ASEJ
Scientific Journal
Bielsko-Biala School of Finance and Law

Volume 27 | Number 2 | June 2023

ISSN2543-9103
eISSN2543-411X
www.asej.eu

Bielsko-Biała

Bielsko-Biala School of Finance and Law
Wyższa Szkoła Finansów i Prawa w Bielsku-Białej

Scientific Journal

Zeszyty Naukowe

Academic Quarterly Publication
Vol 27, No 2 (2023)

Bielsko-Biala 2023

Scientific Journal of Bielsko-Biala School of Finance and Law
The Journal is published by Bielsko-Biala School of Finance and Law; ISSN 2543-9103, eISSN 2543-411X.

The Journal is a quarterly publication with the scoring of 70 assigned by the Polish Ministry of Education and Science, prompting quality scientific work with local and global impacts, conducting a peer-review evaluation process and providing immediate open access to its content. The publication features original research papers as well as review articles in all areas of science, with particular emphasis on social sciences (including Finance, Economics, Business, Law, Internal Security) and technical sciences (especially IT).

The Scientific Journal Office
Bielsko-Biala School of Finance and Law University Press
ul. Tańskiego 5, 43-382 Bielsko-Biała;
tel. +48 33 829 72 42, fax. +48 33 829 72 21; http://www.wsfip.edu.pl; http://asej.eu

ISSN 2543 – 9103 eISSN 2543-411X

March – 2023

Contents

Editorial Words

Dear Distinguished Readers,

In the realm of academia, where the pursuit of knowledge and the sharing of wisdom take center stage, we are delighted to introduce the second issue of Volume 27 of the ASEJ Scientific Journal. This publication, in partnership with the Bielsko-Biala School of Finance and Law, continues to serve as a repository of intellectual exploration and a testament to the wealth of contemporary research.

Within the pages of this volume, a diverse collection of scholarly articles awaits. Each article represents a facet of our collective commitment to understanding the intricate tapestry of global concerns. From the realm of education to the intricacies of energy security, from the digital landscape to geopolitical intricacies, these articles provide valuable insights and open doors to meaningful discourse.

The essence of this volume lies in its unwavering dedication to furthering our comprehension of complex subjects. These articles, penned by experts and scholars who are leaders in their fields, are a testament to the rigorous examination and exploration of topics that resonate with our ever-evolving world.

As you embark on this intellectual journey through Volume 27, No. 2, we invite you to consider the broader tapestry of knowledge it presents. Each article adds depth and dimension to the ongoing conversations surrounding the most pressing issues of our time. Together, they form a mosaic of thought, offering fresh perspectives, innovative solutions, and a deeper understanding of the complexities that define our contemporary world.

These articles are more than words on paper; they represent the collective pursuit of wisdom and the desire to share it with our readers. In each piece, you will find the dedication of researchers who have invested their time, expertise, and energy to illuminate the issues at hand.

We encourage you to engage with these articles, to discuss and debate their findings, and to contribute to the ongoing dialogue that drives the pursuit of knowledge. We trust that this volume will not only inform but also inspire, and that the insights it offers will be a valuable addition to your intellectual journey.

The imperative role of risk management in ensuring the security of logistics processes within small service enterprises is illuminated, emphasizing the significance of mitigating risks in this sector. Safety management in the context of ISO 9000 quality management systems is dissected, underscoring the pivotal role of these systems in ensuring the safety and quality of organizations.

We invite you to immerse yourselves in this eclectic collection of scholarly works, each a beacon of knowledge and insight into these crucial subjects. The articles contained within this volume aspire to stimulate discussion, foster a deeper understanding, and inspire further exploration. We trust that the journey through these pages will be an intellectually enriching experience for all our readers.

Doc. Dr Kateryna Pilova
Editor of the ASEJ, Issue 2, Volume 27, 2023.

Expansion of logistics infrastructure in the oil sector as a form of improving Poland's energy security

Dominik Piękoś[1], Przemysław Suduł[2] and Sławomir Augustyn[3]

[1]School battalion, Military University of Technology
Poland
[2] 18th Artillery Regiment -Poland

[3] Institute of Logistics, Military University of Technology
Poland

***Abstract*— Energy security refers to a country's ability to provide stable access to energy, including energy resources such as oil. In Poland, PKN Orlen and PERN S.A. are the key companies managing oil logistics and processing for public and private use. A special purchaser of petroleum substances is the Armed Forces of the Republic of Poland, which are a fundamental element of the State Defense System, which use the acquired fuels to ensure the effective implementation of state defense and security policies.**

The article presents the possibilities of improving the logistics infrastructure in the oil sector through critical modeling of the elements that make up the logistics supply chain (project 116B 844/2023) with the use of innovative technologies. The ongoing investments enable the increase of storage space and faster transport of petroleum products using new technologies, which translates into increased energy security of the country. The expansion of logistics infrastructure in this sector significantly contributes to increasing the country's independence form external supplies, improving the efficiency of the transportation of raw materials and providing the opportunity to create strategic reserves in the event of disruptions in the oil flow. At the same time, it is important to constantly strive to diversify energy sources and develop other forms of energy production, such as renewable energy sources, to reduce dependence on fossil fuels.

Keywords— energy security, fuel logistics, oil, pipelines.

I. INTRODUCTION

Poland is more than 95% dependent on foreign oil imports. In 2022, domestic refineries processed 26.9 million tons of crude oil, 8% more than in 2021. Reports from the Polish Organization of Petroleum Industry and Trade (POPiHN) for 2021 and 2022 (POPiHN, 2022; POPiHN, 2023) indicate that internally assured supplies to Polish refineries amount to 860,000 tons of crude oil, or 3.2% of their demand in 2022. The state-owned oil and gas exploration, production and distribution company is Polish Oil and Gas Mining (PGNiG), which draws oil from Baltic deposits. The need to supplement domestic market demand necessitates supplementary imports, which to the greatest extent have come from Russia and Saudi Arabia. There is an extensive pipeline network to transport crude oil both from seaports to refineries and between refineries.

Oil transportation logistics encompasses a wide range of activities that are necessary to transport, store and distribute the crude within the country. The oil sector in Poland includes the necessary tools that enable the importation, storage of crude oil, its transportation (by sea, pipeline, rail and truck) and the process monitoring system. The main representatives of this sector are Oil Pipeline Exploitation Company (PERN) and Polish Oil Concern (PKN) Orlen, dominating the domestic market. Oil transportation logistics requires close monitoring of processes to ensure safety, avoiding spills, damage or theft of products. Special monitoring systems, technical safeguards and inspection procedures are used for this purpose. PERN S.A. manages a network of oil and product pipelines, while PKN Orlen fully secures the supply of crude oil to refineries in Poland, the Czech Republic and Lithuania.

PERN's logistics infrastructure in the oil sector includes 2,558 km of crude and product pipelines and 23 storage bases.

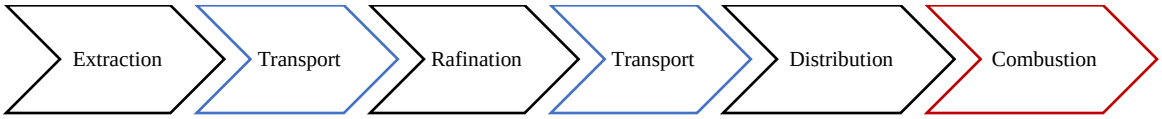
ASEJ - Scientific Journal of Bielsko-Biala School of Finance and Law
Volume 27, No 2 (2023), pages 8
https://doi.org/10.19192/wsfip.sj2.2023.2
Received: May 2023, Accepted: June 2023,
Published: June 2023

The total storage capacity for fuels in 2.4 million m3. The company also has 4 bases for storing crude oil, with a total capacity of more than 4.1 million m3, which are located in Miszewko Strzałkowskie, Adamowo near the border withBelarus. 2 bases are located in Gdansk, near oil port.

Once the oil is delivered to the terminals, the crude is stored in oil tanks. Storage plays an important role in maintaining supply stability and allows flexible inventory management. When demand is declared, it is transported to the refineries. PKN Orlen has five refineries – two in Poland (in Plock and Trzebinia), two in the Czech Republic (in Litvinov and Kralupy and Vivavou) and one in Lithuania (in Mažeikiai). Oil at the refineries is again stored in tanks, from which it is sent to processing facilities. To separate its various components, refinery processes are used, which include conservative and destructive processes. The most commonly used for obtaining gasoline and diesel is fractional distillation, which is carried out in a rectification column, where the crude oil is heated to very high temperatures. As the temperature cools, its vapor returns to a liquid state, separating into different fractions of petroleum products. Production plants in Plock and Litvinov are integrated with petrochemical complexes, where cracking and reforming are used in the gasoline production process (PKN Orlen, 2019). Cracking is the controlled decomposition of long petroleum hydrocarbons (PHCs) into compounds with shorter carbon chains, such as those found in gasoline and diesel fuel. Cracking can be initiated thermally, catalytically or by radiation (using ionizing radiation). Reforming is an alternative process that describes the transformation of straight-chain PHCs into branched-chain or ring hydrocarbons. It is a reaction commonly aimed at obtaining high octane number fuel from light fractions of crude oil or cracking products.

Once gasoline and diesel fuel are produced, they are put on the market. From the extraction or production of the raw material to its final use in an engine, fuel passes though many stages that make up its life cycle (FIGURE. 1). In addition to sea and pipeline transportation, crude oil can also be transported by rail and Orlen Group tank cars. This type of transport is particularly important for deliveries to smaller customers, as well as internal distribution of petroleum products. For individual customers, fuel is transported to gas stations in tank cars with maximum capacity of 50,000 liters.

FIGURE. 1. OIL PROCESSING FROM EXTRACTION TO COMBUSTION.



Source: own study

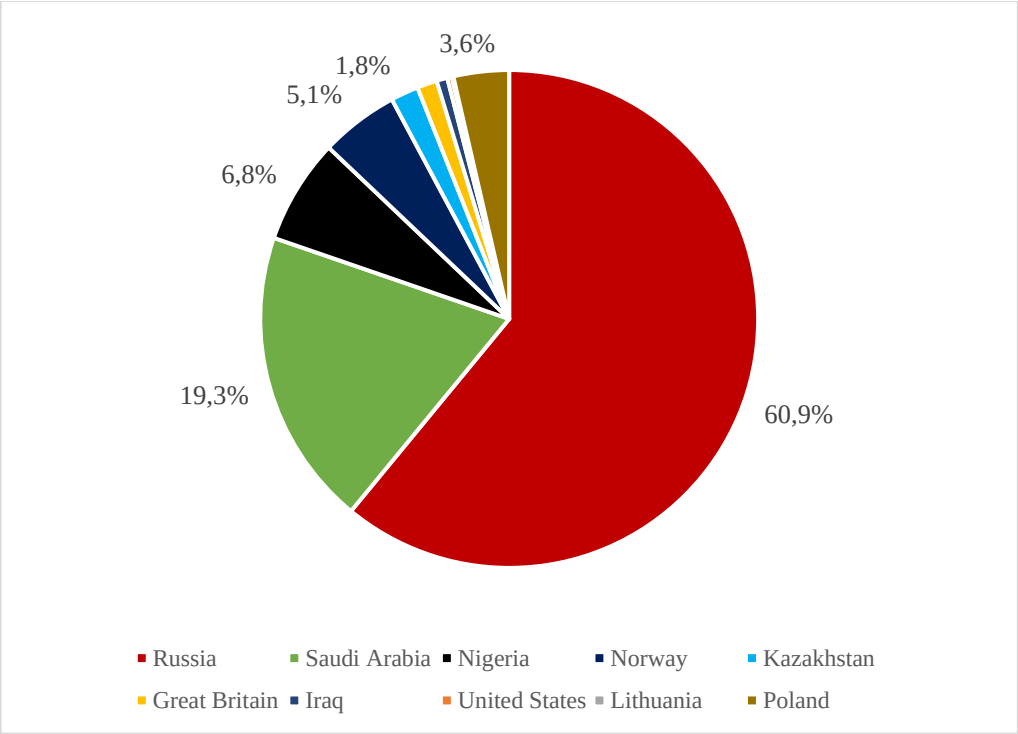
The network of pipelines, transporting oil, is one of the economic elements of international cooperation. Investments in this area can help strengthen Poland's diplomatic, political and defense ties with other Central and Eastern European countries. A common pipeline infrastructure can also enable the rapid exchange of fuels and resources between allies in the event of joint military operations. The construction of new pipelines along strategic transportation routes and close to military bases enables rapid transportation of fuels between storage bases and refineries. It is worth mentioning that pipelines require adequate military security to avoid threats to infrastructure and reliability of fuel supply.

II. POLAND'S ENERGY SECURITY

Among the most commonly used indicators of supply security in the oil sector are those of import and export dependence and commodity reserves. The effect of the EU's energy dependence on fossil fuel imports from Russia is evidenced by the failure to impose sanctions after the start of war in Ukraine. This is due to the lower price of russian oil compared to the other suppliers. In Poland's energy policy after the start of the war, there was a change in strategy and a shift to increasing diversification of oil sources. According to studies, Poland's energy security is not threatened in the near future, and our country is considered self-sufficient (Pangsy-Kania and Wierzbicka, 2022).

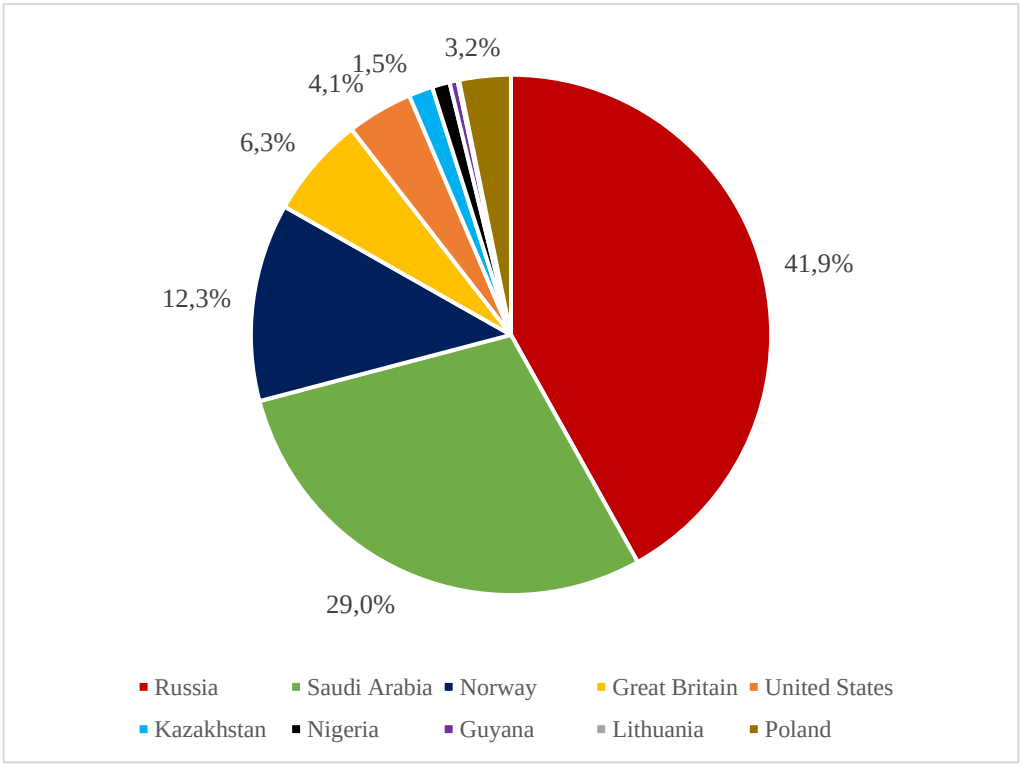
Seaports play an important role in receiving tankers and then transferring oil to pipelines or other modes of transportation. The main oil transshipment ports in Poland are Gdansk, Gdynia and Swinoujscie. They are used to receive tankers with imported oil. The main Polish oil port, Naftoport is located in Gdansk. It is one of the largest oil transshipment terminals in the Baltic Sea, with an annual capacity of 36 million tons of crude oil and 4 million tons of petroleum products. The storage and technological facilities of the coastal terminal's transshipment equipment are two crude oil bases in Gdansk owned by PERN, which is the majority shareholder of Naftoport in Gdansk. Due to the limited technical depth of the ports in Gdynia and Swinoujscie, these ports are not suitable for handling tankers with a capacity of more than 35,000 tons, as their draft exceeds 15 maters (Mioduszewski, 2021; Ministry of Infrastructure, 2022). Russia, Saudi Arabia and Norway account for the largest share of oil imports to Poland, together providing 83.2% of the country's demand (Fig. 2, Fig. 3). It is worth nothing the declining share of oil imports from Russia in 2022 (41.9%) compared to data from 2021 (60.9%) and 2020 (70%) (POPiHN, 2022; POPiHN, 2023).

FIGURE 2. SHARE OF CRUDE OIL SUPPLY TO DOMESTIC REFINERIES IN 2021 [%].



Source: POPiHN, 2022. Przemysł i Handel Naftowy – raport roczny za rok 2021.

FIGURE. 3. SHARE OF CRUDE OIL SUPPLY TO DOMESTIC REFINERIES IN 2022 [%].



Source: POPiHN, 2023. Przemysł i Handel Naftowy – raport roczny za rok 2022.

Russia's actions over the years have proven how, by means of threats as well as real halts in the transmission of raw materials, it is possible to influence the political decisions of countries. As recently as 2013, about 30% of Russian oil exports flowed through Poland (Kaźmierczak, 2013). Currently, there is an observable trend of withdrawal from this market. Nevertheless, oil imports from Russia via the Druzhba pipeline still account for the largest share of supplies to Poland. PERN continues to develop its pipeline network to increase capacity and efficiency of fuel transportation. These

investments include building new pipeline sections, modernizing existing routes and installing modern monitoring and control systems.

PERN S.A. and PKN Orlen are primarily responsible for energy security in the oil sector. PERN manages a network of pipelines across Poland and supplies raw materials to refineries, while PKN Orlen distributes crude oil transformation products to domestic and foreign markets. The companies are also undertaking investments to develop and modernize their logistics infrastructure.

III. NEEDS AND OPPORTUNITIES FOR THE DEVELOPMENT OF FUEL AND OIL LOGISTICS INFRASTRUCTURE IN POLAND

The development plan is drawn up on the basis of the energy policy of Poland and the European Union, applicable legal acts, the concept of spatial development of the country, as well as analyses, forecasts and projects for the development of the system, consistent with the strategic objectives. The development of logistics infrastructure in the oil sector implies the expansion of oil terminals, the modernization of the pipeline network or the intermodality of the transport of petroleum products. The path towards sustainable energy development of the country obliges to include investments in modern technologies, such as monitoring systems, smart logistics solutions and digital management platforms. In July 2022, PKN ORLEN merged with LOTOS Group, and the Saudi company Aramco Fuels Poland became a shareholder in the Gdansk Refinery. PERN is making investments in the expansion of storage space (at the Gdansk base and selected storage depots in the country) and pipelines (the second line of the Pomeranian section and the Boronów-Trzebinia section). The construction of a new section of the pipeline, and the consequent change in the method of supplying products to the Trzebinia terminal from rail to pipeline, is linked to a number of investments that the Orlen Group is making at the terminal. PKN Orlen is also pursuing the expansion of the LNG terminal in Swinoujscie with a capacity of 5 billion m3 per year by another 2.5 billion m3, which will allow greater diversification of the direction of liquefied natural gas takes place there. The next stage is road transport, for which cryogenic tankers are used (Kuźmicki and Mikołajczak, 2021).

Currently, the transportation of crude oil in Poland is carried out mainly by pipelines, tankers and railroads. Poland has a network of pipelines (Figure. 4), which allow oil to be transported from ports to refineries and other industrial centers.

FIGURE. 4. MAP OF STORAGE BASES, PIPELINES, PETROLEUM AND FUEL BASES IN POLAND.

Source: PERN

Poland's main pipeline is the Druzhba pipeline, a strategic pipeline for Central Europe, which allows deliveries from Siberia to Germany. In February 2023, Russia temporarily halted the flow of oil through the pipeline (Martewicz, 2023). Such actions are likely to be repeated due to Polish and European Union policies openly supporting Ukrainian forces in the conflict with Russia. In order to prevent them, the Department of Oil and Transport Fuels of the Ministry of Climate and Environment, together with the Energy Community, has implemented an energy security strategy and proposed increasing sanctions against Russia (Perdana, Vielle and Schenckery, 2022). In Poland, the Druzhba pipeline has three sections:

The Eastern Section, which receives oil from the east, connects the Adamowo storage depot, located near the Belarus border, with Poland's largest crude depot in Miszewko Strzalkowskie near Plock. This section reaches a capacity of 50 million tons of oil per year.

The Pomeranian Section connects the raw material base in Miszewko Strzalkowskie near Plock with the handling base in Gdansk. The Pomeranian pipeline can transport petroleum in two directions. On the route from Gdansk to Plock, its capacity is about 30 million tons of oil per year, while in the opposite direction the pipeline has a capacity of about 27 million tons per year.

The Western Section connects the crude base in Miszewko Strzalkowskie near Plock with the MVP tank park located at the Schwedt refinery. It reaches a capacity of 27 million tons of crude oil per year.

An alternative way of importing oil is by sea to the oil port in Gdansk. New agreements with the United States and Norway after Russia's attack on Ukraine make it possible to increase oil imports to this port. Once the oil reaches the port, it is unloaded and transferred to refineries or stored for strategic purposes.

As part of its long-term strategy, PERN is working to expand the national fuel pipeline network, which will allow fuel to be delivered by pipeline to the largest urban agglomerations – Warsaw and Silesia. The plan includes the construction of several pipeline sections, such as Boronow–Trzebinia, Boronow–Radzionkow, Ostrow Wielkopolski–Wroclaw, Plock–Warsaw, Plock–Malaszowice and Plock–Lublin. In addition, PERN is planning to expand cross-border fuel pipeline connections, which will allow diversification of fuel supply sources to Poland, which in the long run will better ensure Poland's energy security. Among these, the key projects appear to be the sections: Rejowiec–Schwedt and Wroclaw–Litvinov.

The company's fundamental project is the construction of the second line of the Pomeranian section of the Druzhba pipeline. As in the case of the first line of the pipeline, a reversible system is planned, allowing crude oil to be transported in both directions on the Gdańsk-Płock route. From the point of view of the country's energy security, this project is considered strategic. The thoroughfare is to run along the current pipeline and will cross three provinces: the Mazovian, Kuyavian-Pomeranian and Pomeranian. An environmental decision has now been issued, specifying the conditions for the implementation of the construction of the crude oil pipeline along with the infrastructure necessary for its operation. As part of this project, pumping stations and gate valve stations will be built or upgraded to allow the pipeline to operate properly. Another key PERN project is the Boronów-Trzebinia product pipeline, which supplies fuel to southern Poland. This project counts as a public purpose investment at the provincial level, as it passes through the provinces of Silesia and Małopolska. The investment is an extension of the existing product pipeline relationship to the Trzebinia Fuel Terminal. The construction of the two pipelines has been under way since 2019, based on a speculative law on the preparation and implementation of strategic investments in the oil sector (Sejm of the Republic of Poland, Dz. U. 2022 poz. 483). In February 2023, PERN obtained occupancy permits for the individual facilities of the Boronów-Trzebinia pipeline and commissioned them. The implementation of the project makes it possible to ensure adequate supply of liquid fuels to the south of Poland.

PERN is implementing the Polish Government's Policy for Logistics Infrastructure in the Oil Sector, also responsible for the expansion of oil storage capacity and storage tanks at fuel depots. At the Gdansk Oil Terminal, six tanks (62,500 m3 each) with a total capacity of 375,000 m3 were put into operation in 2016, another 4 tanks with a total capacity of 345,000 m3 were put into operation in 2020, along with associated infrastructure, and in August 2021 a tank with a capacity of 45,000 m3 was incorporated into the terminal. In 2020, the expansion of crude oil storage capacity at the Gdansk base was completed and 2 tanks with a capacity of 100,000 m3 each, along with associated logistics infrastructure, were commissioned, increasing the total storage capacity to 1.1 million m3. The increase in storage capacity enabled an increase in the flexibility of the transmission system, greater possibilities for separating different grades of crude oil and additional space for emergency stockpiling. A natural consequence of this expansion was the construction of additional storage tanks at PERN fuel depots. In 2019, 4 new tanks (32,000 m3 each) were built at 2 fuel depots. In 2021, the formation of 9 tanks, with total capacity of 222,000 m3, at 6 fuel bases were completed. In 2022, construction work were completed at 3 fuel bases, erecting 7 new tanks with a capacity 32,000 m3 each, while another 8 tanks (32,000 m3 each) are currently under construction at 4 bases. The creation of new storage areas is a response to the significant increase in demand for the services provided. Their primary use will be for fuel trading and storage of emergency stocks.

In the context of logistics in the oil sector, it is worth noting the cooperation between Poland and other European Union countries. The northern route of the Druzhba pipeline runs through Belarus, Poland and Germany, supplying refineries in Poland, eastern Germany and the Baltic States. The southern branch of this pipeline runs through Ukraine and splits into two lines to Slovakia and Hungary. The trunk pipeline is also connected to the Adria pipeline, flowing through Croatia. Oil supplies to Western Europe are provided by oil ports, the largest of which are located in Rotterdam, Antwerp, Hamburg in the North Sea and Algeciras, Valencia and Marseille in the Mediterranean Sea (Vrieling, 2007). As a result of sanctions

imposed on Russian fuels, refineries in eastern Germany are facing a particularly difficult situation. The port of Rostock, like that of Gdynia, is too shallow to accept supply from large tankers and provide oil to refineries in Schwedt and Leuna (**Błąd! Nie można odnaleźć źródła odwołania.** 5). In the event that Russia stopped oil shipments, these units would be left without supplies. Accordingly, Poland has pledged to help by supplying crude oil through a network of pipelines from Gdansk's Naftoport. The agreement with Germany is bilateral and ensures the energy security of Polish refineries in the event that foreign reserves are needed. Moreover, negotiations are underway on the possibility of PKN Orlen entering the shareholding of the German Schwedt refinery. The condition for such a solution, however, is the removal of the Russian company Rosneft from the refinery's shareholding.

FIGURE 5. MAP OF THE PIPELINE DISTRIBUTION AND REFINERIES IN GERMANY

Source: European Commission, Climate, Infrastructure And Environment Executive Agency/Energy PCI Transparency platform. Interactive map of oil terminals and pipelines.

As early as 2009, the region was defined as one of the logistically isolated. East Germany, along with Poland and the Baltic states, did not have access to diversified and integrated sources of oil, not counting imports through the ports of Gdansk and Rostock. In European commission documents, the lack of development of oil sector logistics infrastructure in Poland was explained by the industry's dependence on coal. The approach to managing the country's energy potential was significantly changed by the new EU climate goals (European Parliament, 2009, PE 416.239). Poland, as a member of the European Union, actively cooperates with other countries in the field of energy security. The successive investments made in the last decade in the Polish territories are justified by the increased energy security of the entire region of Central and Eastern Europe. Measures made to diversify energy supplies increase the region's level of independence from Russian supplies. Expansion and modernization of oil infrastructure allows to increase the capacity and efficiency of the system, as well as to improve the security of supply. However, it is worth noting that in recent years there has also been a growing awareness of and need for an energy transition towards renewable energy sources. Investments in the oil sector are often undertaken in parallel with the development of other forms of energy, such as solar, wind and geothermal, to gradually reduce dependence on fossil fuels and contribute to more sustainable energy development.

IV. IMPORTANCE OF OIL FLOW LOGISTICS FOR THE MILITARY

Oil is one of the key energy resources that is essential to military operations. Ensuring stable and secure access to oil is crucial to maintaining the continuity of military operations, both during conflicts and in peacetime. Various public institutions are involved in supplying the Polish military with oil. The key role in supplying the army with oil and other fuels is played by the Ministry of National Defense (MON), which is the main government body responsible for defense policy and ensuring the operational capabilities of the Polish Armed Forces. The Ministry cooperates with various entities, both domestic and foreign, to ensure adequate fuel supplies for defense needs. The process of supplying the Polish military with oil involves negotiating and signing contracts between the Ministry of National Defense and relevant fuel suppliers (Ministry of National Defence, 2003). Once the contracts are concluded, the fuels are delivered to military depots or directly to stationary or container fueling stations under the responsibility of the Military Economic Departments (WOG), where they are stored and used according to operational needs. The National Critical Infrastructure Protection Program covers the energy, energy resources and fuel supply system, which is one of the key critical infrastructure systems (Ministry of National Defence, 2023). In facility security, a good practice is the approach that any design, production, import, construction and operation of equipment, installations and networks should ensure the rational and economical use of fuels or energy. According to the ratified NATO standardization agreement called STANAG, all special agents (including fuels) produced from petroleum are classified as Class 3.

According to the Ministry of National Defense, annually the Armed Forces of the Republic of Poland purchase between 75,000 and 100,000 tons of fuel, and consumption is at the level of 90,000 tons of fuel. Taking into account the fuel consumption of the army of the Republic of Poland, a separate supply system has been organized (Szlachta, 2007). It is divided into stationary and mobile systems. The stationary system is responsible for the regional supply of units and provides a base for the mobilization development of the army. The Armed Forces Support Inspectorate buys fuel from refineries in tenders that are announced by Regional Logistics Bases (4 in Poland). Delivered fuel is accumulated in the fuel depots of the Regional Logistics Bases, airbase depots and war port commands. The essential elements of the stationary supply system are located in specific regions and are important links in the procurement and operation system, forming the technical and economic infrastructure. The mobile system consists of Logistics Brigades (2 in the country: in Opole and Bydgoszcz), designed for direct battlefield security. A third unit of this type is in the process of being established near Lodz. The brigades are

subordinate to the Armed Forces Support Inspectorate. In peacetime, they deal with the training of reserves and the ongoing maintenance of military equipment, which includes tanks and military aircraft. In the case of the Polish army's primary tanks, the Leopard 2PL, fuel consumption per 100 km ranges from 210 to 790 liters of fuel. The level of fuel burned by tanks depends primarily on their weight and terrain conditions. The main producer of aviation fuel in Poland is PKN Orlen. The corporation is capable of producing 100,000 tons of aviation fuel per month and storing up to 15 million liters at its storage base in Plock. The logistics process for air operations requires a process approach as defined by NATO procedures (Stiepowikow, 2019).

Controlling oil flow routes is part of military strategy. Troops may be involved in protecting strategic pipelines, oil terminals, ports and refineries to ensure the safe transport of oil, as disruptions in fuel supply can have serious consequences for the country's defense capabilities. The army's energy security requires developed internal logistics, which is why the Polish Armed Forces have their own logistics units responsible for transporting and distributing fuels to various military units in the country. High combat readiness and operational capabilities of troops depend on access to sufficient quantities of fuel. Oil flow logistics allows the necessary amount of fuel to be delivered to areas of military operations at the right time and place. This ensures continuity of operations, enabling troops to maintain their combat capability. In order to minimize oil requirements, modernization of the vehicle fleet, introduction of more efficient military technologies and training in the optimal use of energy resources are regularly applied in the Polish Armed Forces.

V. SUMMARY

By properly modeling the logistics infrastructure in the oil sector as a form of improving Poland's energy security, it is an important research tool that provides support in the logistics management of the supply chain of strategic energy sources. Energy security is a critical aspect for the country's stability and economic growth. The development process of logistics infrastructure plays a special role in securing uninterrupted fuel and oil supplies. PERN S.A. and PKN Orlen, as national and regional leaders logistics in that sectors, are therefore indirectly responsible for the country's energy security. Investments made in the area of energy infrastructure are aimed at enlarging capacity, improving the efficiency of crude oil and other petroleum products transportation and increasing the reliability of supply. Optimizing logistics in the oil sector is also crucial for military operations. In the current geopolitical situation, diversification of supply sources and independences form Russian oil imports is a challenge for all of Europe. In the context of Russia's attack on Ukraine, cooperation with allies in the wounds of the European Union is crucial to maintaining the country's energy security. In the face of armed conflict, the Polish military is stockpiling reserves of raw materials that can be used in emergency situations. On the other hand, the economic growth recorded in the pre-epidemic years, the growing demand for energy and development of the oil sector pose challenges to Poland's efficient transportation, distribution and storage of fuels. At the same time, there are opportunities for infrastructure development, such as expansion of pipelines, modernization of terminals and monitoring system evolution. Ensuring the safe and uninterrupted fuels and oil flow is crucial to the country's stability, military capabilities, economic advancement and sustainable energy development.

VI. REFERENCES

COWI A/S, 2009. Gas and Oil Pipelines in Europe, IP/A/ITRE/NT/2009-13, PE 416.239 European Parliament [online]. Available at: https://www.europarl.europa.eu/document/activities/cont/201106/20110628ATT22856/20110628ATT22856EN.pdf [1 August 2023].

Kaźmierczak M., 2013. Poprawa poziomu bezpieczeństwa energetycznego państwa wynikająca z nowej koncepcji gospodarowania ropą naftową w Polsce. Cz. 3, Budowa nowych magazynów i ropociągów. Zeszyty Naukowe Akademii Sztuki Wojennej, 2(91), 288-299.

Kuźmicki J., Mikołajczak, T., 2021. Raport Zrównoważonego Rozwoju [online]. Gaz-System. Available at: https://www.gaz-system.pl/pl/asset.html?id=baa69a5b-159a-4950-947e-1aae42f7ee1e [1 August 2023].

Martewicz M., 2023. Poland Says Russia Stops Oil Flows Via Key Druzhba Pipeline [online]. Bloomberg. Available at: https://www.bloomberg.com/news/articles/2023-02-25/poland-s-orlen-says-russia-cuts-oil-deliveries-via-key-pipeline [1 August 2023].

Ministry of Infrastructure, 2022. Raport z realizacji polityki morskiej Rzeczypospolitej Polskiej w 2021 r. [online]. Available at: https://www.gov.pl/attachment/d0f1e62b-5e68-4f3d-9cda-81bb2c89f0a2 [1 August 2023].

Ministry of National Defence, 2003. Decyzja nr 339/MON Ministra Obrony Narodowej z dnia 12 grudnia 2003 r. w sprawie planowania i realizacji zakupu paliw stałych i płynnych do celów grzewczych dla jednostek organizacyjnych resortu obrony narodowej [online]. Available at: https://sip.lex.pl/akty-prawne/dzienniki-resortowe/planowanie-i-realizacja-zakupu-paliw-stalych-i-plynnych-do-celow-33847829 [1 August 2023].

Ministry of National Defence, 2023. Narodowy Program Ochrony Infrastruktury Krytycznej [online]. Available at: https://www.gov.pl/web/rcb/narodowy-program-ochrony-infrastruktury-krytycznej

Mioduszewski T., 2021. Analiza Nawigacyjna określająca możliwość wykonywania przeładunków offshore z wykorzystaniem jednostek typu jack-up przy nabrzeżach Helskie I i Bułgarskim w Porcie Gdynia wraz z operacjami wejścia/wyjścia do Portu oraz manewrów wewnątrz Portu [online].

Pracownia Projektowa Budownictwa Hydrotechnicznego Aquaprojekt. Available at: https://www.port.gdynia.pl/wp-content/uploads/2021/09/7.0_Zalacznik_nr_11_do_Specyfikacja_Postepowania_-_Analiza_nawigacyjna.pdf [1 August 2023].

Pangsy-Kania S., Wierzbicka, K., 2022. Niezależność od importu surowców energetycznych jako kluczowy element bezpieczeństwa ekonomicznego państwa. Polska na tle krajów UE. Optimum. Economic Studies, 3(109), 86-102.

Perdana S., Vielle, M., Schenckery, M., 2022. European Economic impacts of cutting energy imports from Russia: A computable general equilibrium analysis. Energy Strategy Reviews, 44, 101006.

PKN Orlen, 2019. Petrochemicals – Challenges, Solutions and the Future [online]. Future Fuelled by Knowledge. Available at: https://ffbk.orlen.com/reports/petrochemicals-challenges-solutions-and-the-future [1 August 2023].

Polska Organizacja Przemysłu i Handlu Naftowego, 2022. Przemysł i Handel Naftowy – raport roczny za rok 2021 [online]. Available at:

https://popihn.pl/wp-content/uploads/2022/04/RAPORT-ZA-ROK-2021.pdf [1 August 2023].

Polska Organizacja Przemysłu i Handlu Naftowego, 2023. Przemysł i Handel Naftowy – raport roczny za rok 2022 [online]. Available at: https://popihn.pl/wp-content/uploads/2023/03/RAPORT-ZA-ROK-2022.pdf [1 August 2023].

Projects of Common Interest, 2023. Climate, Infrastructure And Environment Executive Agency/Energy PCI Transparency platform. Interactive map of oil terminals and pipelines [online]. European Commission. Available at: https://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/main.html [1 August 2023].

Sejm of the Republic of Poland, Ustawa z dnia 27 stycznia 2022 r. o zmianie ustawy o przygotowaniu i realizacji strategicznych inwestycji w sektorze naftowym [online]. Dz. U. 2022 poz. 483. Available at: https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20220000483 [1 August 2023].

Szlachta, A., 2007. Organizacja logistyki w siłach zbrojnych Rzeczypospolitej Polskiej. Logistics and Transport, 4(1), 77-85.

Stiepowikow, C., 2019. Specyfika wojskowego transportu paliw lotniczych oraz wykorzystywanych środków technicznych. Zeszyty Naukowe Collegium Witelona, 32, 233-241.

Vrieling, E., 2007. European Pipeline Infrastructure Networks. [online]. European Chemical Site Promotion Platform. Available at: https://chemicalparks.eu/europe/pipeline-networks [1 August 2023].

WSFiP conducts research and educates students in the following fields:

Finance and Accounting
- Treasure Administration
- Banking
- Corporate Finance
- Accountancy
- Accounting and Finance in Public Sector Institutions
- Corporate Accounting and Controlling
- Audit
- Management and Finance in Real Estate

Law
- this program gives strong legal foundations to undertake further professional training for judges, prosecutors, atorneys, notaries, bailiffs.

Administration
- Fiscal Administration
- Local Government Administration

Logistics
- this program gives good preparation for work in logistics companies as well as in other economic and administrative units.

Cyberspace and Social Communication
- Communication and Image Creations
- Safety in the Cyberspace

Internal Security
- Administration and Management in Security
- Security and Public Order
- Security and Development in Euro-region
- Security of Information and Information Systems
- Security in Business
- Criminology and Investigative Studies
- Criminology and Forensics
- Protection of People and Property
- Public Order Agencies

Information Technology
- Databases and Net Systems
- Computer Graphics and Multimedia Techniques
- Design of Applications for Mobile Devices
- IT Services in Public Administration Units

Postgraduate courses
- Administrative studies
- Fiscal Administration
- Law and management in health service