滕藤, 1930–2023) was a Chinese chemical and nuclear scientist and also a senior government officer. Between 1988 and 1993, as the Vice Minister of Education, Teng automatically became China's official delegate on the executive board of UNESCO, and between 1991 and 1993, he was elected vice-chairman of the board. During his official affiliation with UNESCO, Teng was responsible for restoring an amicable relationship with African delegates and establishing the Asian Association for Social Science Research (AASSR).[3] After taking his new position at the Chinese Academy of Social Sciences, Teng still maintained close contact with the UN, and between 1995 and 1997, he was the president of AASSR. Thus, when UNDESA started surveying natural gas transport and utilisation in Northeast Asia in the form of the TUGNA research programme, Teng was selected as the contact for

1 Interviews with Teng Teng, July 5, 2017 and July 19, 2017.
2 UNDESA, *Proceedings of the UN Symposium*.
3 Interview with Teng Teng, November 6, 2017.

the Chinese section. Given the fact that Northeast Asia had plenty of natural gas resources and a great consumption market, UNDESA sought potential routes for natural gas transportation networks in the twenty-first century. The original outline of the research project was that there was one contact in each of the six countries (Russia, Mongolia, North Korea, South Korea, Japan, and China) who was responsible for the local survey, coordinating with the other countries' delegates, and submitting a country report.[4]

However, when the TUGNA project held its symposium in Beijing on December 4–6, 2000, only four country reports had been submitted. Russia's report was written by, among others, Boris G. Saneev, L. A. Platonov, A. D. Sokolov, S. P. Popov, A. M. Kler, and Yu. D. Kononov (from the Energy System Institute, Irkutsk); Mongolia's was by Dr. M. Saandar (Monmap Engineering Services Co., Ltd), Dr. J. Dorjpurev (Energy Conservation Co., Ltd), and Mr. Bat-Erdene (Director, Department of Oil and Mineral Exploration and Mining Industry, The Ministry of Industry and Trade); South Korea's report was by Yonghun Jung (Korea Energy Economics Institute); and China's was by Prof. Teng Teng and Prof. Wei Yanshen, both from the Chinese Academy of Social Sciences.[5] Originally, an Italian scientist was appointed as the leader of the whole project, but he quit halfway through, and his position was handed over to Teng.[6]

As a result, in addition to preparing China's national survey, Teng and his Chinese team had to coordinate with the other Northeast Asian countries. The Chinese team members mostly came from the Chinese Academy of Social Sciences, e.g., Wei Yanshen (Teng's colleague) and Qiu Tong (a Ph.D. student of Teng's, now a professor at Tsinghua University). Qiu Tong's doctoral study between 1995 and 2000 was supervised by Teng and Wei and funded by the TUGNA project. For the 2000 symposium, she contributed a paper entitled "Technical, Economic and Financial Aspects of Natural Gas Pipelines and Distribution Systems,"[7] and her work for the project has also yielded her Ph.D. thesis. For China's national surveys, Qiu accompanied Teng to visit Northeast China and the oil fields in Xinjiang Province. For the international surveys, Teng, Qiu, and Wei visited the Ministry of Industry and Trade of Mongolia as well as the Energy System Institute (ESI) and the oil fields in Irkutsk, Russia. Wei, with several other colleagues, also visited North Korea.[8] Based on all this

4 Interview with Qiu Tong, December 5, 2018.
5 UNDESA, *Proceedings of the UN Symposium*, preface.
6 Interview with Qiu Tong, December 5, 2018.
7 UNDESA, *Proceedings of the UN Symposium*.
8 Interview with Qiu Tong, December 5, 2018.

fieldwork and surveys and considering China's energy demand and import conditions, they finally proposed five possible gas pipeline networks in Northeast Asia. The country reports and the proposed solutions are presented below.

Russia's, Mongolia's, and South Korea's Country Reports

Russia's Country Report

The Russian country report is entitled "Role of Russian Natural Gas in the Formation of the Gas Pipeline Network in Northeast Asian Countries." It was produced by the Energy Systems Institute (SEI) in Irkutsk, thus reflecting the concerns relevant specifically to the Asian part of Russia. In 1997, the Asian regions possessed eighty percent of Russia's prospected natural gas reserves (about one third of the world's total), seventy-five percent (four percent) of oil reserves, and ninety percent (nine percent) of coal reserves; and produced ninety-three percent of natural gas, more than sixty-eight percent of oil, eighty percent of coal, and thirty-three percent of all electric power in Russia.[9] The economic crisis in Russia and its transition to a market-orientated economy in the 1990s increased the significance of its external economic relations for both the energy sector and the whole economy.[10]

After the disintegration of the Soviet Union, the strategy of economic and geopolitical development for the Asian regions had to be adapted to the new geopolitical situation and aimed to solve long-term problems. As suggested in Russia's country report, the long-term priority directions included: (1) creating conditions for social stabilisation and then economic development of the Asian regions of Russia; (2) maintaining the industrial, scientific, technological, and other potentials during the transition period; (3) enhancing domestic and international economic ties; (4) attracting foreign investment and technologies via the Asian regions.[11]

As the main fossil energy repository of Russia, the Asian regions performed an important role in maintaining the economic stability of all the entities in the former Soviet Union and enhancing Russia's geopolitical connections with other Northeast Asian countries by exporting fuel and energy resources.[12] Before 2000, there had already been some discussions, both at

9 UNDESA, *Proceedings of the UN Symposium*, 74.
10 Milov, "Russia's Downfall," 165.
11 UNDESA, *Proceedings of the UN Symposium*, 74.
12 Milov, "Russia's Downfall," 165.

the national and international levels, of various options for natural gas export from the Asian regions of Russia to the (other) Northeast Asian countries. However, these proposals were not coordinated with one another in terms of prices, volumes, time, or commercial sustainability.[13] Russia's country report suggested that future plans and the implementation processes should be controlled and coordinated at the federal and interregional levels to assess the consequences of such international cooperation.

According to the estimation of the authors of the report, large-scale infrastructure was infeasible in Siberia and the Far East until 2015–2020, due to the economic crisis in Russia during its period of transition to a market economy. Hence, before that time, the principal task was to maintain and strengthen the foundation for future development. It was suggested that the development of the gas pipeline network and the export system in the east of Russia should undergo the following three stages:

Stage 1 (2000–2010):

- Formation of the regional gas pipeline network in eastern Siberia and construction of the export gas pipeline: Irkutsk Oblast–Mongolia–China–Korea.
- Resource base: Kovyktinskoye gas condensate field (Irkutsk Oblast), natural gas fields in West Yakutia and Krasnoyarsk Krai.
- Potential supply for export may reach 30 billion cubic metres of natural gas.

Stage 2 (2010–2015):

- Formation of the regional gas pipeline network in western Siberia and construction of the export gas pipeline: western Siberia–eastern Siberia–Northeast Asian countries (China, Korea).
- Resource base: natural gas fields in western and eastern Siberia.
- Potential supply for export may account for 30–35 billion cubic metres of natural gas.
- Formation of the regional gas pipeline network in the Far East and construction export gas pipelines to Japan and other countries of Northeast Asia (North Korea, South Korea).
- Resource base: natural gas fields of Central Yakutia and Sakhalin shelf.
- Potential supply of natural gas for export may be 25–30 billion cubic meters.

13 Cao, "Russia's Pacific," 82–85.

Stage 3 (2015–2020):

- Creation of a unified gas pipeline system in the east of Russia and Northeast Asia.[14]

Mongolia's Country Report

The structure of the energy sector of Mongolia at the turn of the twenty-first century was relatively simple. It relied primarily on domestic coal and imported petroleum products.[15]

Half of the total population lived in the central part of the country, including the cities of Ulaanbaatar, Darkhan, and Erdenet. The energy supply of the central part relied on an interconnected grid fed by coal-fired thermal power stations. Heat was cogenerated from those power stations with electricity and distributed by district heating systems. In the other parts of the country, energy systems were isolated and mostly received electricity from oil-based diesel power stations and heat from coal-fired thermal plants. One town was supplied with electricity and heat from a coal-fired thermal power station, while the other population centres received electricity from oil-based diesel power stations and heat from coal-fired heating stations.[16] This energy system was unable to meet load fluctuations and peak demand in daily system operations. Peak demand was met by importing expensive electricity from Russia.[17] With the collapse of the USSR, when Soviet aid stopped, the energy supply in Mongolia faced difficulties.

Domestic coal was the most important energy source, accounting for close to eighty percent of total primary commercial energy use in 1993, followed by petrol fuels (nineteen percent). In 2000, Mongolia had no domestic oil production, and all petroleum products were imported.[18] Mongolia also made substantial use of traditional fuels (wood and dung), which were the only energy source for nomadic herders and most low-income families, even those living in urban areas. In 1993, twenty-five percent of total energy consumption in the country came from such sources.[19]

14 UNDESA, *Proceedings of the UN Symposium*, 91.

15 Sodovyn and Saneev, "China–Mongolia–Russia," 1–4; Asian Development Bank, *Technical Assistance*, 1-6.

16 Chu and Meng, "Ecology Migration," 104–109.

17 Sodovyn and Saneev, "China–Mongolia–Russia," 1–4.

18 Wang, "Oil and Natural," 36–40.

19 Chu and Meng, "Ecology Migration," 104–109.

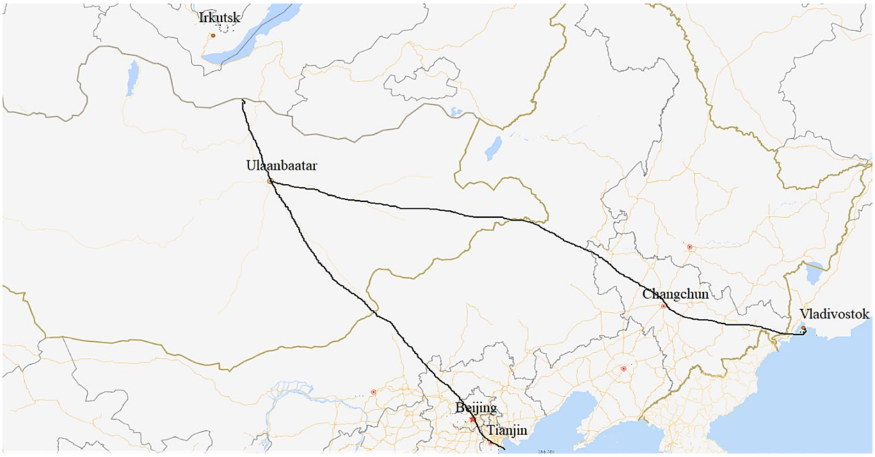

Fig. 1 Proposed routes of the liquid natural gas pipeline (Map data from Google Maps, 2023, routes marked by the author).

Given a forecast of Mongolia's energy supply and demand until 2020, two gas-pipelines were proposed in the country report, as illustrated in Figure 1: (1) Sukhbaatar–Darkhan–Ulaanbaatar–Bagnuur–Choir–Sainshand–Chinese border; (2) Sukhbaatar–Darkhan–Ulaanbaatar–Undurkhan–Chojbalsan–Sumber–Chinese border. Route 1 was to cross Mongolia from north to south, connecting Russian gas fields, e.g., Irkutsk or Chita, with Beijing, which also allowed shipment transportation via the port city of Tianjin. The planned length of this route inside Mongolia was over 1020 km. Route 2 separated from Route 1 in Ulaanbaatar and went eastward to reach the Northeast Asian Economic Free Zone region—the Tumen River Area—through the Dornod Region of Mongolia and the Inner Mongolia, Heilongjiang, and Jilin Provinces of China as well as the port city of Vladivostok. The prospected length within Mongolia was over 1200 km.[20]

South Korea's Country Report

In the last thirty years of the twentieth century, energy consumption in South Korea rapidly increased to fuel economic growth.[21] Lacking its own energy resources, South Korea faced energy insecurity and tried to diversify its energy

20 UNDESA, *Proceedings of the UN Symposium*, 110.
21 Park, Yun and Jeon, "An Analysis," 288–290.

sources and types, in particular, its dependency on imports from the Middle East. A combination of environmental constraints on the use of fossil fuels and rising per-capita income (allowing more choices) led to an increase of natural gas as a part of energy consumption. In the 1980s and 1990s, the demand for natural gas grew rapidly, with a two-digit growth rate per year until the Asian financial crisis of 1997.[22]

South Korea lacks commercially viable natural gas resources of its own, and the only imported form had been liquefied natural gas (LNG). The Korean gas industry started in 1983 with the establishment of the Korea Gas Corporation (KOGAS), a government-owned import and wholesale monopoly, and an LNG import contract from Indonesia.[23] The first LNG shipment arrived at Pyongtaek terminal in October 1986 and was supplied to Korea Electric Power Corporation (KEPCO) as fuel for power generation from November in that year. By 2000, KOGAS was still the sole owner and operator of LNG receiving terminals at Pyongtaek and Inchon, operating ten storage tanks with a 100,000 kl (kilolitre) capacity each.[24]

In South Korea, natural gas was used mainly for power generation and urban gas supply for heating and cooking. In 1987, power generation consumed ninety-five percent of the total amount, which decreased to less than fifty percent in 1996. For city gas use, natural gas began to be supplied to metropolitan Seoul area in February 1987. Thereafter, the volume grew rapidly at an average rate of 42.5 percent with a continuously widening service area, to cover forty cities and counties across the country by the end of 1996. In 1997, natural gas consumption reached 11 Mt, including 5.7 Mt of city gas consumption and 5.3 Mt of power generation consumption. Compared to the forecasts, the natural gas consumption for power generation was higher, but that for city gas was lower, because of the financial crisis and relatively warm weather.[25]

In 2000, South Korea's LNG imports accounted for about fourteen percent of the world total. According to the Long-Term Natural Gas Supply and Demand Plan announced by the Korean government, the average annual growth rate of demand for natural gas was projected to be 5.7 percent from 1998 to 2010. In 1997, the share of natural gas in terms of total primary energy was about 6.5 percent. Although natural gas at that moment accounted for only a small portion of South Korea's energy balance, it was already being

22 UNDESA, *Proceedings of the UN Symposium*, 123.
23 Lee, Kim, and Kim, "Effects," 1–3; UNDESA, *Proceedings of the UN Symposium*, 123.
24 Stern, *Natural Gas*.
25 UNDESA, *Proceedings of the UN Symposium*, 124.

used in a wide range of end-use applications. Governmental interventions had played an important role in the boom of Korean natural gas consumption. In large cities like Seoul, gas use was supported by the government regulations related to air quality concerns, and most of the gas network construction had been made possible by governmental funding. Starting from 1991, all oil-fired power plants in the metropolitan area were supposed to steadily switch to natural gas out of environmental concerns.[26]

The demand for oil and its products grew rapidly, but more slowly than LNG. Oil was the most important fuel of all, accounting for about sixty percent of total primary energy. Oil imports mostly came from the Middle East, with Saudi Arabia as the major supplier. The dependency of crude oil on the Middle East countries was around seventy percent in the 1990s. The South Korean government, having experienced the oil supply disruptions of the 1970s and 1980s due to the 1973 and 1979 oil crises, attempted to diversify its oil importing sources. The dependency on Middle East oil imports declined from 72.2 percent in 1993 to 66.7 percent in 1997. Low world oil prices helped improve South Korea's trade balance.[27]

Table 9.1 LNG imports of South Korea in 1993 and 1997 (kilotons).[28]

Regions	**1993**	**1997**
Indonesia	4108	6848
Malaysia	90	4028
Brunei	–	753
Australia	56	–
Total kilotons	4454	11629
Total $ (millions)	774	2300

LNG had been being imported from Southeast Asian countries since 1987, and Indonesia was the major exporter to South Korea. As of 1997, Indonesia had supplied more than fifty-eight percent of the total LNG demand in South Korea (see Table 9.1). The major supply source of LNG would shift from Southeast Asia to the Middle East from 1999, when the first cargo from Oman arrived in South Korea. The combined total amounts of LNG

26 UNDESA, *Proceedings of the UN Symposium*, 125–126.
27 Park, Yun, and Jeon, "An Analysis," 288–290.
28 UNDESA, *Proceedings of the UN Symposium*, 132.

contracted with Qatar and Oman would reach 8.9 million tons a year from 2002, intensifying concerns about energy security.[29]

In this situation, Russian gas appeared to be a good possible alternative. The South Korean country report then discussed the potential supply capacity of Russian gas. By comparing three regions in the Far East and Siberia, the gas fields in Irkutsk Oblast were finally identified as the most appropriate option.

The Kovykta gas field in the Irkutsk region, with a reserve of 1,100 billion cubic metres, was considered most promising and was closest to the potential markets in China and South Korea. South Korea, Japan, and China considered a possible joint project for this field. According to a tentative project scheme, about 20 million LNG-equivalent tons of natural gas were to be supplied via the Irkutsk Oblast to China (7 million tons), Mongolia, and South Korea (7 million tons, LNG). The hope was that the so-called the Irkutsk project would supply these countries with natural gas for the next generation.[30] The gas fields in the Krasnoyarsk region were considered as an additional supply source, should the resources in the Irkutsk region become depleted or turn out to be insufficient.[31]

Five Potential Pipeline Networks

After having introduced the single country reports, we now turn to the central part of the results of UNDESA's research project, dealing with the proposed new pipeline net for natural gas. Based on the proposals in the country reports and the forecast of China's demand and output of natural gas (see Table 9.2), the Chinese team outlined five potential pipeline networks, as introduced below.

Table 9.2 Forecast of demand and output of natural gas in China (billion cubic metres).[32]

	2005	2010	2015	2020
Demand	50–60	90–110	150–180	190–230
Proportion of primary energy	3%	7%	9%	10%

29 Stern, *Natural Gas*.
30 Cao, "Russia's Pacific," 82–85.
31 Chen, "Sino-Russian," 48–49.
32 UNDESA, *Proceedings of the UN Symposium*, 146.

Table 9.2 (continued)

	2005	2010	2015	2020
Output	42–50	70–80	90–100	100–120
Overseas share gas & coal-bed gas	0	5	20	40
Gap between supply and demand	8–10	15–25	40–60	50–70
Imported LNG (kilotons)	3,000	6,000	10,000	12,000
Imported PNG[33]	4–6	7–17	27–47	34–54

[1] Irkutsk–Manzhouli–Harbin–Shenyang–Dalian–Inchon

By 2000, the Chinese, Russian, and South Korean governments and some multinational oil corporations had expressed interest in the Irkutsk pipeline project. The pipeline was meant to start at the Kovykta gas field as the supply source and to proceed along the proposed Sino-Russian oil pipeline through Ulan-Ude, Chita, and Manzhouli (according to the Sino-Russian agreement signed in March 2000, a 2,400-km oil pipeline would be built from Angarsk in East Siberia to Northeast China). From Manzhouli, natural gas was also supposed to be transported to some large cities and industrial bases in Northeast China, such as Daqing, Harbin, Changchun, and Shenyang. Given the great demand for gas in Northeast China, the construction was expected to start around 2005–2007. This route could also be extended to South Korea either by land or by sea. The whole length of Route 1 was estimated at 4000 km, and the export capacity to China could reach 20–25 bcm/year and 10 bcm/year to South Korea. Considering the economic, geographical, and political conditions in Northeast Asia, Route 1 was suggested by the Chinese team as the best option for pipeline network infrastructure for the following reasons: first, Northeast China was in urgent need of energy due to economic development, and the local oil output was insufficient; second, it was not economical for China's national pipeline to reach the northeastern provinces, making it necessary to import natural gas from abroad to supplement the

33 PNG: Pipeline Natural Gas.

Fig. 2 Potential submarine pipeline routes (Map data from Google Maps, 2023, routes marked by the author).

domestic shortage; third, Route 1 was supposed to follow the same route as the Trans-Siberian Railroad and also the proposed Sino-Russian oil pipeline. This would make the geological prospecting, infrastructure, supervision, and maintenance of the pipelines more economically efficient and environmentally friendly.[34] Finally, it was possible for Route 1 to satisfy the need of another gas market: South Korea. The first option was to build a direct international submarine pipeline from Dalian to Inchon. The second option was to build a submarine pipeline to Weihai or Rongcheng (in Shandong Province) first, and then to Inchon or Mogpo (see Figure 2). In addition, the Chinese team laid some hopes on the improvement of the political atmosphere in the Korean Peninsula to facilitate a crossing pipeline.[35]

[2] Sakhalin–Vladivostok–Tumen River–North Korea–South Korea

Route 2 was an attempt to make use of the natural gas on the Sakhalin. The line would start Yuzhno–Sakhalinsk (in southern Sakhalin), and then the LNG would be shipped to Japan, South Korea, and China. The natural gas transported via this route would directly enter the world LNG competitive market. The major trait of Route 2 was that it passed the Tumen River area (the Tumen River Development Program was officially put forward by UNDP in 1991). In December 1995, China, Russia, North Korea, South Korea, and

34 UNDESA, *Proceedings of the UN Symposium*, 150–151.
35 UNDESA, *Proceedings of the UN Symposium*, 151.

Mongolia signed an agreement and memorandum on the development of this area.[36] The reasoning behind this agreement was that the construction of Route 2 across the Tumen River would boost related industries in this region, such as gas chemistry and LNG factories, and stimulate development and cooperation among the neighbouring regions. Another advantage of Route 2 was that it went along the proposed pipeline project in the Russian Far East and promised to resolve the energy shortage in Khabarovsk and Vladivostok.[37]

[3] Irkutsk–Ulaanbaatar–Beijing–Rizhao–South Korea (or Japan)

Route 3 proposed fields in the Irkutsk region as the gas source and linked them to Rizhao, a coast city in Shandong Province, via Ulaanbaatar, Inner Mongolia, and Beijing. There was also a possibility of extending it further to South Korea or Japan. The length until Rizhao was 3364 km, and the planed export capacity was 30 bcm/year. The major advantage of Route 3 was the short total length and a link to the existing pipeline networks of China. The Chinese team suggested that Route 3 be built after 2010. Before then, the gas demand of North China could be satisfied by the gas fields in the Ordos Basin through the pipeline between Shaanxi Province and Beijing. Too-early construction for Route 3 was not considered desirable because of the market situation and the lower profit of the project.[38]

[4] Yakutsk–Heihe–Daqing–Shenyang

According to the estimations, even if Route 1 and Route 3 were to be constructed, the continuously increasing demand for natural gas after 2010 would still not be met. Route 4 was to start from the gas fields in the Sakha Republic, cross Heihe (in Heilongjiang Province) and connect with Route 1 in Harbin. The construction was planned around 2010–2013, in order to supply natural gas for Northeast China, North Korea, and South Korea. This transnational pipeline was supposed to be built step by step in several stages. The transnational pipeline networks, together with the domestic pipelines in each country, were expected to form a grand pipeline network by 2020. Until then,

36 Blanchard, "The Heyday of Beijing's."
37 UNDESA, *Proceedings of the UN Symposium*, 151.
38 UNDESA, *Proceedings of the UN Symposium*, 151.

the major cities in Northeast Asia would have multi-source natural gas from the synthetic pipeline networks, which would help to guarantee the steady development of the region's energy system.[39]

[5] West Siberia–Shanshan–Shanghai

West Siberia is one of the most gas-rich regions in the world, and by the end of the twentieth century, it was already linked to Europe with gas pipelines. Route 5 was supposed to connect the gas fields of western Siberia with Shanshan in Xinjiang Province and then with China's existing pipeline network. The whole length of Route 5 only needed 1500 km to be constructed. The construction of this route was scheduled for around 2015, when the domestic supply from western China (Xinjiang) would no longer be able to satisfy the needs of eastern China. By connecting to China's interior, Route 5 could bring natural gas to the cities like Lanzhou, Xi'an, Xinyang, Nanjing, and Shanghai. There was also a possibility of exporting western Siberian gas to Japan either through LNG or through a submarine pipeline. Compared to the other routes above, Route 5 was supposed to be the latest one to be implemented.[40]

Conclusion

After the end of the Cold War and with the rise of globalisation, there was an opportunity for countries in Northeast Asia to collaborate, leveraging their respective strengths in markets, capital, technology, and natural resources. This cooperation could have enhanced both domestic and regional development and enabled competition with other major economic centres like North America and Europe. Around 2000, the TUGNA project aimed to foster regional cooperation by focusing on relatively clean energy, specifically the transport and utilisation of natural gas. The Asian part of Russia had abundant energy resources, while other countries in the region had significant consumption and import needs. The TUGNA archives offer us a chance to examine the potential of this cooperation—a potential that remained unrealised.

Around that time, political tensions in Northeast Asia had been eased to some extent, and economic reforms were being carried out, especially in

39 UNDESA, *Proceedings of the UN Symposium*, 152.
40 UNDESA, *Proceedings of the UN Symposium*, 152.

China, South Korea, and Russia, where markets were steadily being opened to foreign investments and modern technologies. Teng Teng, a chemical scientist and the leader of the TUGNA project, along with the Chinese team, managed to outline five potential pipeline routes for transporting natural gas. The plan for the five routes was based on estimates of increasing population, economic growth, and the energy market. Route 1 was suggested as the most appropriate and urgent option. China's need were catered to in almost all the routes, primarily due to its vast consumption market and potential economic and population growth.

However, regional cooperation was complicated by diverse economic structures and national security needs in Northeast Asia, the high price of Russian gas, a lack of financial resources in Mongolia, and the persistent geopolitical risk on the Korean peninsula. Although most of the proposed routes were not implemented, by studying the TUGNA project today, we can grasp the original intentions of the actors involved as well as the circumstances and potentials of Northeast Asian cooperation in infrastructure in the changing world.

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