"Gas pipeline wars" in the post-Soviet space: geographical aspect

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Abstract. The article discusses the transformation of the territorial organization of gas pipeline transport in the post-Soviet period under the influence of the system of international relations that developed between the countries of the post-Soviet space. Notably, the author establishes the following major geographical factors affecting this process: the level of provision with natural gas and the peculiarities of the transport and geographical position of the countries. The author specifically emphasizes an active, consistent and purposeful policy on this issue in Russia, Azerbaijan, Kazakhstan, and Turkmenistan, which reinforces and strengthens the geopolitical interests of these states in the examined region. Their competitive advantages are clearly indicated. Particular attention is focused on the possibility of multipurpose use of gas pipelines thanks to the connecting pipes created between them. The interest intersection of three categories of states was revealed: those of the countries in the post-Soviet space (Russia, Ukraine, Azerbaijan, Turkmenistan, Kazakhstan, Uzbekistan); those of Russia and countries located in the neighboring regions (EU, China, Turkey, Iran); those of the states actively involved in investing in geological exploration, creation of mining enterprises, gas storages, construction of compressor stations on them (USA, Great Britain, Saudi Arabia, Japan, etc.).

Introduction

In the post-Soviet period, the formation of the territorial organization of gas pipeline transport in the post-Soviet countries took place not so much under the influence of the growing needs of the population and the economy for energy carriers, but rather under the influence of foreign policy factors closely related to the nature of relations between the countries. Any changes in them led initially to the transformation of the state border function (in majority of cases, from contact to barrier), and then to a corresponding work reorganization of the overall pipeline transport. The formation of such a barrier function was accompanied by an interest clash of the post-Soviet countries in respect of gas transportation. This study aims at identification of any geographical features characterizing the manifestation of this confrontation. This goal involves performing the following tasks: identifying the countries of the investigated region that exploit gas pipelines as an instrument of their foreign policy, and, accordingly, the geographical factors underlying this process; establishing the geographic orientation of gas pipelines and the geopolitical interests of states associated with their activities; highlighting the most important and most problematic gas pipelines in the context of international relations between Russia and the countries of the region under study; detecting countries of the examined region, whose interests intersect with each other and, ultimately, with the interests of Russia in matters of gas transportation.

Results and Discussion

The interdisciplinary nature of the subject of research attracts to the stated topic a good many representatives of various sciences, among which political scientists and economists stand out for the greatest publication activity. Considering the study goals and the existing correlation between the geographical orientation of the gas pipelines in the former Soviet Union countries and their performed functions (in the context of the "gas transport confrontation"), it is reasonable to group the existing surveys on a geographical basis.

Firstly, these are researches aimed at identifying current trends in the transformation of the entire transport system of Russia and the neighboring countries (including its pipeline component) in the post-Soviet period. The following works are the closest to the stated topic: L.B. Vardomsky, A.G. Pylin [1], T.I. Pototskaya [2, 3], G.V. Sdasyuk, N.N. Komedchikov [4], A.A. Kolomeytseva [5, 6], I. A. Rodionova [7, 8] et al.

Secondly, these are studies devoted to the conflict in the functioning of gas transmission pipelines in the most important and at the same time most problematic region of the former Soviet Union for Russia - the western, which embraces almost all of its export pipelines. Abstracting from a large number of publications on this topic, the author refers only to those researches whose opinions were taken into account for writing this article: I.A. Kapitonov, V.I. Voloshin, V.G. Korolev [9], L.S. Kosikova [10].

Thirdly, these are articles examining the competition between countries in respect of transporting gas produced in the Caspian basin: S. Zhiltsov [11, 12, 13], K.S. Gadzhiev [14], A.S. Degtev, A.R. Margoev, A.A. Tokarev [15] et al.

Fourthly, these are works studying gas transportation projects focused on delivering gas to the most dynamically developing region of the world, directly bordering the post-Soviet space, - the Asia-Pacific (APR): V.A. Shuper [16], M.M. Shatz [17], L.V. Eder, I.V. Filimonova, I.V. Provornaya, A.V. Komarova, S.M. Nikitenko [18], I. Tomberg. [19] et al.

The basis of the study was the database compiled by the author taking into account public information provided by the leading operators of the main pipelines transporting gas through the territory of each state of the region in question - Gazprom (Russia), Gazprom transgaz Belarus (Belarus), Ukrtransgaz (Ukraine), SOCAR (Azerbaijan), Intergas Central Asia and others. The results of studies carried out by industry analytical organizations were also taken into consideration in this work.

The author considers the post-Soviet space in the traditional sense, namely, these are countries formed as a result of the USSR collapse. Almost all of them, to a varying extent and with different efficiency, exploit gas pipelines not only to solve economic problems, but also as an instrument of foreign policy, actively participating in the construction of gas transmission pipelines. Notably, the most active, consistent and focused policies in this matter are pursued by countries of the following categories.

Firstly, these are gas producing countries, since it is in their territory that many gas pipelines originate. However, despite the good gas supply in general (post-Soviet countries account for 30% of world reserves, 22% of world production and 38% of world gas exports) (Table 1), only Turkmenistan and Azerbaijan can be attributed to this group.

Secondly, these are transit countries. They do not have significant gas reserves, but at the same time they have a favorable transport and geographical position, located on the main routes of gas transportation through gas pipelines from gas producing countries to gas consuming countries. These include Lithuania (gas transit from Russia to Russia - the Kaliningrad region), Belarus (gas transit from Russia to Europe), Moldova (gas transit from Russia to Europe) and Georgia (gas transit from Azerbaijan to Turkey).

Table 1. Positions of the countries in the post-Soviet space in the global gas market, 2017 [BP Statistical Review of World Energy June 2018 URL: http://www.bp.com/statisticalreview]

	Proved natural gas reserves		**Natural gas production**		**Natural gas export through gas pipelines**	
	trn. cu. m.	**%**	**bn. cu. m.**	**%**	**bn. cu. m.**	**%**
Russia	35	18,1	635,6	17,3	215,4	29,1
Turkmenistan	19,5	10,1	62	1,7	33,6	4,5
Azerbaijan	1,3	0,7	17,7	0,5	8,9	1,2
Uzbekistan	1,2	0,6	53,4	1,5	11,8	1,6
Kazakhstan	1,1	0,6	27,1	0,7	13,2	1,8
Ukraine	1,1	0,5	19,4	0,5	-	-
All CIS countries	**59,2**	**30,6**	**815,2**	**22,2**	**282,9**	**38,2**
The whole world	193,5	100	3680,4	100	740,7	100

However, in pure form the listed types of countries are not common. Most states that actively utilize gas pipelines as a foreign policy instrument combine both functions. These include the following countries: Russia (18% of world reserves, 17% of world production, 29% of world gas exports), which acts as a transit country for gas coming from Uzbekistan and Kazakhstan to Europe; Ukraine (1% of world gas reserves; 0.5% of world production), through which gas in transit went from Russia, Uzbekistan, Kazakhstan, Turkmenistan to Europe; Kazakhstan (0.6%; 0.7%; 1.8%, respectively) serving gas transit from Uzbekistan to Russia; Uzbekistan (0.6%; 1.5%; 1.6%, respectively), which provides gas transit from Turkmenistan to Kazakhstan and farther to China.

Thus, even a cursory analysis of international statistics reflecting the functioning of the gas industry underlines the obvious leadership of Russia both in terms of gas reserves / production / export and in diversifying gas export directions through gas pipelines in the region under consideration and allows us to identify countries whose interests overlap (compete) with its interests in terms of gas transportation. At the same time, each of the gas transportation directions differs in a different level of competition. On this basis groups of gas pipelines can be distinguished (Fig. 1).

The most numerous and significant group is made up by *gas pipeline systems oriented to Europe*, since 75% of the gas exported by Russia through gas pipelines goes to this particular region of the world (Table 2). Most of them were built in the Soviet period. The entry of the USSR into the world gas market required creating a system of transportation lines that would meet the needs of the rapidly developing European economies, at that time almost the only consumer of Russian gas. In this regard, all gas pipelines of this category are distinguished by high throughput. We confine ourselves to listing the most important of them. Thus, the "*Soyuz"* and "*Central Asia - Center"* gas pipelines provided gas from the Orenburg gas condensate field and Uzbekistan, Turkmenistan to Romania, Hungary and Slovakia, and then to other European countries (the Czech Republic, Austria, Germany, France, Switzerland, Slovenia, Italy). The "*Brotherhood*" and "*Progress*" gas pipeline systems, passing through one transport corridor, provided gas export from the northern regions of the Tyumen region to Slovakia, Hungary, Romania, and then to the Czech Republic, Austria, Italy, Slovenia and Croatia. The collapse of the USSR led to the division of the listed pipelines between the countries of the post-Soviet space and, as a result, to consequent dependence on each other in terms of gas export. This had a particularly adverse effect on the interests of Russia, which is developing the resource base of the listed transport systems, and is therefore heavily

investing in their reconstruction. The complexity of relations between Russia and Ukraine in the studied field has turned into one of the major problems affecting the system of foreign policy relations in the post-Soviet period in the post-Soviet space.

Table 2. The main directions of gas export through gas pipelines in post-Soviet countries, 2017. [BP Statistical Review of World Energy June 2018 URL: http://www.bp.com/statisticalreview]

Exporting countries	**Export volume**	**Importing countries**						
		Turkey	Russia	China	Kazakhstan	Belarus	Ukraine	Europe
	bn. cu. m.	bn. cu. m.	bn. cu. m.	bn. cu. m.	bn. cu. m.	bn. cu. m.	bn. cu. m.	bn. cu. m.
Russia	215,4	27,6	-	-	3,3	17,8	-	161,7
Europe	149,5	-	-	-	-	-	13,3	-
Turkmenistan	33,6	-	-	31,7	0,3	-	-	-
Kazakhstan	13,2	-	12,1	1	-	-	-	-
Uzbekistan	11,8	-	6,7	3,4	1,7	-	-	-
Azerbaijan	8,9	6,3	-	-	-	-	-	2,1

An obvious way to solve such problems is to build transport routes bypassing transit countries (in this case, Ukraine), which was implemented in due course. The new gas pipeline passed through the territory of Russia's main ally in the post-Soviet space, bordering Europe - Belarus. This is the *"Yamal-Europe"* gas pipeline system: Torzhok (Russia) - Minsk (Belarus) - Chechanow (Poland) - Malnov (Germany). Its design involved due consideration for the existing route of the *Torzhok gas pipeline (Russia) - Minsk (Belarus) - Ivatsevichi (Belarus)*.

However, its capacity can provide only a third of gas exports going through Ukraine, which in the conditions of constantly deteriorating relations with Ukraine, did not solve the problem of gas export dependence. In addition, following the Ukraine's example, Belarus also began exploiting its transit position to put pressure on Russia in terms of making various kinds of economic decisions. As a result, it was decided to build gas pipelines that bypass all transit countries to the main consumers of Russian gas (Europe and Turkey) and have a capacity that covers the entire volume of gas exported from Russia through Ukraine. Consequently, there was established a system of gas transmission pipelines passing along the bottom of the Black and Baltic Seas. The first to build was the "*Blue Stream"*: CS Beregovaya (Russia) - Samsun (Turkey) - Ankara (Turkey), then the "*Nord Stream"*: Vyborg (Russia) - Greifswald (Germany) and, finally, the completion of the "*Turkish Stream"* construction: CS Russian (Russia) - (Turkey) and "*Nord Stream 2"*. The total capacity of the listed offshore pipelines amounts to 160 billion cubic meters per year, which completely covers the entire volume of gas exported by Russia through Ukraine to Europe (162 billion cubic meters), which not only allowed it to solve the problem presented by transport dependence of gas exports from Ukraine, but also made it possible to diversify the direction of this export.

In the meantime, in the post-Soviet period large gas condensate as well as oil and gas fields were discovered in the Caspian Sea, concentrated mainly in the marine sectors of Azerbaijan and Turkmenistan. This circumstance led to the need to create gas transmission systems that would allow gas to be delivered from the Caspian basin to the main consumers, which were traditionally considered to be European countries at that time.

It was their interest in diversifying the sources of gas consumed and the corresponding support that caused construction of the "*South Caucasus"* Gas Pipeline bypassing Russia: Baku (Azerbaijan) - Tbilisi (Georgia) - Erzurum (Turkey). This gas pipeline is part of a major gas transmission project, which is usually regarded as a competitor to Russian gas transmission pipelines of the European orientation – "*The Southern Gas Corridor"*, combining the existing *"South Caucasus", Trans-Anatolian (TANAP)* and still under construction *"Trans-Adriatic" (TAP*) gas pipelines, which are supposed to deliver gas to Europe through Turkish territory not only from the fields of Azerbaijan, but also in case of the creation of the "*Trans-Caspian"* gas pipeline from Kazakhstan and Turkmenistan, and also from Iran, provided that the economic sanctions are lifted. This pipeline is designed to transport 20 billion cubic meters of gas per year, which can be regarded as the price of the volume of possible gas transportation lost by Russia.

"*Caspian*" gas pipeline: Bekdash (Turkmenistan) - Beineu (Kazakhstan) - Aleksandrov Gai (Russia), in turn, is a Russian version of the solution to transporting Caspian oil to Europe, designed to pump 40 billion cubic meters of gas. If implemented, Russia would have the opportunity to include almost all of the gas produced by Turkmenistan and Kazakhstan in the Caspian basin in the transportation through a single system of major export gas pipelines. But the complexity of relations between the countries resulted in the cancellation of gas contracts between them and the consequent freezing of this project.

Thus, the considered group of gas pipelines plays the most significant role for Russia in the system of international relations because of the priority for the European direction of gas export. Having said that, it presents major problems, which, nevertheless, can be dealt with. The only area in which Russia's position continues to be relatively weak is the transportation of export flows of Caspian gas.

Unlike the Europe-oriented gas pipeline system, the functioning of intraregional international gas pipeline systems is rarely subjected to geopolitical analysis. This is due to their initial focus on meeting the domestic gas needs of the national republics within the USSR (for some, with the subsequent possibility of exporting it) - most of these pipelines were built in the Soviet period. In this regard, many of them went into the international arena only after the collapse of the Soviet Union, becoming a link between the gas transmission systems of Russia, the newly independent states and countries (regions) - gas consumers.

In the post-Soviet period, gas pipelines of this group were built with the active involvement of Russia and Turkmenistan. As for Russia, its main objective was the gas supply to the strategically important territories, namely, the Kaliningrad region (construction of the second branch "*Torzhok - Minsk - Vilnius – Kaliningrad"*), South Ossetia ("*Dzuariku - Tskhinval"*), Crimea ("*Krasnodar Territory – Crimea"*). Freezing gas contracts with Russia determined Turkmenistan's urgent need for diversification of gas export directions, which, in turn, led to the launch of gas transmission projects aimed at Iran, China, Europe and, as a result, to the creation of a gas pipeline linking all of them together and allowing redistribution of gas flows within the unified system: "*East – West*" (Dovletabad and South Iolotan - Caspian). Its construction paves the way for the construction of a pipeline actively supported by the EU, since in the future it will focus on exporting Turkmen gas to this region bypassing Russia (along the bottom of the Caspian Sea with further connection with the South Caucasus gas pipeline and the Southern Corridor, in general) – *"Trans-Caspian"*.

Exploring the importance of this gas pipeline group in the foreign policy of the countries in the post-Soviet space, we note the following aspects of its geopolitical importance. Firstly, it is the presence of Russia's interests in their functioning, since most of the listed highways begin in its territory, still using the Russian resource base. The total throughput of these pipelines is 55 billion cubic meters per year, i.e. 50% of the total transit of all gas pipelines in this group. Secondly, the most problematic for Russia part of the gas pipelines in this group (characterized by a high level of competition) is associated with the transportation of gas

from the Caspian basin. In the meantime, the gas pipeline Baku (Azerbaijan) - Novo-Fila (Russia), which provides the supply of natural gas both to the Russian market and in reverse mode to Azerbaijan and then further to Europe, under conditions of its full load (it is designed for transportation of 14 billion cubic meters of gas per year), seems to help Azerbaijan in the transportation of Caspian oil, rather than to compete with it..

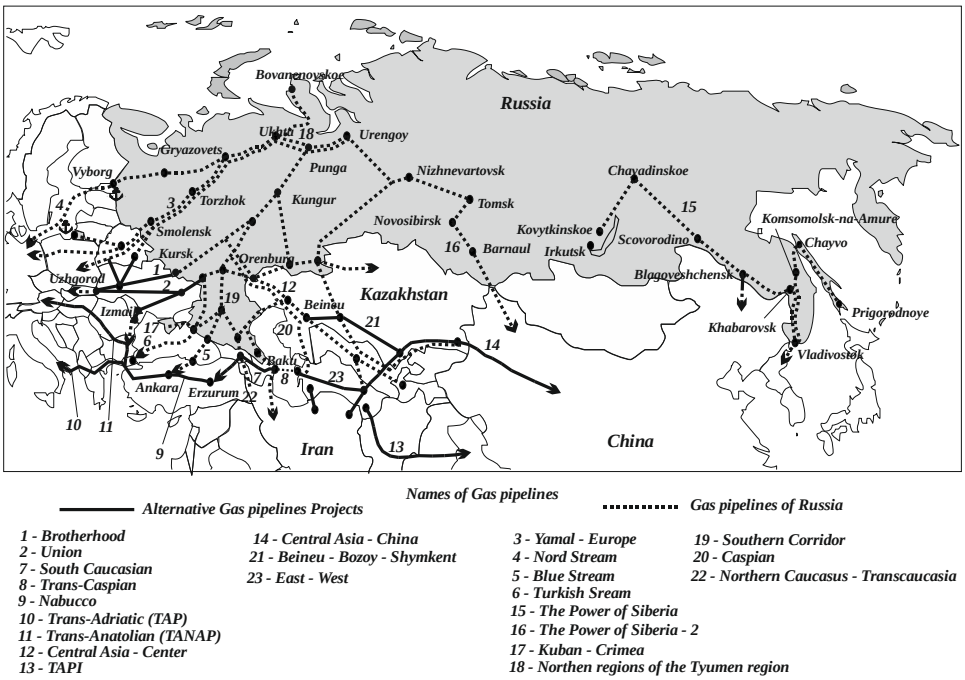

Fig. 1. The geography of "gas wars" in the post-Soviet space. Compiled by the author

Thirdly, the routes of some gas pipelines in this group and individual elements of their infrastructure served as the basis for the construction of a number of new export gas transmission systems. This applies primarily to the Yamal-Europe system, which was built as one transport corridor with the existing at that time Torzhok-Minsk-Ivatsevichi; to the Central Asia-China gas pipeline system laid parallel to the Bukhara gas-bearing region-Tashkent-Bishkek-Almaty gas pipeline; to the Iran-Armenia gas pipeline, exploiting sections of the North Caucasus-Transcaucasia highway, etc. In general, emphasizing the importance of intraregional international gas pipeline systems, we still note that some of them work with incomplete workloads, which reduces the possibility of their use as a tool of foreign policy in the post-Soviet space.

The highest level of competition is characteristic of the "youngest" group of gas pipelines built / under construction in the post-Soviet period - these are gas pipeline systems oriented to the Asia-Pacific region (APR) (Fig. 1). Arisen under the influence of certain geographical, economic and related political factors, they are becoming increasingly significant. However, many of them operate in combination with the transportation of gas in a liquefied form. Given this peculiarity, the position of competitors can be described as parity, based on approximately equal total throughput of the pipelines they have built (under construction): 90 versus 90 billion cubic meters per year. The main competitors from the countries of the former Soviet Union are Russia and Turkmenistan, which stand out for their good gas supply, which provides a resource base for the gas transmission systems they are building. For

Russia, this is the Eastern Program, aimed at creating a system combining gas production and transportation to China and other Asia-Pacific countries. Its outcome was *"The Trans-Sakhalin Pipeline System"*, targeted, ultimately, at the export of liquefied natural gas. The construction of the gas transportation corridor, which consists of two gas pipeline systems, is still in progress: "*Power of Siberia"* (Irkutsk Region - Yakutia - Vladivostok) - export of liquefied gas and "*Altai / Power of Siberia – 2"*: Western Siberia (Russia) - Xinjiang Uygur Autonomous Republic (China) - natural gas export.

Meanwhile, the transportation of Turkmen gas to the Chinese market is associated with the construction of one of the longest gas pipelines in the world: *"Central Asia – China"* (Turkmenistan, Uzbekistan, Kazakhstan, China). The region already has a gas pipeline built in a similar direction back in the Soviet period: *"Bukhara gas-bearing region Tashkent-Bishkek-Almaty" ("BGR-TBA").* However, the problem of its functioning, associated with passing through disputed territories between Uzbekistan and Kyrgyzstan, forced the builders of a new gas pipeline to lay a route bypassing the conflict area, thereby ensuring the stability of the system. Since the interests of Kyrgyzstan and Tajikistan were not taken into account as a result of these actions, they joined the project later by signing an agreement on the construction of the fourth branch of the "*Central Asia-China* " gas pipeline running through Kyrgyzstan and Tajikistan to China. In the analytical literature on gas transportation in Kazakhstan [19], another branch of the Central Asia-Center gas pipeline is considered to be "*Beineu-Bozoi-Shymkent (Kazakhstan)"*, which enabled Kazakhstan to diversify the direction of transit and export of natural gas through the country through the Central Asia-Center and Bukhara-Ural gas pipelines, creating an alternative sales route bypassing Russia.

At the same time, a statement of the parity of the competing parties in this group of gas pipelines fixes rather the potential positions of the countries creating gas transmission systems here. If one does not take into account the throughput of pipelines that have not yet been built and the volumes of exported liquefied gas, then the positions of the Central Asian countries are not comparable with Russia in this domain, because the volume of gas exported via pipelines to China from Turkmenistan is more than 30 billion cubic meters annually (Uzbekistan - 3.4; Kazakhstan - 1), while Russia does not yet carry out this operation (Table 2).

Systems of interregional gas pipelines arose as a result of the search by post-Soviet countries for new markets for their gas / new gas supply sources located in the adjacent regions. Meanwhile, it was Iran that attracted the main attention. Turkmenistan began to consider it as a consumer market, having built "*The Korpeje (Turkmenistan) - Kurt-Kui (Iran)"* gas pipelines, and then "*Dovletabad (Turkmenistan) - Hangeran (Iran)"*. However, due to disagreements between Turkmenistan and Iran over gas supplies and Iran's construction of its own gas pipeline to the country's northern provinces, Turkmen gas pipelines in this direction were suspended. Iran turned out to be also attractive for Azerbaijan, which is connected with it by "*The Gazi-Astara (Azerbaijan) - Bind-Biand (Iran)"* gas pipeline, built back in the Soviet period and used today not in full, but as part of swap operations between countries to meet the needs of the Nakhchivan Autonomous Republic of Azerbaijan, which is under blockade due to the presence of unresolved territorial disputes between Armenia and Azerbaijan.

Of the promising yet unrealized interregional transport projects that are focused on the search for new markets, it is worth highlighting the most ambitious both in length (1800 - 3000 km.), and in throughput (more than 30 billion cubic meters per year): "*TAPI" (Turkmenistan - Afghanistan - Pakistan - India*), presumably linking not only energy surpluses with energy-deficient countries, but also countries with a large number of unresolved geopolitical problems. This circumstance makes the construction of the gas pipeline both relevant and problematic at the same time.

An attempt to identify countries that could become a new source of gas supply for the countries of the former Soviet Union within the category of interregional gas pipelines allows Iran to be singled out again in the context of its interaction with neighboring Armenia. Due to the fact that this country in the Soviet period was supplied with gas coming from Russia via "*The North Caucasus – Transcaucasia"* gas pipeline mentioned earlier, and in the post-Soviet period via the same pipeline, but to a lesser extent due to the military-political problems that existed at that period in the region, Armenia experienced a shortage of energy resources. Hence the desire to attract neighboring Iran to solve this problem, also focusing attention on its potentially transit position on the path of a possible gas transportation from Iran through Armenia, Georgia, the Black Sea, Ukraine to Europe. Given the large capacity, this gas transmission project could act as a competitor for Russian gas pipelines, which forced Russia to intervene in its creation, insisting on reducing the capacity to the size that meets the needs of the Armenian economy. As a result, "*The Iran-Armenia"* gas pipeline: Meghri (Iran) - Yerevan (Armenia) was commissioned.

In general, it is worth noting that this group of gas pipelines stands out for its potentially high level of competition for Russian gas transportation projects. The aggregate throughput of all the listed pipelines that compete with the interests of Russia and the aggregate throughput of gas pipelines in which Russia participates, is correlated as follows: 60 versus 2 billion cubic meters per year. However, taking into account the potential nature of the activity of one part of the projects and the problematic functioning of the other part, as well as the possibility of Russia's participation in the largest of them (TAPI), eliminates this competition.

Conclusion

The study allowed the author to conclude that, firstly, the countries of the former Soviet Union are actively exploiting gas transmission lines as an instrument of international relations. That said, the main geographical factors affecting this process are: the level of natural gas supply and the particular transport and geographical location of the territory.

Secondly, the main mechanism that allows the countries of the studied region to use gas pipelines as an instrument of their foreign policy is participation in the construction of major gas pipelines. This process is largely due to the reconstruction of old ("Soviet") gas pipelines, the construction of new branches based on them, and the laying of new gas pipelines along old routes. Having said that, Russia, Azerbaijan, Kazakhstan, and Turkmenistan are pursuing the most active, consistent and focused policy in this respect, which strengthens their position in the region.

Thirdly, the gas pipelines of the countries in the post-Soviet space, having different geographical orientations, were formed at different time periods. Thus, gas pipeline systems oriented towards Europe, as well as systems of intraregional international gas pipelines, were built primarily as elements of a unified transport system of the USSR. Meanwhile, gas pipeline systems oriented to the Asia-Pacific countries and most of the interregional gas pipelines were created after the collapse of the USSR as alternative pipelines delivering gas to consumer countries bypassing Russia. In this regard, we can claim that the distinguished groups of gas pipelines consolidate and strengthen the geopolitical interests of different states.

Fourth, the group of gas pipelines oriented to Europe, being the most important for Russia in the system of international relations with the countries of the studied region, presents major problems. Nevertheless, these problems can still be dealt with. Meanwhile, Russia's position in the field of transportation of Caspian gas is relatively weak. However, the possibility of multivariate use of gas pipelines due to the connecting pipes created between them can solve this problem, provided that friendly relations between countries are established and sustained.

Thus, an analysis of the functioning of the gas transportation systems in the post-Soviet space, which have an impact on the system of international relations, has revealed the intersection of the interests of two categories of states. Firstly, these are the interests of the countries of the post-Soviet space: Russia, Ukraine, Azerbaijan, Turkmenistan, Kazakhstan, Uzbekistan. Secondly, these are the interests of Russia and the countries located in neighboring regions: the EU, China, Turkey, Iran. Meanwhile, there is another category of states whose interests are realized in the "gas transport confrontation" in the studied region, these are states that are actively involved in investing in geological exploration, the creation of mining enterprises, gas storages, the construction of compressor stations on them (which was not considered in this article) - the USA, UK, Saudi Arabia, Japan, etc.

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