

Greenfield grain transshipment terminal on the border of Ukraine and Poland: a prefeasibility study

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UAFATA

KSE

Center for Food
and Land Use Research
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Photo: Unsplash Shalitha Dissanayaka

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Acknowledgments

This report was prepared by the team of the Center for Food and Land Use Research at the Kyiv School of Economics (KSE Agrocenter) with a close cooperation of European Investment Bank (EIB) and UAFATA, and under the guidance of the Ministry for Agrarian Policy and Food of Ukraine.

The Center conducts applied and fundamental economic research in the field of agriculture and land policy, as well as prepares regular analytical reviews on key issues of agriculture and land policy in Ukraine.

The main mission of the Center is to provide key stakeholders in the private and public sectors with quality analytics to make optimal data-driven decisions.

The Center studies the development of agri-food markets and value chains, focusing on food security and the economics of sustainable land use. The Center regularly analyzes proposed and implemented policy changes that affect the agricultural sector and land market.

The report was prepared under the general supervision and editing of Oleg Nivievskiy, Associate Member of the Center for Food and Land Use Research (KSE Agrocenter), based on analytical contribution by Oleksandr Nychporuk (Content manager and senior financial and business analyst), Oleksandr Starikov (senior financial analyst), Yuriy Diachyk (senior agribusiness and agrilogistics expert), Mariia Bogonos (senior agricultural economist and modelling expert), Pavlo Maryshev (grains and oilseeds market expert), Rodion Rybchynskiy (senior storage facilities sector expert), Artur Kopanskyi (senior storage facilities technical expert), Oleg Kartavtsev (senior environmental expert), and Volodymyr Brunko (senior engineer).

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Executive summary

The Ministry for Agrarian Policy and Food of Ukraine is exploring various options of supporting investments into alternative land routes/transshipment capacities for current and future agricultural exports from Ukraine as an insurance policy of the Government. Investing in such a project makes Ukrainian agriculture less vulnerable to interruptions of the sea route trade caused by Russia. This is also extremely valuable to analyze if the war with Russia develops into a protracted, frozen conflict with constant threats to the openness and safety of maritime traffic.

The NGO 'KSE Institute,' with the support of the international Technical Assistance Program 'Technical Assistance to support the implementation of the Ukraine Agri-Food Value Chain' financed by the European Investment Bank, is conducting a market study and pre-feasibility analysis of constructing a grain transshipment terminal at the border of Ukraine and Poland.

Market Analysis: a potential for increased exports to the EU from the Western oblasts of Ukraine

Almost a decade of agricultural (mainly crop based) progress has been reversed by Russia's full-scale invasion. Total grain and oilseed output is expected to plummet to 53 million tons this season, or 50% of the record 2021 harvest. It might take at least a decade to return to the prewar output levels if an average prewar productivity growth is assumed.

We expect that Ukraine's port capacities will still be exceeding potential exports of grains and oilseeds by 2030, as Ukraine's agriculture will likely not fully recover after the war by then. So, under a scenario of fully functioning Ukraine's Black Sea and Azov Sea ports, the terminal occupancy can only be achieved by its commercial or generally economic attractiveness, and not a surplus of grain inside the country.

An important conclusion for our study is that the imports from Ukraine of grains and oilseeds to the EU could potentially be expanded. It would especially make sense from the areas located within 200 km zone from the terminal location under consideration: in the Yagodyn-Kovel area or in the Mostys'ka-Shegyni area.

Corresponding expected resource supply is expected to be the following. If the terminal is located in Yagodyn-Kovel area, then Ternopil, Lviv and Volyn could be using the terminal after the end of the war. If the terminal were located in Mostys'ka-Shegyni area, then Zakarpattya, Ivano-Frankivsk, Lviv, Ternopil, Khmelnytskyi and Chernivtsi oblasts could be supplying the terminal after the war. Under this assumption the potential availability of supplies for the terminal is expected in the range of **2.3 to 6 mln tonnes** of grains and oilseeds for the Yagodyn-Kovel area, and **4.2-11.2 mln tonnes** for the Mostys'ka-Shegyni area depending on the year and scenario.

In the current market environment, the EU (ports) destinations look more attractive for the terminal at question and its corresponding resource base/cargo owners. This might change, though, when the Black Sea ports operations and their security are fully restored to pre-war conditions. And most likely the alternative destinations will become equally attractive for cargo owners. So other factors such as demand for grain in each direction, market trends and potential risks or challenges associated with each destination may influence the attractiveness of alternative destinations.

Considering the saturation of grain storage capacities within a 200 km radius of the planned elevator construction, as well as the active development of transshipment hubs, the new elevator will operate in a highly competitive environment. This will require additional efforts to attract cargo owners to the terminal.

Further development of the company's services, such as grain drying, pelletizing byproducts, and container operations, can serve as additional incentives for successful competition in the region. This would attract further investments and result in changes to financial indicators in the short and long term.

The forecasted terminal's revenue is generated by the provision of services for the transshipment of grain cargoes (railway car to railway car, truck to railway car), grain cleaning and customs clearance of grain cargoes.

A viable strategy option for the project is to envisage at least 50% of annual elevator utilization with its own grain, which entails the development of internal trading. That will ensure terminal profitability. The project could be interesting for grain traders, who can provide part or even all of the terminal's annual utilization with their own grain.

Technical Analysis: a half-million tons per year terminal

The grain terminal will be located on the border of Ukraine and Poland near major transportation arteries such as highway and railway with two types of gauge: narrow and wide. The location will be chosen based on proximity to major grain producers in the region, the possibility to connect to both types of railway, easy access to the terminal by trucks, along the shortest routes to Polish and German ports, in compliance with environmental legislation. According

to the latter, purchase of a land plot is possible only near the border of Ukraine and Poland in two directions: 1) the region between Kovel and cross-border railway crossing Yagodyn; 2) region between Mostys'ka and cross-border railway crossing Shegyni.

The grain terminal will be designed to handle on average 500 000 metric tons of grains and oilseeds per year. The design will include the following key components:

- (a) Receiving system: grain will be received from trucks or railcars and unloaded into pits using mechanical or pneumatic system, capacity of unloading from trucks will be 4000 t per day and from railcar - 3250 t per day;
- (b) Cleaning system: grain will be cleaned using a combination of screens, air separators and magnetic separators to remove impurities such as stones, dust and metal.
- (c) Storage system: cleaned grain will be stored in silos with a total capacity of 20 000 metric tons. The silos will be equipped with temperature monitoring and ventilation systems to maintain optimal conditions for grain storage. 14 silos for 1400t and 2 silos for 500t are planned to be built;
- (d) Loading system: grain will be loaded onto railcars using a mechanical or pneumatic system, loading volumes will be about 1800t per day;
- (e) Weighing system: grain will be weighed using a calibrated scale system to ensure accurate measurement of the quantity of grain being transported.

Financial Analysis: a commercially viable project

The investments required for the implementation of the project are 12.55 million USD. It is expected that the project implementation will start in the 3rd quarter of 2023. The terminal will be put into operation and start functioning in the 3rd quarter of 2025. Reinvestments are also planned using project funds to replace railway sleepers every 4 years, with a cost equivalent to 40% of the construction cost of the railway track. After 10 years, the active part of the equipment will be renewed.

Under the base scenario, the project is commercially viable. The project efficiency indicators are:

Net Present Value (NPV)	2 994 kUSD
Internal Rate of Return (IRR)	17.0 % annual
Modified Internal Rate of Return (MIRR)	14.7 % annual
Profitability Index (PI)	1.28
Regular Payback (RPB)	5.1 years
Discounted Payback (DPB)	10.9 years

The terminal's forecasted net sales could reach \$4.58 million in 2026, with a net profit margin (net profit/net sales) of 32%. Average forecasted net profit margin is 38%, EBITDA margin is 58%,

Taking into consideration the scenario's probability, the project's expected NPV is 3.62 million USD.

Project's NPV is very sensitive to changes in the grain transshipment (handling) price and to changes in the transshipment volumes. It's important to obtain forecasted levels of those variables. NPV break-even analysis shows that the grain transshipment volumes can drop to 402.5 thousand tons per year or transshipment price can drop to 7.59 USD/t before the project's NPV falls to zero.

A. Background of the proposed grain terminal

The NGO 'KSE Institute,' with the support of the international Technical Assistance Program 'Technical Assistance to support the implementation of the Ukraine Agri-Food Value Chain' financed by the European Investment Bank, is conducting a market study and pre-feasibility analysis of constructing a grain transshipment terminal at the border of Ukraine and Poland

The Ministry for Agrarian Policy and Food of Ukraine is exploring various options of supporting investments into alternative land routes/transshipment capacities for current and future agricultural exports from Ukraine as an insurance policy of the Government. The price of Russian war is already immense for Ukraine and increasing daily. The most recent estimate of total economic war damages to Ukraine, dating from September 2022, is USD 136 billion or almost 64% of the country's 2021 GDP (KSE, 2022). Total war damages and losses for Ukrainian agriculture were estimated to be USD 40.9 billion as of September 2022 (Nivievskiy et al., 2023). This estimate includes USD 8.7 billion in damages and USD 31 billion in losses. Disruptions in export flows were the major driver of substantial losses due to the destruction of transportation infrastructure and harbor facilities that led to a large backlog of grains and oilseeds and reduced domestic prices in Ukraine. Under normal circumstances, transporting bulk agricultural commodities (key agricultural export from Ukraine) by ship/via ports is much less costly than by land. Following the outbreak of the Russian war and blockade of major ports, however, exporters have been forced to turn to the land route. Even after the Black Sea Grain Initiative began to operate and exceed expectations, traders continued to move Ukrainian grain and oilseeds to world markets overland to the Romanian port Constanta, or to Baltic ports in Poland (e.g. Gdansk) and Germany (e.g. Rostock). It is in principle at least worth considering investing in land route alternatives, even given the whole uncertainty in terms of the timing and outcome of the war. On the one hand, investing in such routes could act as an **insurance policy** (in terms of the policy priorities for sector recovery and reconstruction), making Ukrainian agriculture less vulnerable to interruptions of the sea route (von Cramon-Taubadel and Nivievskiy, 2023). This could prove extremely valuable if the war with Russia develops into a protracted, frozen conflict with constant threats to the openness and safety of maritime traffic. Furthermore, with a view to Ukraine's goal of EU membership, some investments into improving westward road and rail connections (e.g. reducing the difficulties caused by the use of different rail gauges on either side of Ukraine's western border) appear inevitable, not only with a view to agricultural trade. On the other hand, if it is possible to reach a stable post-war situation in which Ukraine once more controls its Black Sea ports, specific infrastructure for moving grains and oilseeds westward by rail could end up as a white elephant. So it is very important to think in advance about alternative/coupled usage of alike facilities to maximize their benefits.

B. Objectives of the study

The objective of the study is to assess the viability of the proposed grain terminal. The study will evaluate the market demand, technical feasibility, financial viability, legal and regulatory requirements and risks associated with the project.

C. Scope of the study

Fundamental focus and scope of the study is viability of a grain terminal as a transshipment facility only, at a pre-selected place at the border, that would facilitate exports of grains and oilseeds from Ukraine. So it will include market analysis, technical feasibility, financial analysis, and legal and regulatory analysis.

A small extension to the fundamental scope of the study will be exploring the options of adding value to the transshipment terminal of interest by additional services or/and activities and exploring further places at the border that could be considered for a greenfield transshipment terminal.

D. Methodology used for the study

Overall the following 3-phases approach and methodology was applied in the study:

Phase I: Scope identification stage. As the Project supports the Ministry of Agrarian Policy and Food of Ukraine in essentially putting together its insurance policy against possible disruptions of agricultural export flows, the team has engaged and discussed through with the Ministry for Agrarian Policy and Food of Ukraine its vision, discuss main assumptions and alternatives. That helped up to understand better and streamline the focus of the study.

Phase II: Data and background information collection phase. During this phase, the project team (in a

close collaboration with the Ministry) collected the necessary data on current agricultural (grains and oilseeds) performance/output, expected development paths, trade flows, past and current grain and oilseeds export logistics costs (taking into account alternative routes on modalities, i.e. various modes of transportation involved), storage facilities and border transshipment facilities sector performance. The project team also engaged with the agribusiness and trading sector representatives in terms of their vision and insights in terms of the current and future (post-war) scenarios of the cross-border trade flows on the border of Ukraine and Poland. The analysis of the most promising cargoes for the terminal and its logistics performance is relevant after the end of the war in Ukraine. This is instrumental in terms of market research and possible usage by private players of the grain terminal during the war and in the post-war time. The team developed and justified assumptions that the war and post-war product mix transshipped by the terminal might be decisive in terms of its financial sustainability.

Construction of the transshipment terminal is also related to a number of various risks, including environmental risks that were also considered and incorporated into the study.

Phase III: Market research analysis and drafting stage. At this stage the team implemented a comprehensive market research analysis based on the data and information/insights generated in the previous stage. It has been enriched by a scenario analysis to assess the future perspectives of the Ukrainian agricultural sector and markets under different war and pos-war-related scenarios until 2030. A so-called AGMEMOD model was applied (see the Annex for a detailed description). It is an econometric, dynamic, partial-equilibrium, multi-country, multi-market model. It covers all EU Member States, some non-EU countries, such as Ukraine, Balkan countries, and Kazakhstan, and a stylized version of the rest of the world (RoW). The model provides annual and regional projections until the year 2030 for markets of the main agricultural commodities. Scenarios considered for modeling exercise were identified by the team and discussed through with the client and with the Ministry of Agrarian Policy and Food of Ukraine.

Phase IV: Feedback collection and responding; final draft reduction. At this stage the team collected from the client, interested stakeholders and from the Ministry of Agrarian Policy and Food feedback on the draft market research submitted and afterwards undertook necessary adjustments and changes to make the draft final.

A. Overview of the global and regional grain and oilseeds markets in 2022 by export routes

Fundamentally growing role of grains and oilseeds for Ukraine's agriculture and globally

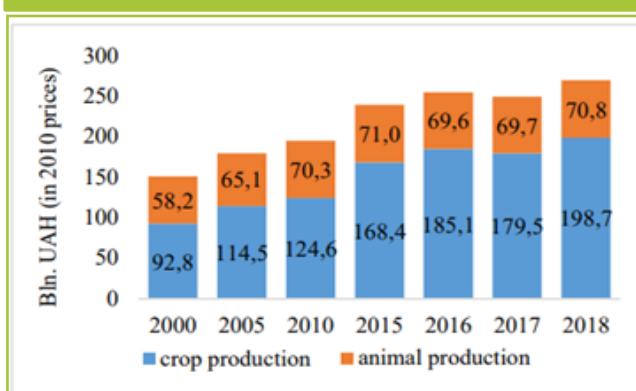
Agriculture is a key sector of the Ukrainian economy and is of vital global importance. Together with upstream (e.g. agricultural machinery) and downstream (e.g. food processing) industries, the entire agri-food sector's share of Ukrainian GDP amounts to roughly 20%. Ukraine's agriculture is mainly crop-based (Figure 1), with grains and oilseeds increasingly becoming a backbone of agricultural growth (Figure 3) and accounting for almost 90% of the total arable land (Nivievskyi et al, 2022; Figure 2).

Over the last two decades, Ukrainian agriculture became an increasingly important source of staple food supplies. Agriculture accounted for 45% of Ukraine's exports in 2020 (Gagalyuk et al., 2022) and close to 60% during the wartime. On average over the 2018-20 period, Ukraine accounted for 10% of global wheat exports, 16% of global maize exports, and 50% of global sunflower oil exports (Glauber and Laborde, 2022). As Ukraine's agriculture was still performing below its potential, it could eventually have made an even much larger contribution to global food security (Nivievskyi et al, 2022).

Figure 3 indicatively shows a possible growth scenario under a 'no war' scenario, assuming decelerating productivity growth as Ukraine approaches its productivity frontier and with additional output predominantly being supplied to global markets.

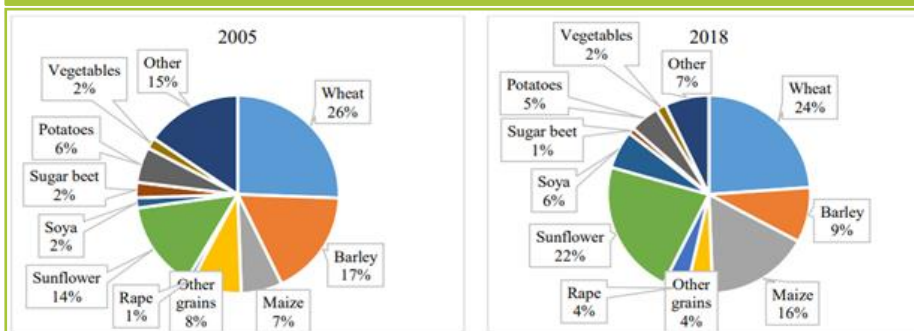
Ukraine's agricultural growth, however, has been terminated by Russia's full-scale military invasion of Ukraine on February 24th, 2022, with the expected immense consequences not only for Ukraine, but also for security in Europe, for energy markets and for global food security (von Cramon-Taubadel, 2022; Glauber and Laborde, 2022a). Essentially, almost a decade of agricultural progress has been reversed. Total grain and oilseed output is expected to be 53 million tons this year, or 50% of the record 2021 harvest. It might take at least a decade to return to the prewar output levels (Figure 3 depicts an average recovery scenario) if an average prewar productivity growth is assumed.

Figure 1 Gross agricultural output



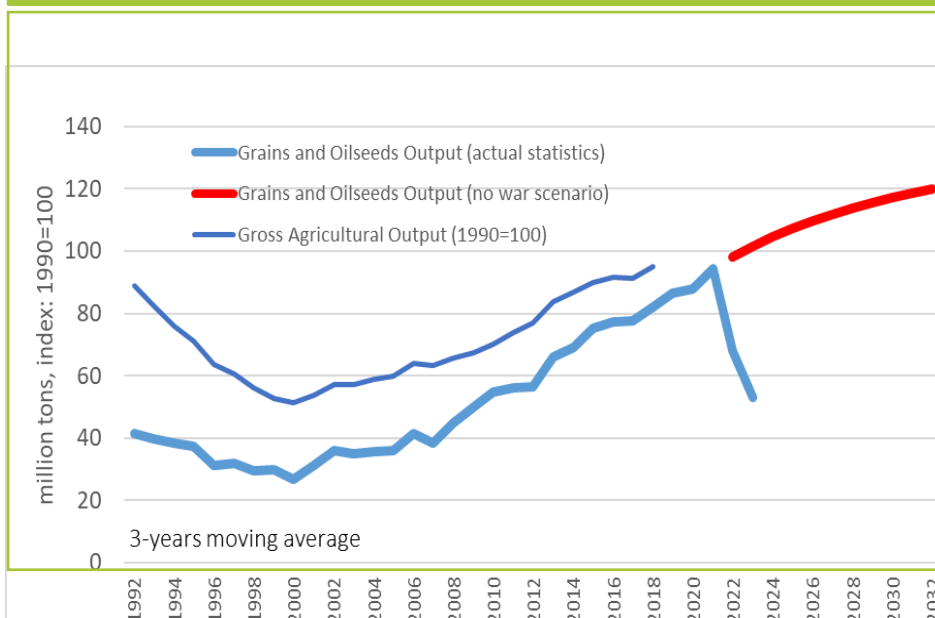
Source: Nivievskyi et al (2022)

Figure 2 Structure of the crops area in 2005 and 2018



Source: Nivievskiy et al (2022)

Figure 3 Agricultural growth and grain and oilseed output in Ukraine (3-year average)



Source: author's presentation using USDA, Ukrstat, WBI and UGA data

Impact of the war, output and exports

The full-scale Russian war has long-lasting negative consequences for Ukraine overall and its agriculture in particular, in terms of the damages and losses (see Background Section A), as well as production outlook. According to the latest estimates of Ukrainian Agribusiness Club, total output of grains and oilseeds was just around 71 mln. tons¹ in 2022 compared to 106 mln. tons in 2021², while this season output of grains and oilseeds is expected at 53 mln tons (Figure 3).

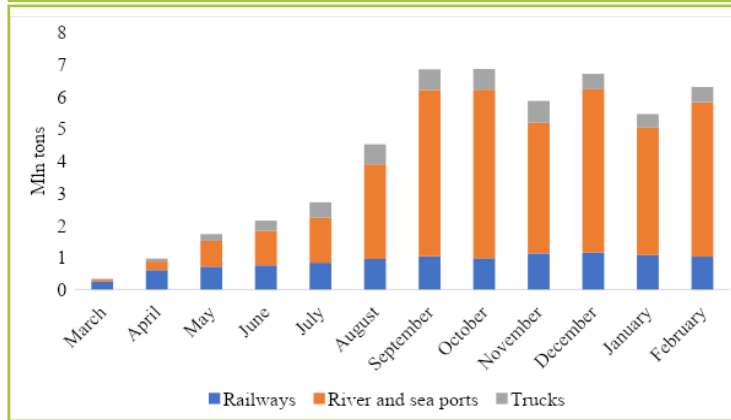
The biggest blow to the agricultural sector has been via blocking seaborne trade and export routes. During the first months of the full-scale invasion, exports via the sea (ports) were limited due to the blockade of Ukrainian seaports (Figure 4). Grains and oilseeds were transported mainly by railways and via the Danube river ports (Izmail, Reni); the share of auto trucks was relatively small. Launching the Grain Deal in August 2022 boosted overall exports due to the opening of three deep-water seaports of Odesa, Chornomorsk, Pivdennyi. Meanwhile, railway exports reached a plateau at slightly above 1 mln. tons per month. Here, the main bottlenecks were loading capacities on the western borders and transportation capacities of the EU railway³.

¹ <https://www.ukrinform.ua/rubric-economy/3675809-virobnictvo-zernovich-v-ukraini-torik-skorotilos-na-37-ukab.html>

² <https://latifundist.com/spetsproekt/956-rekordnij-2021--bilshe-100-mln-t-vrozhayu-mozhemo-zvikati-do-sotki-chi-tse-vinyatok>

³ <https://biz.nv.ua/ukr/economics/eksport-zbizhzhya-z-ukrajini-silki-vtrachayut-fermeri-cherez-zatori-na-kordoni-novini-ukrajini-50266771.html>

Figure 4 Export of grain and oilseeds from Ukraine by mode of transport

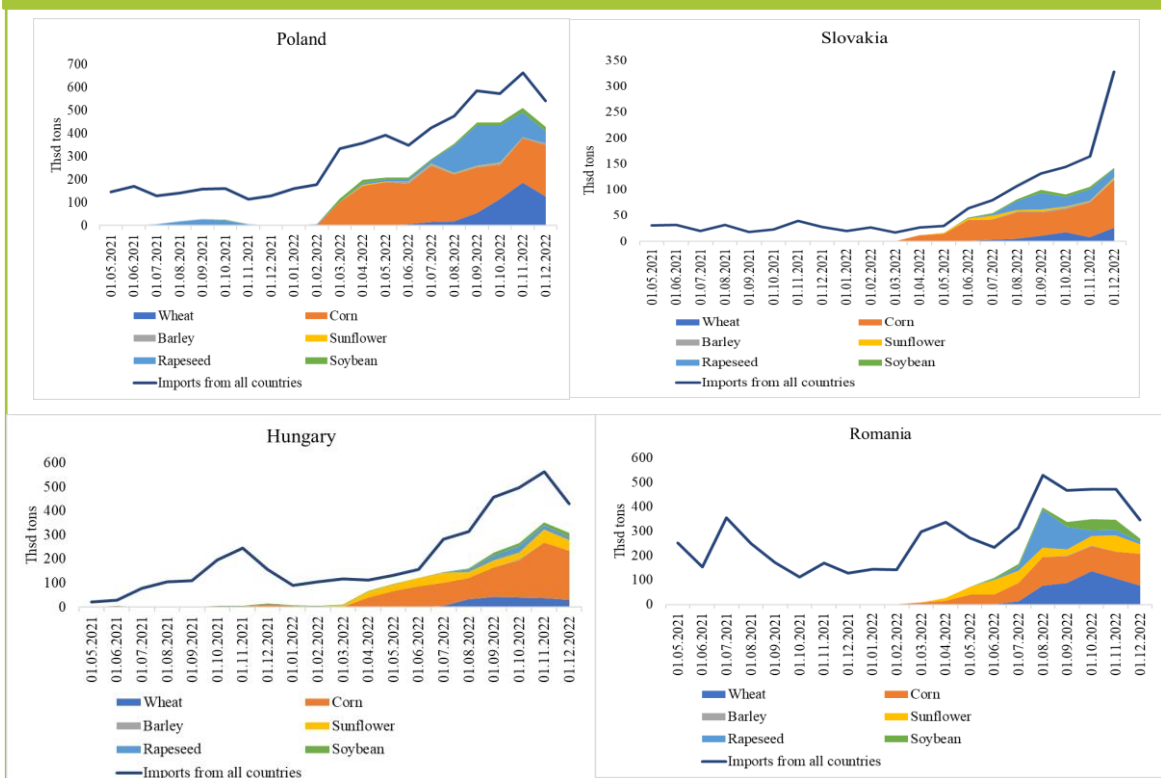


Source: Ministry of Agrarian Policy and Food of Ukraine

Import of Ukrainian grains and oilseeds to European countries for domestic consumption: transit versus import

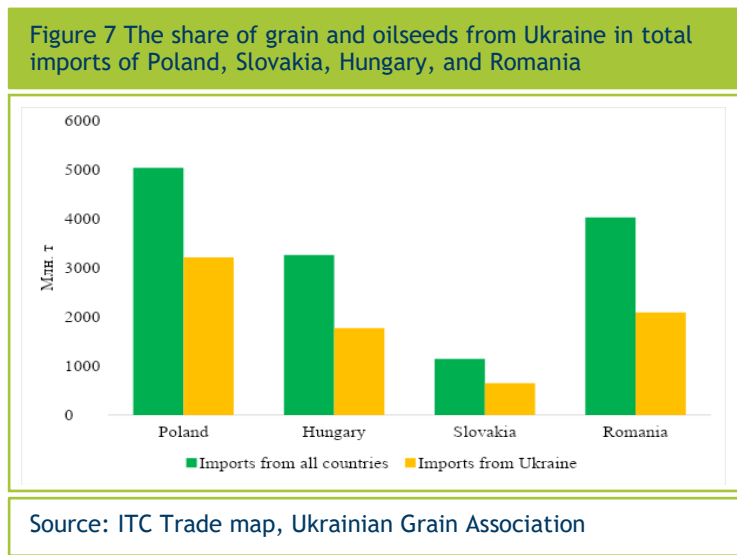
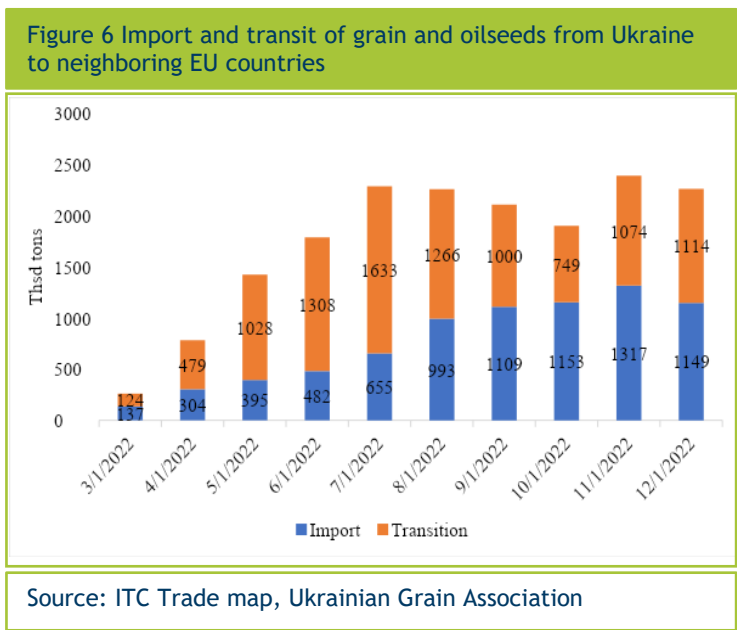
Using the mirrored data from ITC trade map, we represent the volume of export of bulk agricultural cargo (grains and oilseeds) to the neighboring EU countries. Figure 5 shows that before the start of the full-scale war, the export of Ukrainian grains and oilseeds to these countries was negligible. The war led to a significant increase in exports to the neighboring countries, especially to Poland and Romania. Imports from Ukraine did not, however, exhaust or crowd out imports of grain and oilseeds from other countries (compare to the blue line). All four countries continued to import agricultural products from other trading partners, primarily from other EU countries.

Figure 5 Export of grain and oilseeds from Ukraine to neighboring EU countries.



Source: ITC Trade

Contrasting ITC Trade and Ukrainian Grain Association (UGA) data allows us to understand the proportion of import and transit of Ukrainian grain and oilseeds in the neighboring EU countries. As we can see, about one half of the Ukrainian grain crossed the EU border, is consumed domestically (Figure 6, Figure 7). And the shares of Ukrainian imports in the total import of grain and oilseeds in the neighboring EU countries is 50-70%. **An important conclusion for our study is that the import from Ukraine could potentially be expanded.**



B. Current and future demand for grains and oilseeds in the EU

This section will assess the current trade flows and future demand for grain in the EU. This analysis should identify the key factors driving demand, including population growth, economic development, and shifts in dietary preferences in the EU.

C. Analysis of the current grain and oilseeds production and exports in Ukraine and outlook till 2030

Projections for grains and oilseeds production in Ukraine: the potential of grain terminal use

To perform the quantitative analysis of the potential use of grain terminal with respect to the expected grains and

oilseeds production quantity in Ukraine, we use AGMEMOD model. We adapt the model to fit the scenarios and update the database to the recent available records (Annex A for more details).

To quantify the expected production of grains and oilseeds in 2024 and beyond, we make assumptions on duration of the war, production costs, changes in yields, ports blockade and many other indicators affecting the farmers' decision to produce and trade. Furthermore, we assign to these variables potentially maximum and minimum values to identify the span of potential expected quantities. Table 1 below summarizes the scenarios with corresponding assumptions.

Table 1 Scenarios description for market analysis

	Optimistic	Optimistic*	Pessimistic	Pessimistic*
End of the war	2023	2023	2025	2025
Availability of financial resources for variable costs	absent in 2024, return to normal in 2025	absent in 2024, return to normal in 2025	absent in 2024-2026, gradual return until 2030	absent in 2024-2026, gradual return until 2030
Fuel expenses as compared to 2021	adjusted to inflation	adjusted to inflation	increased by 50%	increased by 50%
Fertilizer expenses compared to 2021	adjusted to inflation	adjusted to inflation	increased by 50%	increased by 50%
Yield change for wheat, rye, oats, corn, sunflower, rapeseed and soya beans compared to 2021	not changed	not changed	decreased by 30%	decreased by 30%
Production of barley	continues	stops in 2023, resumes in 2024	continues	stops in 2023-2025, resumes in 2026
Labor availability	in 2023 - 30% less, in 2024 - 30% less, starting from 2025 - gradual return to 2021 level	in 2023 - 30% less, in 2024 - 30% less, starting from 2025 - gradual return to 2021 level	in 2023 - 30% less, in 2024-2025 - 40% less, starting from 2025 - gradual return to 2021 level	in 2023 - 30% less, in 2024-2025 - 40% less, starting from 2025 - gradual return to 2021 level
Credit rates	18%	18%	25%	25%
Production for the grain terminal	from all over Ukraine	from 200 km zone	from all over Ukraine	from 200 km zone
Access to ports (seas and rivers)	2023 as of today, 2024-2026 – only Odesa and Danube ports, 2027-2030 – all ports are available except of the Azov sea ports	2023 as of today, 2024-2026 – only Odesa and Danube ports, 2027-2030 – all ports are available except of the Azov sea ports	2023-2025 as of today, 2026-2027 – only Odesa and Danube ports, 2028-2030 – all ports are available except of the Azov sea ports	2023-2025 as of today, 2026-2027 – only Odesa and Danube ports, 2028-2030 – all ports are available except of the Azov sea ports
Set aside - uncultivated land	-5% of area is not cultivated, because of absence of financial and other resources	-5% of area is not cultivated, because of absence of financial and other resources	-15% of area is not cultivated, because of absence of financial and other resources	-15% of area is not cultivated, because of absence of financial and other resources
Green deal impact	no impact	+20% increase in production costs on average	+20% increase in production costs on average	+20% increase in production costs on average

Projection results

The detailed results of the scenarios are presented in the Annex A for more details. As the major interest of this report is in quantities of crops produced and potentially exported, only the respective values are presented. However, to provide with comments and explanations, we refer to the rest of the estimated variables such as, for example,

market prices. Furthermore, we do not refer to any of the scenarios as the baseline here, as with the start of the war the volatility level of the economy does not allow treating any of the assumptions and the status quo as long-term.

The projections show very limited development of the sector under the scenarios assumptions presented in the tables above. Gaining profits only to cover the production costs in 2023-2024 in Optimistic and Optimistic* and in 2023-2025 in Pessimistic scenarios results in severe decline in production of grains and oilseeds in this period with the following slow increase for wheat. Corn recovers better than wheat given the general trend towards production of this crop in the previous years originated from, among else, the climate change. Rye, considering its very small production quantities - mainly oriented onto the domestic market, recovers rather quickly, still however, not reaching the average pre-war production levels. Barley, as a crop produced for domestic market and for export, recovers rather quickly as well, by 2030 approximating the pre-war production quantities in Scenarios Opt and Opt*. Overall, export trends follow the production trends.

Although 2022 for rapeseed and soya beans was not as dramatic as for sunflower seeds, the model projects that the scenario assumptions severely demotivate production of the former to commodities at the benefit of sunflower. In particular, with after-war stabilization (even under very harsh economic conditions) sunflower seeds and oil production will return to the mainstream of Ukrainian oilseeds production.

The trends under the scenarios are not similar among the crops as the substitution in production effect takes place. The production change results from both area and yield changes for all the commodities. The overall conclusion is: the assumptions of the three scenarios results in very drastic drop of crops production and export in Ukraine. The assumed recovery patterns, however, allow for very slow recovery (not reaching the pre-war levels), and for some crops, stabilization at very low production levels. The table below provides the more exact figures projected.

Regional Outlook

The distribution of production projected among the oblasts of Ukraine is presented in the annexed Table 22 through Table 29. It follows the trends of the years before the war. In other words, as the model projects the production at the country level, the distribution is calculated outside the model by applying the oblast-level production shares.

If we assume that the commodities will be transported to the terminal from around 200 km zone, then if the terminal is located in Yagodyn-Kovel area, than Ternopil, Lviv and Volyn could be using the terminal after the end of the war. If the terminal were located in Mostys'ka-Shegyni area, then Zakarpattya, Ivano-Frankivsk, Lviv, Ternopil, Khmelnytskyi and Chernivtsi oblasts could be supplying the terminal after the war. Under this assumption the potential fill of the terminal is from 2.3 to 6 mln tonnes of grains and oilseeds if it is located in Yagodyn-Kovel area and from 4.2 to 11.2 mln tonnes of grains and oilseeds if it is located in Mostys'ka-Shegyni area depending on the year and scenario (see the table below).

Potential loading of the terminal in the conditions of the unblocking of the Black Sea ports and the full restoration of maritime logistics

The Black and Azov sea ports are able to handle about **6.5 million tons** of grains and oilseeds per month. Historical data, however, shows higher values. Record export volumes (via sea and land routes combined) were observed in November 2021: about 6.8 million tons of grains and about 1.1 million tons of oilseeds and their processing products. As the grain and vegetable oil was exported mainly via the sea ports, one can make a conclusion that more than 7.5 million tons of agricultural cargo were shipped via the ports in November 2021. In our opinion, this level will be difficult to achieve in the conditions of post-war recovery due to existing problems with land and port infrastructure and security (military) risks. The estimate of 6.5 million tons is more realistic.

Currently, the maximum capacity of the Danube ports is about 1.5 million tons per month. Modernization of the port infrastructure and additional dredging will allow to reach 2 million tons per month of throughput capacity⁴.

From the analysis above, the bulk export volumes in 2030 is **55 million tons** or **4.6 million tons** per month. Together with oils and meals (about **12 million tons**) these make up **67 million tons**.

Scenario 2030: **49 million tons** or **4.1 million tons** per month. Together with oils and meal - **61 million tons**.

⁴ <https://landlord.ua/news/modernizatsiia-portiv-na-dunai-obiidetsia-u-200-mln-miu/>

The export potential is lower than the capacity of seaports. We take into account the priority of logistics directions.

1. Sea ports (78 million tons per year).
2. Danube (18 million tons per year).
3. Railway crossings on the western borders (the remainder).

This means that only if the export exceeds **96 million tons** (78+18), then the surplus can be exported through the western borders.

Conclusion from the section: Ukraine's port capacities far exceed potential exports of grains and oilseeds by 2030, as we expect that the agriculture will not fully recover after the war by then. So, under a scenario of fully functioning Ukraine's Black Sea and Azov Sea ports, the terminal occupancy can only be achieved by its commercial or generally economic attractiveness, and not a surplus of grain inside the country.

An important conclusion for our study is that the imports from Ukraine of grains and oilseeds to the EU could potentially be expanded. Especially it would make sense from the areas located within 200 km zone from the terminal location under consideration: in the Yagodyn-Kovel area or in the Mostys'ka-Shegyni area.

Corresponding expected resource supply is expected to be the following. If the terminal is located in Yagodyn-Kovel area, than Ternopil, Lviv and Volyn could be using the terminal after the end of the war. If the terminal were located in Mostys'ka-Shegyni area, then Zakarpattya, Ivano-Frankivsk, Lviv, Ternopil, Khmelnytskyi and Chernivtsi oblasts could be supplying the terminal after the war. Under this assumption the potential availability of supplies for the terminal is expected in the range of 2.3 to 6 mln tonnes of grains and oilseeds for the Yagodyn-Kovel area, and 4.2-11.2 mln tonnes for the Mostys'ka-Shegyni area depending on the year and scenario.

D. Analysis of the grain and oilseeds export costs

The analysis of export costs for alternative export destinations (EU versus Ukrainian ports) and corresponding prices available there, demonstrates that the spatial price arbitrage is hardly possible. Cargo owners would be on average indifferent with respect to sending their staff to Ukrainian ports vs the EU ones.

Analysis of alternative locations of land plots for construction of the terminal (see Annex B for their description) left only two alternatives available: in Lviv region along railway between Shegyni and Mostys'ka or in Volyn' region along the railway between Yagodyn and Kovel. Locations near other railway cross-borders do not meet ecological standards or have no access to the narrow gauge.

The comparison of transfer costs was made on the basis that all cargo will be shipped by rail in bulk from the above location to the ports on DAP terms (Table 2). Logistic expenses for grain delivery from the western part of Ukraine to Polish, German and Ukrainian ports involve various costs and factors that need to be considered. The cost of shipping of grain from Ukraine to German and Polish ports (in contrast to Ukrainian ports), additionally to transportation costs, also involves the cost of grain transshipment from truck or railcar on wide gauge track to railcar on narrow one (storage fee included) and customs clearance (15-17 USD/t on top of the costs in the Table 2 for the EU ports destinations).

Table 2 Cost of grain logistic to ports (in USD per t)

Terminal location	Gdansk	Gdynia	Swinoujscie	Szczecin	Rostok	Lubeck	Hamburg	Odesa
Yagodyn	40	41	51	49	63	64	66	37
Shegyni	47	48	55	51	63	64	66	33

Logistics costs for oilseeds will be about 10 USD on top of the costs specified in Table 2.

To understand what destination is more attractive for traders, we also compare the DAP prices in the alternative ports, specifically DAP Gdansk and DAP Odesa (FOB was not used to account for differences in port handling costs). On the 10th of May 2023 price for corn was about USD 173 DAP Odesa and USD 219 DAP Gdansk. So taking into account the differences in transfer costs and price difference, one may conclude that the EU ports destinations are more attractive for cargo owners at the moment. This might change, though, when the Black Sea ports operations and their security will be restored to pre-war conditions.

Conclusion from the section: In the current market environment, the EU (ports) destinations look more attractive for the terminal at question and its corresponding resource base/cargo owners. This might change, though, when the Black Sea ports operations and their security are fully restored to pre-war conditions. And most likely the alternative destinations will become equally attractive for cargo owners. So other factors such as demand for grain in each direction, market trends and potential risks or challenges associated with each destination may influence the attractiveness of alternative destinations.

E. Analysis of the grain and oilseeds storage facilities market in Ukraine

This section should examine the current state of the regional GO storage facilities market in the vicinity of 200 km from the western border of Ukraine to help to decide on the location and technical characteristics of the grain terminal, with a view of adding value addition services and strengthening a competitive position of the terminal.

For our designed terminal, we consider warehouses and silos for industrial grain and oilseed storage, and enterprises engaged in handling of grain and oilseeds in the border zone. We analyze nominal storage capacities (the capacities for storage of all competing enterprises located in the area under consideration) in the vicinity of 200 km from the point of analysis (elevator). The 200 km zone is considered as the maximum distance for grain transportation by road from local agricultural producers to storage facilities.

We consider industrial warehouse and elevator capacities in several areas of the western regions of Ukraine that have the right to store and dispatch third-party grain, as well as issue warehouse documents for grain, i.e., they are connected to the State Register of Ukraine. These rayons are:

Lviv Oblast: Drohobych District, Zolochiv District, Lviv District, Sambir District, Stryi District, Chervonohrad District, Yavoriv District.

Ternopil Oblast: Kremenets District, Ternopil District, Chortkiv District.

Zakarpattia Oblast: Berehove District, Mukachevo District, Rakhiv District, Tyachiv District, Uzhhorod District, Khust District.

Ivano-Frankivsk Oblast: Verkhovyna District, Ivano-Frankivsk District, Kalush District, Kolomyia District, Kosiv District, Nadvirna District.

Volyn Oblast: Volodymyr-Volynskiy District, Lutsk District, Kovel District.

Rivne Oblast: Dubno District, Rivne District. Khmelnytskyi Oblast: Kamianets-Podilskyi District, Khmelnytskyi District.

Chernivtsi Oblast: Vyzhnytsia District, Chernivtsi District.

The list of companies within the 200 km zone comprises 203 enterprises. The total registered storage capacity is about 7.7 million tons, of which approximately 2 million tons are flat storage and the remaining 5.7 million tons are silo storages. These are both elevators and grain processing plants and mills.

More than 80% of the enterprises are equipped with grain dryers from various manufacturers. All companies have the capability to receive and dispatch grain shipments by road, and about 60% of the companies can handle rail transportation.

All information regarding elevators in the 200 km zone is provided in a separate supplementary table to this report. If we compare the total storage capacity of grain storage facilities with the gross harvest of grain and oilseed crops in the designated regions (based on data from the State Statistics Committee for 2021), we can obtain the storage coverage coefficient for each region in western Ukraine.

Table 3 Storage capacities in the 200 km zone from the designed terminal

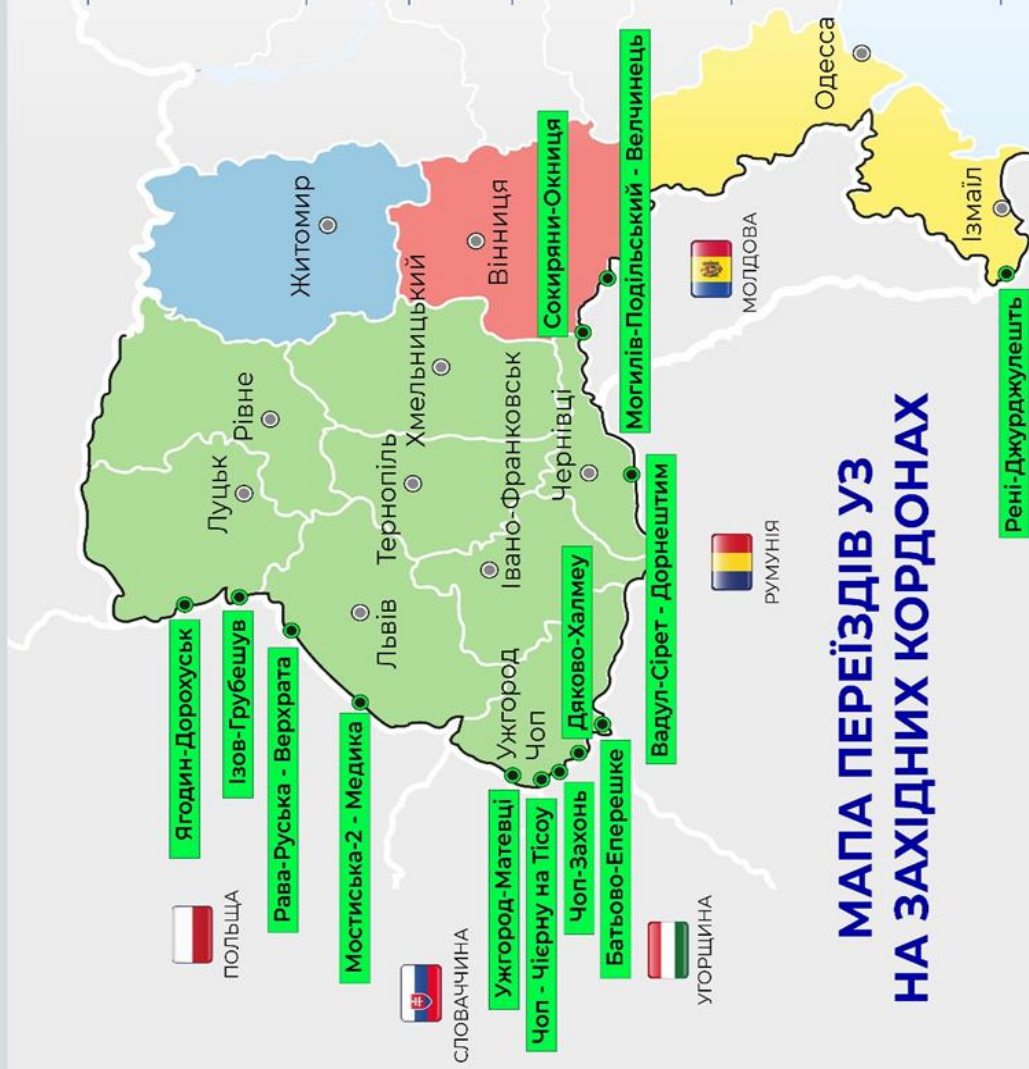
Oblast	Storage capacities as of 01 January 2022, mln t	Gross output of grains and oilseed in 2021, mln t	Difference between the gross output and storage capacities, mln t
Khmelnyska	3,13	6,07	2,9
Ternopil	2,39	4,10	1,7
Lviv	1,07	2,37	1,3
Rivne	1,15	2,06	0,9
Chernivtsi	0,13	0,98	0,8
Ivano-Frankivsk	0,48	1,29	0,8
Volyn	1,27	1,87	0,6
Zakarpattia	0,04	0,40	0,4

Conclusion from the section: Considering the saturation of grain storage capacities within a 200 km radius of the planned elevator construction, as well as the active development of transshipment hubs, the new elevator will operate in a highly competitive environment. This will require additional efforts to attract cargo owners to the terminal.

Further development of the company's services, such as grain drying, pelletizing byproducts, and container operations, can serve as additional incentives for successful competition in the region. This would attract further investments and result in changes to financial indicators in the short and long term.

A viable strategy option for the project is to envisage at least 50% annual elevator utilization with its own grain, which entails the development of internal trading. That will ensure terminal profitability. The project could be interesting for grain traders, who can provide part or even all of the terminal's annual utilization with their own grain.

ПЕРЕВАНТАЖУВАЛЬНІ ЗЕРНОВІ ТЕРМІНАЛИ НА ЗАХІДНИХ КОРДОНАХ УКРАЇНИ



МАПА ПЕРЕЇЗДІВ УЗ НА ЗАХІДНИХ КОРДОНАХ

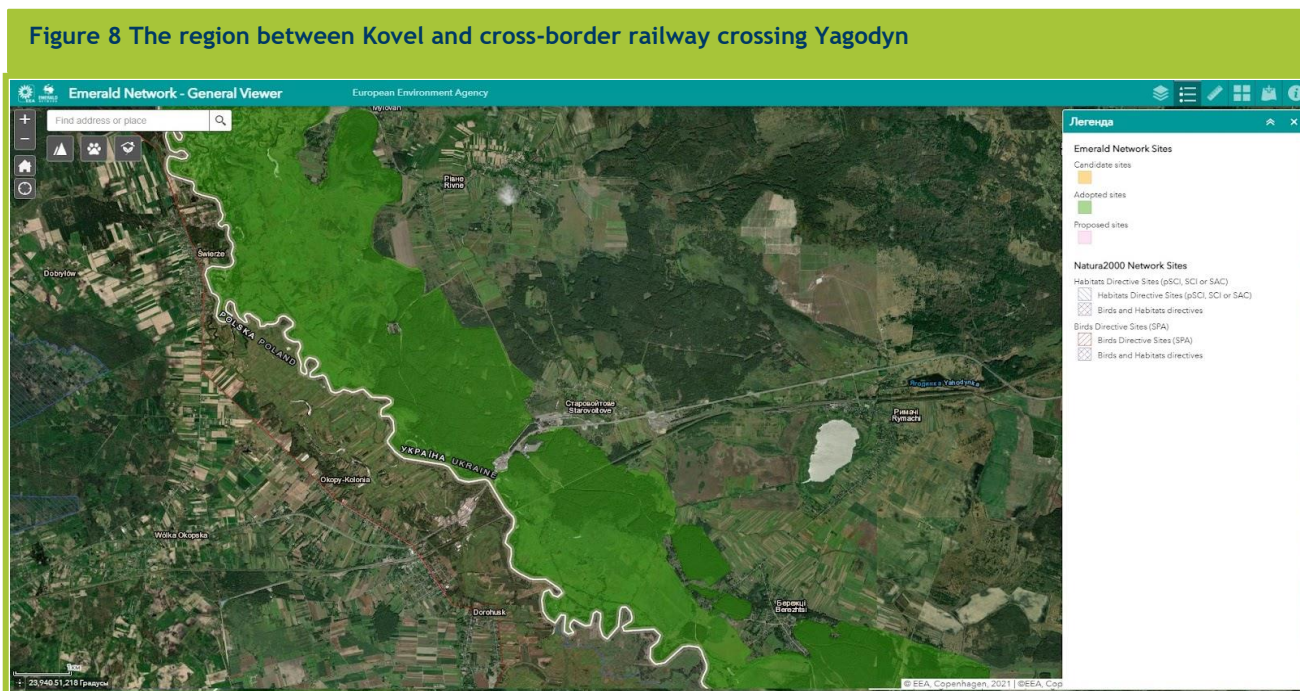
● Залізничні прикордонні переходи

№ з/п	Прокладений період	Назва української станції	Назва іноземної території	Переробна спроможність ваг/добу	Додаткова кількість спроможність ваг/добу	Загальна кількість ваг/добу
1	Мостиська-Марина (Польща)	Мостиська-2	МЛ Лшай	-	50	50
		Мостиська-1	Аграна Пескостява	25	25	50
			Агросом	15	15	30
			Місце залягального користування УЗ	-	60	60
		Всього Україна:	40	150	190	
2	Ягодин-Дорохуськ (Польща)	Марина	Реніградік	10	-	10
			Всього Україна + Польща:	50	150	200
		Міців	Волни-Мор-продукт	20	-	20
		Ковель	Ковельська реалізаційна база хл/бол продуктів	25	-	25
		Місце залягального користування УЗ	-	50	50	
		Всього Україна:	45	50	95	
3	Ізов-Хубешів (Польща)	Хелчи	Карго Кокош ПП	15	-	15
			Павлар	40	-	40
			Транстол	20	-	20
			Всього Польща:	75	0	75
		Всього Україна + Польща:	120	50	170	
4	Вадул-Сірет - Дорнештим (Румунія)	Вовка Баранівська	ПОЛЬЩА	50	-	50
		Славул	Бунтеміні, Славіков, ВРН	10	-	10
		Шибешини	Азельмітал, Ройкі Сок	70	-	70
			Всього Польща:	130	-	130
		Всього Україна:	-	30	30	
5	Чоп - Чієрна на Тісоу (Словаччина)	Дорнешти	Юнкош Холдінг	20	-	20
			Всього Україна + Румунія:	20	30	50
		Чоп	Експортсуба	20	-	20
			Завартагіспорт	15	-	15
		Місце залягального користування УЗ	-	50	50	
		Берег вільне ХПП	30	-	30	
		Місце залягального користування УЗ	-	80	80	
		Петро Карбо Хем	10	-	10	
		Місце залягального користування УЗ	-	60	60	
		Мушачеро	-	60	60	
		Барнасоа	-	60	60	
		Всього Україна:	75	310	385	
6	Чоп - Захочь (Угорщина)	Чоп	Експортсуба	20	-	20
			Завартагіспорт	15	-	15
			Місце залягального користування УЗ	-	50	50
			Берег вільне ХПП	30	-	30
		Місце залягального користування УЗ	-	80	80	
		Петро Карбо Хем	10	-	10	
		Місце залягального користування УЗ	-	60	60	
		Мушачеро	-	60	60	
		Барнасоа	-	60	60	
		Всього Україна:	75	310	385	
7	Дяково-Халмеу (Румунія)	Захочь	Захочь-Порт	20	-	20
			Всього Україна + Угорщина:	95	310	405
		Червонолів	Місце залягального користування УЗ	-	60	60
		Дяково	Місце залягального користування УЗ	-	60	60
		Всього Україна:	-	120	120	
		Всього Україна + Румунія:	30	30	30	
		Всього України	160	660	820	
		Всього країни Європи:	285	0	285	
		РАЗОМ:	445	660	1105	

A. Location of the proposed grain terminal and site analysis

The grain terminal will be located on the border of Ukraine and Poland near major transportation arteries such as highway and railway with two types of railway gauge: narrow and wide. The location will be chosen based on proximity to major grain producers in the region, the possibility to connect to both types of railway, easy access to the terminal by trucks, along the shortest routes to Polish and German ports, in compliance with [environmental legislation](#). According to the latter, purchase of a land plot is possible only near the border of Ukraine and Poland in two directions: 1) the region between Kovel and cross-border railway crossing point Yagodyn; 2) region between Mostys'ka and cross-border railway crossing point Shegyni.

Figure 8 The region between Kovel and cross-border railway crossing Yagodyn



The region between Mostys'ka and cross-border railway crossing Shegyni

Administrative organization. The village of Shegyni, the center of the rural community, is located 80 km from the regional center and 50 km from the district center of Yavoriv.

Geographical and climatic characteristics of the territory. The territory of the community is located within the Western European Platform on the Podilsk Highlands. The relief of the surface is an undulating plain with a decrease to the north and an increase to the south.

The climate is temperate-continental, with mild winters, long wet springs, warm rainy summers, and relatively dry, warm autumns. The average temperature in January is -5°C , July – from $+18^{\circ}\text{C}$. The annual amount of precipitation is ~ 600 mm.

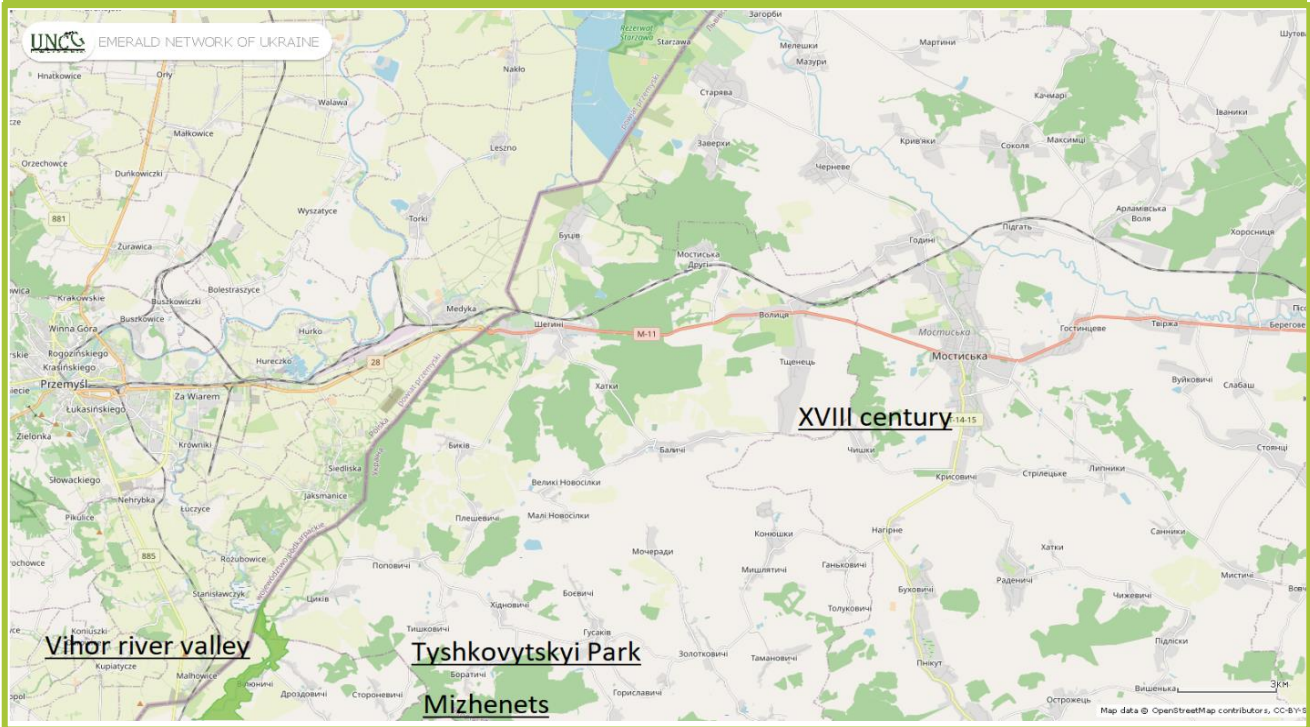
According to long-term weather observations:

- average maximum air temperature of the hottest month of the year – 23.3°C ;
- the average air temperature of the coldest month of the year is -2.7°C ;
- wind speed (according to average long-term data), the repetition of which is exceeded by 5% - 8-9 m/s.

The condition of flora and fauna, nature reserve. There are three nature conservation areas and the territory of the Emerald network sites - part of the territory of the Emerald network "Vihor river valley" (505 ha) (see Figure). Nature conservation areas include: "Tyshkovytskyi Park" (14 ha), a monument of garden and park art of local importance (14 ha) and; reserve tract "Mizhenets" (8.7 ha) (Figure 9).

The cultural heritage. The objects of cultural heritage are responsible for local importance - historical and archeological monuments in the villages of Balichi, Mocheradi, Popovichi, Butsviv and Pleshevychi.

Figure 9 The region between Mostys'ka and cross-border railway crossing Shegyni3



Source: <http://emerald.net.ua/>

B. Technical concept and design of the grain terminal

The purpose of this technical concept is to provide an overview of the design and operation of a grain terminal on the border of Ukraine and Poland. The terminal will be designed to handle a variety of grains, including wheat, rapeseed, corn and soybeans, and will serve as a key hub for grain transportation and storage in the Western Europe region.

The grain terminal will be designed to handle nearly **500 000 metric tons** of grain per year.

The design will include the following key components:

- (a) Receiving system: grain will be received from trucks or railcars and unloaded into pits using mechanical or pneumatic system, capacity of unloading from trucks will be 4000 t per day and from railcar - 3250 t per day;
- (b) Cleaning system: grain will be cleaned using a combination of screens, air separators and magnetic separators to remove impurities such as stones, dust and metal.
- (c) Storage system: cleaned grain will be stored in silos with a total capacity of 20 000 metric tons. The silos will be equipped with temperature monitoring and ventilation systems to maintain optimal conditions for grain storage. 14 silos for 1400t and 2 silos for 500t are planned to be built;
- (d) Loading system: grain will be loaded onto railway cars using a mechanical or pneumatic system, loading volumes will be about 1800t per day;
- (e) Weighing system: grain will be weighed using a calibrated scale system to ensure accurate measurement of the quantity of grain being transported.

Operation:

- (a) The grain terminal will operate on 24/7 basis with a staff of trained operators and maintenance personnel. The following procedures will be implemented to ensure safe and efficient operation;

- (b) Safety procedures: all personnel will be required to follow strict safety procedures including the use of personal protective equipment, regular equipment inspections and emergency response plans;
- (c) Maintenance procedures: regular maintenance and inspection of all equipment will be conducted to ensure optimal performance and minimize downtime;
- (d) Quality control procedures: grain will be regularly tested for quality and moisture content to ensure compliance with industry standards;
- (e) Environmental procedures: the terminal will comply with all applicable environmental regulations, including the proper disposal of waste materials and implementation of measures to minimize dust and noise pollution.

In conclusion, the proposed grain terminal on the border of Ukraine and Poland will provide a key hub for grain transportation and storage in the region. The terminal will be designed and operated to the highest standards of safety, efficiency and environmental responsibility.

Transshipping productivity – **500** thd.t per year
 Grain carriers/**1534** railway tracks-**1425** railway tracks

Storage volume – **20** thd.t
 Staff:

- Administrative - 15 persons
- Operational - 47 persons



CC2 – national class of responsibility (as base for building permission procedures)

List of rules, codes to design is available in the Annex D

Land plot area – as base 7.5 ha (75 000 m²)

Dimension – as base 150x470

Leveling – 1 % up to 5% on both side

Territory balance – as base:

- Building plots – up to 1..1,1%
- Equipment plots – up to 5..8%
- Roads, sites, pedestrian walkways – up to 12..16%
- Railways zones – up to 9..11%
- Zones lines of pipes, cables and so on - 3.5%
- Green zones and sanitary and safe zones – 59..70%



Buildings

Administration and service building

Intended for accommodation of terminal staff, clients, guests. Total area of premises: 300 m².

List of rooms in the administrative building – see Annex B Table 30.

Building fire resistance group - I.

A+ class of energy efficiency.

Building technology - thermo active building system.

State building regulations:

ДСТУ Б В.2.5-44:2010 Engineering equipment of buildings and structures. Design of building heating systems with heat pumps (EN 154550:2007, MOD)

ДСТУ EN ISO 11855-1:2017 Design of buildings. Design, determination of overall dimensions, installation and adjustment of built-in heating and cooling systems. part 1,2,3,4,5

ISO 11855-1:2021 Building environment design — Embedded radiant heating and cooling systems

Floors -1..2

Annual need – 25 kWt*hour electricity per square meter for heating-cooling-ventilation of buildings.

Electricity Capacity – 0,15 kWt per square meter for not technological needs of buildings.

Water use – 0,2 l/person for office staff and 150 l/person for workers staff per day.

Table 4 Buildings

Part of building	Description
1	2
Building system	TABS – поєднання несучої функції функції забезпечення клімату. Будинки – акумулятори клімату
Construction system	Повний монолітний залізничний каркас, колони/пілони, горизонтальні диски перекриттів (без ригельні або, при розрахунку, приховані ригелі), ядро жорсткості – сходові клітка
Foundation	Плитний, поверхневого закладення, суміщений із підлогою 1-го поверху. Товщина – 200...300mm
External walls	Газоблок, типу «Аэрок» або аналог, 500 кг/м3, товщина стін 200mm
Internal walls	Газоблок, типу «Аэрок или аналог, 100..200mm, гипсові блоки, 80mm, цегла глиняна звичайна, 120,250mm, гипсокартонні перегородки по оцинкованому профілю
Facades	«Мокрий» - мінеральне або акрилове декоративне фарбування штукатуркою типу «Zirezit» або аналог. Навісний вентиляований фасад будь-яких типів та рішень. Товщина 150 мм
Roof	Пласка, еврорубероїд в 2 шари по гідроізоляції, геотканині та утеплювачу 300 мм
Windows	Формула 4-10-4-10-4. Рами – 5-х камерні. Обов'язкове використання внутрішніх або зовнішніх жалюзей, рафштор або аналогів (ручних або автоматичних на вибір авторів проекту).
Doors	На вибір авторів проекту. Вхідні з тамбуром або тепловою завісою (автоматичною)
Insolation	Під фундаментною плитою, знизу – 150mm ППС, цоколь – 150mm ЕППС, стіни – 150..200mm ППС, покрівля 300..350 ППС
Staircase	Монолітні залізобетонні
Drainage	Прихований внутрішній
Climate	Нагрівання – контроль температури несучих, горизонтальних частин будівлі за допомогою розміщення в них контуру ПЕ труб (d20) з теплоносієм – водою, з температурою 25..27C («обратка» - 21C). Джерело тепла – теплові насоси (ТН) типу «Повітря-вода» Охолодження - контроль температури несучих, горизонтальних частин будівлі у вигляді розміщення у яких контуру ПЕ труб (d20) з теплоносієм – водою, із температурою 20..21C («обратка» - 24..25C). Джерело холоду-ТН типу «Повітря-вода» Вентиляція – природна припливна через вентрешітки у зовнішніх стінах та примусова одноканальна витяжна з рекуперацією на зовнішній блок ТН з викидом на бічний фасад будівлі Облік – пооб'єктний
Water supply	3-х контурне. Вода питна (В1) - абонентська доставка по 15..20 л. Вода загального призначення (В2) – крани мийок, душових та ін. системи пожежогасіння. Вода оборотного водопостачання (В3) – санітарні прилади санвузлів – унітази, біде тощо. Розрахункове водоспоживання (з урахуванням коф.одночасності (В2) – 20..150 л/особи на добу Лічильники води пооб'єктні Водопостачання - свердловина
Water waste	ЛОС з періодичним вивозом
Water heating	Індивідуальні електричні бойлери – 80..120 л
Electricity supply	0,15 кВт per square meter as base for this stage of design

Part of building	Description
Fire safety	Протипожежна сигналізація, вогнегасники поверхові з регулярним контролем працездатності, пожежні резервуари та пожежні гідранти дворові
Entrance control system	За окремим проектом

When planning the entrances/exits of the premises, it is mandatory to take into account the inclusiveness requirements in regard to the State building regulation - ДБН В.2.2-40:2018 (Annex B Table 30).

Shelters

Separately constructed based on the calculation of 0.5 m² per regular employee of the Complex and the average number of visitors. It is a fully monolithic reinforced concrete structure with wall, floor, and roof thickness of 250 mm, equipped with emergency power supply, lighting, ventilation, water supply, and drainage systems.

Checkpoints

A one-story building with complete delivery, rectangular in shape with dimensions along the axes in the plan of 4.00x5.00 m. The height of the building (from the top of the site covering to the top of the roof) is 2.7 m. The building is mounted on a concrete monolithic slab.

Diesel locomotive depot

The structure is made of a metal profile frame. Walls, roof, gates, doors - metal professional sheet. The floor is a monolithic reinforced concrete slab with a topping sealing coating and drainage channels for VOCs of oil refining products.

Technology and Equipment

Figure 10 Technological scheme

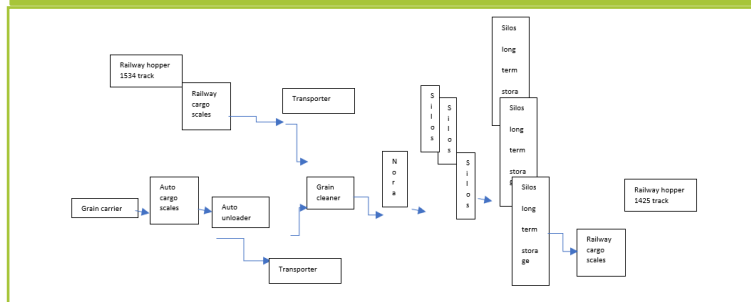


Figure 11 Illustration of the transshipment terminal



Source: <https://elevatorist.com/blog/read/222-noriynaya-vyishka-elevatora--logika-primeneniya>

Storage Facilities

Designed for the operational storage and discharge of grain. The distinguishing feature of the cone-based silos compared to flat-based silos, is the presence of a lower metal discharge cone, with a cone angle of 45° and 60° with respect to the horizontal plane. The standard configuration of cone-based silos is similar to the configuration of flat-based silos.

The standard configuration of silos includes:

- The roof of the silo is of a lock type, providing additional structural rigidity.
- The roof framework is made of assembled galvanized high load-bearing capacity rafters.
- The body of the silo is made of galvanized profiled sheets with a pitch of 131.18 mm, which is optimal in terms of structural strength and metal capacity.
- The structures are made of sheet structural steel with a special zinc coating ZM310, which provides maximum corrosion prevention (zinc, aluminum, magnesium).
- The body sheets are made of structural steel S 350 GD Z600.
- Access hatch in the cone base and on the roof of the silo.
- Vertical W-shaped stiffening ribs.
- High-strength flanged bolts, including nuts and sealing gaskets.
- Stairs on the silo body with intermediate platforms for resting.
- Stairs on the silo roof with safety railings.
- Set of fasteners and chemical anchors for securing the silo to the foundation.
- Sealing cord and polyurethane foam for joint sealing.
- Level sensor for bulk materials.
- Active ventilation system, including perforated flooring and exhaust fans.
- Temperature monitoring system with sensors installed every 1.5 meters.
- Bolted connections of quality class 8.8 and 10.9 (ISO 898-1:2009 and 898-2:2003).
- Pre-assembled equipment, hot-dip galvanized with a coating of 70-85 µm (Standard UNE-EN ISO 10684:2006).
- Quality class 8 nuts.
- Sealability ensured by the use of neoprene EPDM gaskets.
- Butyl hydrosealant for joint connections.
- Steel storage capacity, diameter ... m, height ... m. Overall height with metal inspection transitions - ... m.
- Silo stability is provided by a system of supports (external stiffening ribs) braced with anti-wind rings and anchored to the foundation with supplied anchor bolts.
- Foundation consists of a monolithic reinforced concrete slab, 400 mm thick.
- Equipment is installed on dry or chemical anchors (such as Hilti anchors).
- Equipped with safety framework, resting platforms, handrails, and anti-slip stairs, fully compliant with EU safety standard (UNE EN ISO 14122-1/2/3/4:2002).
- The standard discharge outlet size is 16 inches (406 mm). Openings up to 22 inches (559 mm) are available to provide higher discharge productivity.
- The ventilation system is based on connecting sectors with polyamide bolts, creating an explosion-proof ventilation surface in accordance with EN 14491:2012 standards, in compliance with ATEX (EU) regulations.



Contactless wave 3-D scanner

Capacity control of silos.

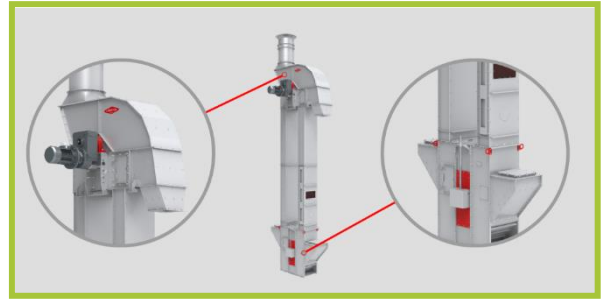


Bucket elevators

Designed for vertical transportation of grain. Capacity ranges from 10 to 500 tons per hour. All bucket elevator structures are self-supporting, with linear conveying speeds not exceeding 2.9 m/s. They have assembled galvanized construction.

The standard configuration of bucket elevators includes:

- Bucket elevator boot with inlet hopper.
- Inlet hopper lined with high molecular weight polyethylene (PEHD) lining.
- Bucket elevator head with drive head casing lined with high molecular weight polyethylene (PEHD) lining.
- Bucket elevator pipes.
- Mechanical reverse motion brake.
- Metal or polymer buckets.
- Bearing units from leading European manufacturers.
- Explosion-proof valve.
- Bucket elevator belt with a tear force of 200 kN/cm.
- Speed sensors, belt misalignment sensors, and grain support.
- Cylindrical or conical-cylindrical motor-reducer.



The structure has a square shape with dimensions of approximately 6.0m x 8.0m at the top of the foundation and a height of 30-50m. The structure includes a metal tower and a monolithic reinforced concrete pit on a natural base, on which the tower rests. The tower frame is a lattice structure made of tubular and rolled profiles. The structural elements are connected by welding and bolts. The supports are attached to the foundation using foundation bolts and anti-slip supports. Platforms and staircases made of rolled profiles and galvanized grating are provided for equipment servicing. To prevent precipitation from entering the pit, a cover made of bent welded profiles and profiled flooring is installed.

Operator's cabin of the bucket elevator tower

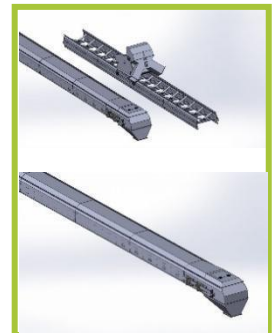
It is a single-story structure with a rectangular shape measuring 4.0m x 5.0m in plan. The height of the building (from the top of the platform covering to the top of the roof) is 2.7m. The structure is mounted on a concrete platform covering without foundations.

Conveyors

Designed for horizontal grain transportation and inclined transportation with an inclination angle of up to 30° from the horizontal. Productivity ranges from 250 to 350 tons per hour. The conveyors are prefabricated and made of galvanized steel. The linear conveying speeds do not exceed 0.65 m/s.

The standard configuration of conveyors includes:

- Drive and tensioning station with unloading and receiving hoppers.
- Bearing units from leading European manufacturers.
- Roller chain with bushing and roller design, equipped with side scrapers.
- 10mm thick PEHD liners for the scrapers.
- Bottom lining with high molecular weight polyethylene (PEHD 1000).
- Support rollers or plates.
- Motor reducer from a European manufacturer.

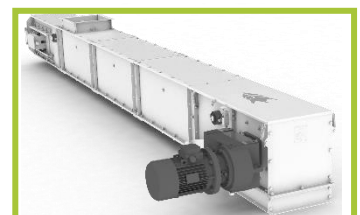


Belt conveyors

Belt conveyors are designed for transporting grain in horizontal planes and planes inclined up to 30° from the horizontal. They have a capacity of 250-350 tons per hour. Belt conveyors can be manufactured in both open and closed configurations.

The standard configuration of belt conveyors includes:

- Drive and tensioning station with lined drums.
- Conveyor frame with support rollers.
- Conveyor belt with a tear resistance of 200 kN/cm.
- Bearing units from leading European manufacturers.
- Cylindrical or conical motor reducer.



Pre-cleaner

Products are directed to the respective sieve sections using combined switching valves. It is designed for preliminary and precise cleaning of all types of cereals, oilseeds, corn, and legumes. With the appropriate selection of sieve sets and precise adjustment, the highest grain quality can be achieved. Certification according to the international standard ISO 9001:2008. Certification in Ukraine by DP "Ukrmetrteststandard."

The pre-cleaner consists of a pneumatic separator and mechanical separators - drum sieves.



Contaminated grains (1) are fed through a distributor (2) onto the drum sieves, which consist of an inner and outer sieve (3). They operate on the principle of planetary motion, rotating around their own axis and simultaneously around the machine's axis. Under the action of centrifugal force, the grain is thrown onto the outer sieves. Larger impurities are retained on the inner sieves (4). Subsequently, the grains are sorted from finer impurities on the outer sieve (5). Then, the cleaned material passes through channels (6) and reaches the discharge openings (7). From there, the cleaned material goes through the AIR SEED pneumatic separator (8), where light particles and dust are suctioned by a fan (9) into a cyclone or a container for impurities, while the clean material exits the cleaner through the outlet (10).



Metal structures

- Working towers;
- Supports for conveyors;
- Overhead and transfer galleries;
- Gallery supports;
- Loading ramps for trucks and railway transport.
- All metal structures can be manufactured in welded or assembled galvanized form. High-strength steel of grade S350 from leading European manufacturers with a zinc coating thickness of 450 g/m² is used to produce assembled galvanized structures.



Auxiliary basic technological equipment

- Self-floating equipment includes:
- Self-floating pipes with adapters of various cross-sections;
- Flanges;
- Clamps;
- Flow dampers;
- Conveyor slide gates;
- Receiving slide gates with manual and electric drive;
- Various cross-sectional diverting valves with manual and electric drive.

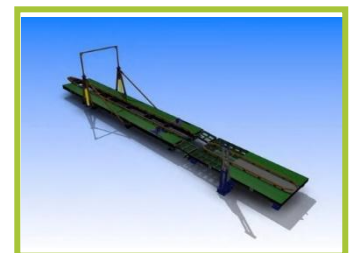


Truck unloading station

Truck unloader

It is used for unloading various agricultural crops and processed products, as well as other bulk materials through the rear end of individual vehicles and tractor-trailers. The maximum length of the vehicle should not exceed 26 m, and the weight should be 80 tons.

It allows unloading a single vehicle and trailer without uncoupling through the open side wall. The maximum length of the vehicle should not exceed 9 m, and the weight should be 60 tons.



Unloading can be done in two ways: through the side and rear walls.

The structure includes a canopy made of metal structures with service platforms and operator rooms, receiving hoppers for the unloading pit, and a beam cage above the receiving hoppers, as well as a monolithic reinforced concrete apron for the receiving hoppers. The framework of this structure includes a platform for installing aspiration equipment.

The unloading pit for two lanes is a spatial beam cage consisting of single-span (main beams) in the transverse direction, to which the structures of the straight and side discharge platforms and beams in the longitudinal direction (for tipper unloading) are attached.

The receiving hopper is a rectangular monolithic reinforced concrete bowl on a natural foundation. Entry and exit ramps are monolithic reinforced concrete slabs on a gravel-sand cushion.

Truck scales

Load capacity: 80 tons

Used for static weighing of cargo transport.

The scales should be designed to withstand at least 110,000 weighings over a period of 10 years. The length of the car scale platform is 18 meters, and the width is 3 meters.

The car scale platform consists of sections measuring 6 meters each.

Installation takes 2-3 days.

The orthotropic weighing platform has a minimal number of welded seams and stress concentrators. The optimal arrangement of the track section on the orthotropic load-bearing beams ensures a uniform distribution of loads. The weighing surface is made of 8 mm thick embossed sheet.



The cross-beam structure is an electrically welded T-beam to minimize rotation of the cross beam during track deflection.

Weighing indicator

Entry and exit ramps are monolithic reinforced concrete slabs on a gravel-sand cushion. The three-lane car weighing station has a frame-truss structure with a rectangular shape measuring 20.0x15.0m in plan and a height of 8.8m from the top of the roadway. The frame elements are made of welded profiles with I-shaped cross-sections, and the trusses are made of round pipes. The roof is made of profiled sheet laid on roof purlins, which are connected to the frame rafters. The trusses on the roof are located in the plane of the frame rafters. The sloping component resulting from external loads is supported by the profiled sheet roof covering. The walls are made of profiled sheet laid on wall rafters of the framework. The connections of structural elements are welded and bolted. The supports are fastened to the foundations using foundation bolts and anti-sliding brackets. Platforms and staircases with fences are provided for equipment servicing and personnel access. They are made of rolled profiles with a checker galvanized flooring. This position also includes an adjacent platform between the foundations for car scales and a monolithic reinforced concrete canopy on a pile foundation.

Grain loading station for railway wagons

The structure has a rectangular shape in plan and a frame-truss construction. At elevation +8.200, there is a beam cage on which the hoppers of the complete set rest. Platforms and stairs are provided for equipment servicing and personnel access. To prevent precipitation, the structure is clad with profiled sheeting on the wall rafters of the framework. The roof is made of sheet metal with transverse ribs for rigidity.

The specified structure includes: metal structures of the grain loading station for railway wagons (which is a frame-truss structure of the complete set); hoppers and above-hopper galleries of the complete set.

Railway Scales

Two- or three-platform scales are used for static weighing, and a properly equipped track measuring 25 meters in both directions from the scales is required for wagon handling. The track should be horizontal, straight, and made of reinforced concrete sleepers without switches.



Functions of static weighing railway scales:

- Display of the current weight of the weighed wagon
- Control of load distribution in the wagon with indication of the displacement of the overall center of

- gravity relative to each platform (bogie) and wagon sides
- Data transmission to a computer via RS-232/485 communication channel
- EN 45501:2017
- TU U 28.2-36495890-003:2012
- Compliance assessment with the requirements of the Technical Regulation on Non-Automatic Weighing Devices, Module B (type examination)
- Certificate No. UA.TR.113-0023-17
- Maximum capacity of the scales: 160 tons

Overhead Conveyor Gallery

The overhead conveyor gallery consists of a single-span structure with a length of 36.5 meters, supported by a tower and a cleaning tower. The longitudinal rigidity of the gallery is ensured by hinged-fixed attachment of the span structure to the tower. The attachment of the span structure to the cleaning tower is hinged-movable. The span structure is composed of two parallel trusses with a height of 2.8 meters, connected by horizontal braces at the top chords. The lower chords are connected by vertical diaphragms. Longitudinal beams are located at the level of the upper chords to support the conveyor and the walkway with a gratings galvanized flooring. The longitudinal beams are supported by transverse support beams located at the truss nodes.

Underground Conveyor Gallery

The structure is an underground reinforced concrete tunnel built on a natural foundation. The deep tunnel connecting two points has a rectangular cross-section. The supporting layer beneath the tunnel consists of a gravel bed.

Electrical Switchgear Building

A single-story structure of rectangular shape with dimensions of 4.0m x 5.0m in plan. The building height (from the top of the platform floor to the top of the roof) is 2.7m. The structure is mounted on a concrete platform without foundations.

Transformer Substation

A single-story structure of rectangular shape with dimensions of 4.5m x 11.0m in plan. It is mounted on a slab foundation with a thickness of 200mm.

Diesel Generator

Characteristics:

- Power 500-550 kVA
- Frequency 50 Hz
- Speed - 1500 rpm
- Voltage - 220-415 V



Equipment of a generator:

ENGINE

- Air cleaner
- Oil drain valve
- Engine filled with high-temperature coolant
- Shutdown due to low oil pressure
- Battery charging alternator installed on the engine

COOLING SYSTEM

- Radiator installed on the equipment
- Protection for radiator fan and charging alternator
- Coolant drain valve
- Cooling system with coolant mixture

EXHAUST GASES

- Exhaust gas flange
- Exhaust pipes with gaskets

FUEL

- Fuel tank for 8 hours of operation
- Fuel lines with BSP fittings

GENERATOR

- FG Wilson

- SHUNT excitation system
- IP21 standard protection
- **CONTROL PANEL**
- PowerWizard 1.1+
- **SUPPORTS**
- Robust steel support frame
- Lifting and towing points on the support frame
- Linear vibration isolators between the base and the engine-generator
- Cables for battery connection and baseplate

Firefighting Pump Station

Single-story building, polygonal in shape with dimensions of 4.6m x 9.27m in plan. The height of the building (from the top of the foundation to the top of the parapet) is 4.0m. The building is made of monolithic reinforced concrete of class C20/25 with a water resistance grade of W4. The thickness of the foundation slab and walls is 300mm, and the floor slab is 200mm.

A pump unit and control equipment are installed in the building.

Fire Reserve Tank

Semi-buried tank, rectangular in shape with dimensions of 10.0m x 10.4m along the axes. The height of the building (from the top of the foundation slab to the top of the roof slab) is 3.2m. The building is made of monolithic reinforced concrete. The construction of the tank floor and walls is made of monolithic reinforced concrete of class C20/25 with a water resistance grade of W8. The thickness of the tank floor and walls is 400mm.

Hydro insulation of the tank floor and walls is ensured by adding "Penetron Admix" (or equivalent) to the concrete according to the manufacturer's technology. The roof slab thickness is 300mm.

Drainage Network and Structures

Closed reinforced concrete channel network with a slope of 1.5% from the technological platforms and parking lots to the reservoir.

Treatment facilities consist of an oil separator with a bypass line. The structures are installed below the planning level. The capacity of the complete set consists of reinforced concrete rings. Wells are designed according to TPR 902-09-46.88 using precast reinforced concrete elements of series 3.900.1-14, and settling chambers are made of monolithic reinforced concrete.

Compensatory reservoir for stormwater runoff

A reservoir with a volume of 1000 m³ should be located at the planned slope of the Complex's territory, with a closed stormwater drainage network connected to it.

Treatment facilities are represented by an oil product separator with a bypass line. The structures are installed below the planning level. The capacity of the complete set consists of reinforced concrete rings. Wells are designed according to TPR 902-09-46.88 using precast reinforced concrete elements of the series 3.900.1-14, and the drop chambers are made of monolithic reinforced concrete.

Compensatory reservoir for drainage runoff

The compensatory reservoir with a volume of 1000 m³ should be located on the planned slope of the Complex's territory, with a network of closed drainage channels leading to it.

Grain waste bunkers

Serial metal bunkers are installed on a site made of monolithic reinforced concrete.

Water intake well

The well is installed in a casing pipe with a headpiece and a protective metal fence around the perimeter. Flow rate - up to 1 m³ per hour. Depth - based on hydrological surveys.



MSW site

A designated area on a 200 mm thick monolithic concrete slab with a topping coating for the disposal of household waste in separate containers as part of a complete supply.

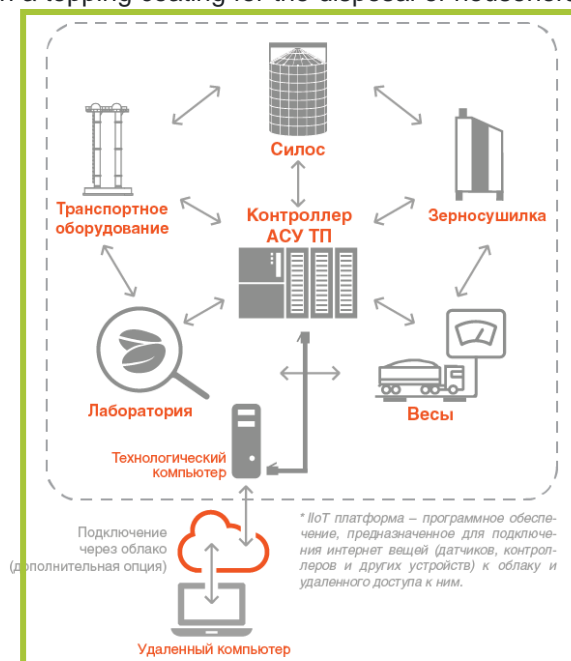
Automation

Automation of elevator equipment (hardware and software part). Thermometry monitoring. Control and management of the weighing complex. Sampling point and laboratory. Accounting and technical records. IT solutions that visualize and integrate these processes into a unified management system.

ELEVATOR AUTOMATION SYSTEM

Power supply cabinets (input cabinets, power distribution cabinets, equipment control cabinets). Programmable logic controller cabinets (PLC cabinets, decentralized peripheral cabinets). Communication equipment cabinets. Lighting cabinets. Automated operator workstation. Hardware - Siemens, Schneider, Eaton.

UNIFIED LINEAR ELEVATOR MANAGEMENT SYSTEM (IT and WEB SOLUTION)



Software solution - PLCnext Technology - Phoenix Contact (or equivalent). A comprehensive software platform with the ability to gradually or selectively connect control modules according to the customer's requirements. Each subsequent connection of new equipment will not require a separate control workstation - one program. Combining all stages of elevator operation in one program: weighing complex, sample collection and laboratory, grain cleaning and drying, transportation to silos, storage and dispatch control. Phoenix Contact PLCnext controller (or equivalent) with expansion. No hidden costs for licenses based on the number of workstations. Integration capability with 1C accounting (or other full-fledged accounting systems).

C. Analysis of the environmental impact of the grain terminal

This section will assess the potential environmental impact and risks associated with the grain terminal, including its effects on air, water quality, and on other environmental factors.

Environmental requirements for land use planning

The plot of land must be located outside the buffer zones of the objects of the nature reserve fund, water protection zones of water supply sources, coastal protection strips, protection zones of cultural heritage monuments, territories of special environmental interest (Emerald network), mining diversions of mineral deposits and rock dumps, sanitary protection of resorts.

To ensure the requirements for the organization of the sanitary protection zone, the distance to the agricultural territory must be more than 100 m. On the side of the agricultural territory, it is necessary to provide for the possibility of creating a strip of trees and shrub plantations with a width of at least 20 m. The minimum area of landscaping of the sanitary protection zone should be up to 60 %.

Earthworks during the performance of preparatory and construction works must be planned in accordance with the working project of the land management regarding the removal and transfer of the fertile soil layer with the determination of the scope of work on the removal, transfer, and storage of the fertile soil layer, taking into account the agrochemical passport of the land plot.

According to the functional land use, the territory of the enterprise should be divided into zones: a) pre-factory (outside the land plot of the enterprise or within its boundaries); b) production; c) utility room; d) warehouse.

When determining the size of the pre-factory areas of enterprises, the estimated number of parking spaces for temporary storage of cars, truck parking lots and improvement of the pre-factory territory should be taken into account.

The width of the gates of car entrances to the site of the enterprise should be taken according to the largest width of

the cars used plus 1.5 m, but not less than 4.5 m, and the width of the gates for railway entrances - not less than 4.9 m.

Semi-enclosed yards should be located with the long side parallel to the prevailing wind direction or with a deviation of no more than 45°, while the open side of the yard should face the windward side of the prevailing wind direction. The width of a semi-enclosed yard in buildings illuminated through window openings should be at least half the height to the top mark of the cornice of the opposite buildings forming the yard, but not less than 15 m.

Buildings and structures, taking into account the specifics of production and natural conditions, should be placed with mandatory compliance with the following requirements: the longitudinal axes of the building and light lanterns should be oriented within the range from 45° to 110° to the meridian; longitudinal axes of aeration lanterns and walls of buildings with openings used for aeration of premises should be oriented in plan perpendicularly or at an angle of at least 45° to the predominant direction of winds in the summer period of the year.

Buildings and structures with equipment that causes significant dynamic loads and vibration should be placed from buildings and structures with productions that are particularly sensitive to vibration at a distance determined by calculations, taking into account the geological conditions of the territory, the physical and mechanical properties of the soil of the foundations, as well as taking into account measures to eliminate the impact of dynamic loads and vibration on soils.

Buildings, structures, open installations with production processes that release gas, smoke and dust into the atmosphere, explosive and fire-hazardous objects should not be located in relation to other production buildings and structures on the windward side of the prevailing winds.

Distances between buildings and structures, depending on the degree of fire resistance and the category of production, should be taken accordingly, taking into account fire regulations. Distances from open ground warehouses to buildings and structures, as well as distances between the specified warehouses, should be taken according to the degree of fire resistance.

After the completion of construction, the territory of the industrial site will be arranged and landscaped. For greening the territory, it is necessary to use local species of trees and shrubs, taking into account their sanitary and protective and decorative properties and resistance to harmful substances that are released. Placement of tree and shrub plantations in the form of dense groups and strips that cause the accumulation of these substances is not allowed on the sites of enterprises where harmful substances can be released.

A rainwater sewer system with appropriate treatment (local sewage treatment plants) must be provided to remove atmospheric precipitation from the built-up area.

Emissions and air quality

Indicators and criteria for assessment of atmospheric emissions

A mandatory condition for the admissibility of the implementation of project solutions and the operation of the enterprise is compliance with the standards of environmental safety of atmospheric air and the standards of maximum permissible emissions of pollutants from emission sources.

The norm of environmental safety of atmospheric air is determined by the "Hygienic Regulation. Maximum permissible concentrations of chemical and biological substances in the atmospheric air of populated areas" taking into account the requirements of DSP-173-96 "State Sanitary Rules for Planning and Building Settlements". In order to check compliance with the specified requirements of the design solutions, there is a calculation of the surface concentrations at the border of the sanitary protection zone defined by the specified regulation to the hygienic standards of maximum permissible concentrations of pollutants in the atmospheric air for each pollutant and the summation groups they form, subject to the condition

$$SM/HDK < 1,$$

where

SM - the maximum calculated surface concentration of the pollutant in atmospheric air, mg/m³;
MPC - one-time maximum permissible concentration, according to hygienic regulations, mg/m³.

Greenhouse Gas (GHG)

In accordance with the international obligations, adopted by Ukraine, the volumes of "greenhouse gas" emissions

are estimated and determined, which include the following chemical compounds: carbon dioxide (CO₂ - CAS 124-38-9), methane (CH₄ - CAS 74-82-8), nitrous oxide (N₂O - CAS 10024-97-2), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur hexafluoride (SF₆). Among the mentioned compounds are those formed during the burning of organic fuel (for example, diesel fuel) - carbon dioxide, methane, nitrous oxide.

Background concentrations of pollutants in atmospheric air

Background concentrations make it possible to assess the level of impact of the pollutants from sources of emissions on atmospheric air. To assess the current state of air pollution (baseline scenario) in the area where the object is located, it is necessary to obtain a calculation of the background concentrations of pollutants. To assess the current state of air pollution (baseline scenario) in the area where the facility is located, it is necessary to obtain a calculation of the background concentrations of pollutants. In order to obtain the values of background concentrations of pollutants in atmospheric air, a request is sent according to the prescribed form. The period of getting is one month.

Impact on atmospheric air during construction

The amount of emissions of polluting substances depends of construction work during construction and the synchronous operation of construction equipment, construction machines and mechanisms, motor vehicles on the construction site in accordance with the calendar schedule of works.

All sources of genesis and emission of pollutants are unorganized. To assess emissions from unorganized sources, in accordance with the requirements of regulatory and legal acts, they are classified as a point source located in the center of the site of the similar type of construction and installation according to the general plan.

The sources of pollutant formation during construction and assembly works will be:

- earthworks, the work related to the processing, transferring, laying and compaction of soil on the site and storage and load/overload of bulk construction materials at open temporary storage sites - excavation, overloading of bulk construction materials in warm and dry weather, as well as storage of bulk construction materials in open areas are accompanied by emissions of particulate matter (dust).

- engines of construction equipment, construction machines and mechanisms, and vehicles - the type, quantity and hours of operation of construction equipment (need) are determined according to the section of the project documentation for construction. The amount of emissions of pollutants from fuel consumption per unit of time and the specific index of the content of pollutants. Diesel fuel combustion emits several types of emissions, including GHGs and air pollutants: Carbon Dioxide, Nitrogen Oxides (NO_x), Particulate Matter (PM), Sulfur Compounds, Volatile Organic Compounds (VOCs).

- metal welding works in accordance with DSTU-NB A.3.1-16:2013. Instructions on welding works during the installation of building structures - electric welding is accompanied by the emission of aerosols, the chemical composition of which depends on the welding metals, used brands of electrodes, devices or installations for welding, cutting, and other conditions. The amount of the number of pollutant emissions, which are part of the aerosol formed under specific conditions, is based on the values of specific pollutant emissions and the duration of the welding process. During welding with electrodes, the following pollutants are released: iron (III) oxide, manganese (IV) oxide, chromium (IV) oxide, silicon oxide, hydrogen fluoride, nitrogen dioxide, carbon oxide, poorly and well soluble fluorides.

- waterproofing, painting and painting works - coating of structures with waterproofing, protective and paint materials in accordance with DSTU-H B A.3.1-23:2013. Instructions on the implementation of works on the arrangement of insulating, decorative, protective coverings of walls, floors and roofs of buildings and structures. Generates emissions of organic solvents (VOCs) and, depending on the technology of applying paint and varnish material, aerosol particles. The amount of emissions emitted during painting and drying depends on the productivity of the painting equipment, the specific rate of material consumption per unit area, the solvent content, taking into account the amount of solvent used to bring the working viscosity to working viscosity, and the ratio characterizing the relative part of the total amount of solvent.

Impact on atmospheric air during operation

Sources of formation and emission of pollutants are divided into mobile, stationary organized and stationary unorganized. Certain stationary organized emission sources (aspiration systems) will be equipped with dust and gas cleaning equipment (cyclones, filters) to achieve safe emission levels.

Mobile sources of formation and emission of pollutants

Internal combustion engines of railway and road transport, located on the territory of the production site, are among the mobile sources of formation and emission of pollutants.

Railway technological transport.

To ensure technological needs, it is envisaged to use a TGM-4B shunting diesel locomotive with an engine power of up to 800 hp. (590 kW).

Grain carriers

Transportation of grain is expected to be carried out by grain carriers with diesel engines. 100 cars will pass during the day. The working time fund in transport is 330 days a year. The mileage of one car on the territory during transportation will be up to 1,000 meters, the movement speed of motor vehicles on the territory according to the rules is 10 km/h or 6 minutes (0.1 h).

Parking for grain carriers

The sources of formation and organized stationary sources of emission of pollutants:

- Transshipment of grain from carriers to transportation equipment to siloses and from siloses in hopper
- Acceptance of grain crops. The sources of pollution are equipped with aspiration systems. The sources of emissions into the atmospheric air of substances in the form of suspended solid particles of undifferentiated composition and dust and grain dust are the openings of aspiration systems.
- Overload of grain waste to and from grain waste bunkers

Wastewater and ambient water quality

Water consumption

The source of water consumption to demand the necessary needs will be an artesian well, which is executed by a separate project based on the results of a hydrogeological assessment of determining the presence and location of an aquifer. Based on the results of water quality tests, a decision is made regarding water consumption. A water meter unit is provided for accounting of water consumption.

Production. Water consumption is not provided for production needs.

Average water consumption is 20 l/person per day for administrative staff and 150 l/person per day for workers staff

Fire fighting

For external fire extinguishing of buildings and structures, a fire-fighting water supply tank with a total capacity of 250m³, a fire-fighting pumping station with Grundfos fire pumps, and a ring network of high-pressure fire-fighting water supply with underground fire hydrants will be provided. Water consumption for external fire extinguishing of buildings and structures is determined in accordance with DBN B.2.2-8-98, DBN V.2.5-75:2013 Annex D.

Drainage and sewage

Domestic sewage. The existing sewage networks are not available on site, the cesspools are designed for the collection of domestic sewage with subsequent removal to treatment facilities. To exclude the filtration of sewage into the ground, cesspools are made of reinforced concrete rings with waterproofing.

Rainwater. The amount of rainwater is determined by the method of extreme rates in accordance with ДБН В.2.5-75:2013. Rain receivers must have grates and sediments to retain garbage. Drainage of rain (melted snow) water from the territory of the site is carried out by a closed network with discharge into the fire protection tank. A local sewage treatment plant is designed on the rainwater sewer network, consisting of a settling tank for cleaning suspended substances and a separator for petroleum products. Requirements for the quality wastewater: the concentration of suspended substances should not exceed 15 mg/l, oil products - 0.3 mg/l; after purification on a sorption filter - the concentration of oil products should not exceed 0.05 mg/l.

Waste Management

Generation and disposal of waste during construction

Construction waste, packaging and container waste and communal waste is generated during construction. Temporary storage of waste up to the amount of the transport lot is determined in places in accordance with the section of the design documentation of the organization of construction production. The construction company that performs the construction work is responsible for the management of waste generated during construction. Damaged reinforced concrete products, products of metal constructions. The type and amount (volume) of construction waste are determined in accordance with the specific norms of loss of construction materials determined by the estimated norms in construction.

Waste produced in welding processes (ends of the electrodes). The volume of formation is up to 10% of the total electrode consumption.

Packaging and container waste: wooden packaging - used wooden pallets, boxes, etc.; metal packaging - used containers of paints and coatings, etc.; plastic packaging (PP, PET, HDPE, LDPE, etc) - used solvent containers, film-packaging material etc.

Communal waste. The actual amount of communal waste during the construction period will depend on the time of construction and the number of construction workers on site. Responsible handling of solid waste involves their separate collection and temporary accumulation during the work shift in specially equipped separate collection containers with appropriate marking (glass, plastic, paper, unsorted, etc.) for transfer for disposal according to the contract. Waste management in accordance with the Rules for the provision of services for the removal of communal waste.

Septic tank sludge. The actual amount of communal waste during the construction period will depend on the time of construction and the number of construction workers on site. Waste management in accordance with the Rules for the provision of services for the removal of communal waste.

Hazardous Waste. Hazardous waste materials are generated in small quantities through a variety of activities such as equipment. Examples of these types of wastes include: spent solvents and oily rags, empty paint cans, chemical containers; used lubricating oil; used batteries (such as nickel-cadmium or lead acid); and lighting equipment, such as lamps. Transportation and disposal of hazardous types of waste is carried out by licensed companies.

Generation and disposal of waste during operations

In accordance with the requirements of the legislation, the accumulation and storage of industrial waste is allowed on the production facility for subsequent disposal up to the volume of the transport lot, but not more than a calendar year. Transportation and disposal of a certain type of waste is held by specialized companies according to the act of acceptance and transfer determined by the terms of the contract. Transportation and disposal of hazardous types of waste is carried out by licensed companies.

Cereal residues. Dust particles formed after being captured by aspiration and filtration systems (all technological equipment that emits dust must be equipped with effective filtration devices for capturing dust and particles) is sent to appropriate technological bunkers for temporary storage. The hermeticity of the bunkers ensures the absence of dust emission to the working area and the environment.

Oil wastes. Used oil products that are unsuitable for their intended use (including used motor and industrial oils and their mixtures) are formed during maintenance of servicing equipment. Classified as hazardous waste - item 42 of the Yellow List of waste. General rules for collection, transportation, storage, processing, utilization and/or disposal of used lubricants (oils) are defined by law. They are collected on the site in a special hermetic container with safety measures. Transfer for disposal is carried out to a counterparty with a license for hazardous waste management.

Hazardous Waste. Hazardous waste materials are generated in small quantities through a variety of activities such as equipment. Examples of these types of wastes include: spent solvents and oily rags, empty paint cans, chemical containers; used lubricating oil; used batteries (such as nickel-cadmium or lead acid); and lighting equipment, such as lamps. This waste should be handled in accordance with the manufacturer's requirements. Transportation and disposal of hazardous types of waste is carried out by licensed companies.

Generation and disposal of maintenance waste

Worn overalls and personal protective equipment for workers. Determining the amount of need and providing employees with appropriate means of personal protection and special clothing/shoes are determined by standards of free support to employees. The amount is calculated by averaging the number of sets of overalls per year, with further adjustment taking into account the weight of each unit of the overalls product in kg; number of units per year; specified period of wearing.

Communal waste. The actual amount of communal waste will depend on the number of staff on site. Responsible handling of solid waste involves their separate collection and temporary accumulation during the work shift in specially equipped separate collection containers with appropriate marking (glass, plastic, paper, unsorted, etc.) for transfer for disposal according to the contract. Waste management in accordance with the Rules for the provision of services for the removal of communal waste.

Septic tank sludge. The actual amount of communal waste during the construction period will depend on the time of construction and the number of construction workers on site. Waste management in accordance with the Rules for the provision of services for the removal of communal waste.

Rubbish swept. It is produced when cleaning the territory with surface and driveways in the warm season. The actual amount of waste depends on the area of the paved area.

Impacts of noise

According to the impact, noise pollution is divided into production noise directly from workplaces, production noise on the territory within the production site, and production noise outside the production territory on the border of the sanitary protection zone.

The data to assessment for performing acoustic calculations are noise characteristics of source (for constant noise – sound power levels, L_w , dB), corrected sound power level (L_{wA} , dBA), noise radiation directivity coefficient; for traffic flows and local sources with non-constant noise - equivalent and maximum sound levels, E_q and L_{max} , dBA, at a distance of 7.5 m, respectively, from the axis of the traffic lane adjacent to the calculation point (from the boundary of the noise source), which are determined by the technical documentation for the equipment.

The normative value of noise is 55 dBA during the day and 45 dBA at night, in accordance with the requirements of the State Sanitary Rules.

Assessment of noise during construction

During construction, there will be typical noise impacts, which objectively cannot be avoided - the operation of technological transport and construction equipment. The assessment of sound levels at the boundary of the construction site is performed for machinery, taking into account the conditions of simultaneous operation of the maximum possible number of machinery and construction equipment. Assessment of the levels of acoustic impact on the environment during construction works is carried out for the operating conditions of the equipment and machinery, in accordance with the construction work schedule. The personnel must be provided with means of personal protection.

The sources of noise during construction work will be construction machinery operating on the site, in particular: trucks, bulldozers >73.6 kW - equiv. 90 dBA, max. 95 dBA; excavators mobile cranes, loading and unloading operations; mobile compressors; mobile diesel generators and etc.

The control points on the border of the construction site are chosen as reference points for calculating the acoustic load from noise sources.

Assessment of noise pollution operation

Staff for time of building – 22...56 persons.

Base technological processes of building:

- Excavation of ground for base of foundations and roads, railways tracks
- Leveling of plots
- Reinforced concrete works
- Welding works
- Wall elevations

- Insolation of foundations, walls and roofs
- External and internal networks
- Decorations works

Base technological equipments:

- construction cranes
- excavators
- bulldozers
- graders
- compressors
- dump trucks

A. Investments

The investments required for the implementation of the project amounts to 12.55 million USD including VAT during almost 2 years before start operations. The consolidated investment schedule for the terminal, as provided in the table below, includes a detailed breakdown of the costs of construction works, equipment, and machinery in the financial model.

Reinvestments are also planned using project funds to replace railway sleepers every 4 years, with a cost equivalent to 40% of the construction cost of the railway track. Additionally, after 10 years, the active part of the equipment (hoppers, conveyors etc.) which depreciated during operation will be renewed. The total amount of reinvestments is 4.68 million USD during 2028-2040 years.

The investments in construction are detailed below in Tables 5-7. The project also envisages the acquisition of land plots in 2023 for the placement of the terminal and access roads. The total area of the land plots will be approximately 7.5 hectares with an average market price of USD 200,000 per hectare. It is also necessary to finance an initial stock of current assets (accounts receivable, fuel stocks, etc.) of an enterprise in the amount of 5% of annual sales. Unforeseen costs in the amount of up to 15% of the cost of buildings and structures may arise as a result of obtaining technical specifications and geological works.

Table 5 Investment category 1: Documentations, design, permissions

No	Item of expenses	Costs, kUSD
1	Land forming documentation	3
2	Urban planning documentation	37
3	Initial data	13
4	Design	120
5	Expertise	10
6	Declaration for preparation works	8
7	Declaration for constructions works	
8	Construction support reports	60
9	Permissions to start exploitation	43
10	Declaration to start exploitation	
	Total	294

* see details in the Annex C

Table 6 Investment category 2: Equipment

No	Items of expenses	Costs, kUSD
1	Main technological equipment	2,456
2	Support equipment	1,975
3	Tracks, cargo carriers, transport	450
4	Equipment for railroad tracks	337
	Total	5,218
	Incl.	
	installation works, 12%	626
	commissioning works, 5%	261

* see details in the Annex C

Table 7 Investment category 3: Buildings and structures

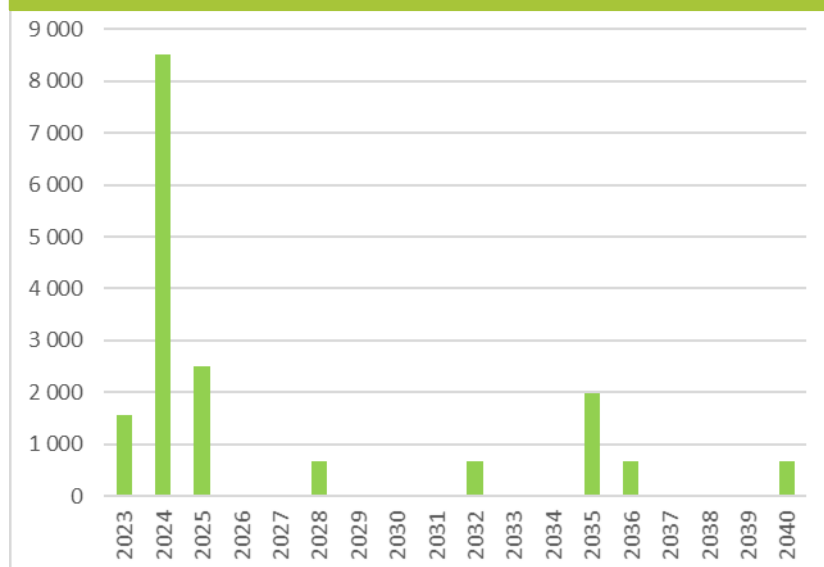
№	Items of expences	Costs, kUSD
1	land development	-
2	buildings	635
3	main technological equipments	666
4	additional equipments and constructions	1,065
5	roads, plots, sites	444
6	railroad tracks, plots and constructions	674
7	extrasite networks and construction	425
8	offsite networks and constructions	674
	Total	4,583

* see details in the Annex C

The straight-line method of depreciation of fixed assets was used. For buildings and structures, the period of useful life is 25 years with a liquidation value of 25% of the purchasing value. For machines and equipment, the useful life is 10 years, and the liquidation value is 15%.

It is expected that the project implementation will start in the 3rd quarter of 2023. The terminal will be put into operation and start functioning in the 3rd quarter of 2025. Development and construction period is 22 months. in Figure 12 shows annual investment expenditures.

Figure 12 Annual investment expenditures, kUSD



B. Sales and costs of the grain terminal

Terminal forecasted revenues are formed by 3 types of services: grain transshipment (handling), grain cleaning and customs clearance services for of grain cargoes. Grain handling services account for 82% of sales. Estimated volume of grain cleaning services will be 1/5 of the transshipment volume (100 thousand tons per year).

Due to the high demand for grain transshipment services in Ukraine at the border with the European Union, the assumption was made that the grain terminal will handle the planned volumes of cargo from the beginning of its operation. For 2025, a coefficient of 0.5 was used for transshipment volumes and planned costs.

During the financial analysis, the following items of operational and administrative costs of this project were identified and calculated:

- Depreciation deductions
- Electricity for transshipment

- Electricity for cleaning
- Diesel
- Railway track maintenance
- Maintenance and current repair of diesel locomotives
- Maintenance and current repair of equipment
- Laboratory certification
- Attestation of scales, verification
- Fire protection measures, safety equipment, energy permits
- Service rate Ukrzaliznytsia
- Payments for customs clearance
- Payments of the DPSS for the registration of phytosanitary documents
- Equipment fumigation
- Deratization
- Uniform
- Labor compensation fund (salary)
- Single social contribution (EUS)
- Utilities
- Lighting, cleaning the territory
- Security costs
- Waste disposal
- Costs for the local community (social responsibility)
- Land tax
- Environmental tax for emissions of solid substances
- Expense insurance
- Advertising
- Opening the terminal costs.

Tax payments were also calculated - VAT and corporate income tax.

C. Analysis of the financial viability of the grain terminal

Brief description of financial model

Financial model calculations are available and provided in a separate Excel file as an Annex to that report. Financial model consists of the sections listed in the Table 8.

Table 8 Structure of financial model		
No	Sheet Name	Description
1	Contents	List of sheets and tables
2	Summary	Key financial and performance indicators
3	Assumptions	Key inputs and assumptions
4	Sales	Sales and revenue
5	Investments	Investment costs
6	Depr.	Depreciation
7	Costs	Operating costs
8	Labor	Wages and wage taxes
9	Admin	Administrative, marketing and general expenses
10	Inflation	Inflation
11	Funds	Financing
12	CF	Cash Flow Statements: Forecast
13	PL	Income Statements (Profits and Losses Statements): Forecast
14	BS	Assets, Equity and Liabilities: Forecast
15	Evaluating	Efficiency evaluating
16	Sensitivity	Sensitivity analysis
17	Scenario	Scenario analysis

The financial model provides few options. It is possible to turn price indices (inflation) on and off to assess their

impact on performance indicators. Price indices are provided for the following variables: electricity prices, diesel fuel prices, nominal wage level, grain handling service prices, grain cleaning prices, and new replacement equipment prices.

It is also possible to switch the currency of calculation of financial reports and indicators: US dollar or Ukrainian hryvnia. The official exchange rate of the NBU was used for currency conversion, it corresponded to the interbank commercial rate at the time of model preparation. Most suppliers of imported equipment and goods use this rate.

The model provides an option to estimate cash flows and financial statements in the case of dividend payments. The share of dividends is 60% of net income (can be changed on the Assumptions sheet) and they are paid if there is a positive cash balance.

Prepared financial model bases on the set of assumptions. Inputs and assumptions provided with commentaries. The most significant variables have base, best and worst values.

To determine the level of consumption of electric energy per transshipped ton of grain, diesel fuel consumption and the level of other costs, the actual accounting data of the grain elevator in the city of Bila Tserkva, Kyiv Oblast, and the grain terminal in Chernivtsi Oblast, on the border with Romania, at the Vadul-Siret checkpoint were used. The last one currently loads and ships approx. 100 wagons per day, i.e. 5000 tons of grain per day. Data were also used on the staff categories, number of personnel, and the wage fund of 2 enterprises: a grain elevator and an operating border grain terminal (has a grain storage capacity of 30,000 tons, transships about 20,000 tons per month, receives cargo from trucks and railways wagons, shipment to the railway).

Control calculating for fuel consumption by diesel locomotives were made, based on the time of their operation (17,5 hours per day) and the rate of fuel consumption by the locomotive per moto-hour (21 liters) and average weight factor for diesel fuel (0,85). To check the level of electrical energy consumption, the coefficients of use of the installed maximum capacity of the equipment that will be purchased for the grain terminal were calculated. The coefficient is at the level of 0.2, which is acceptable for such enterprise.

Key inputs and assumptions to the financial model are listed in Table 9. That used to build projected cash flow statements, income (profits and losses) and balance sheet for the grain transshipment terminal.

Table 9 List of key inputs and assumptions for base scenario		
Name	Indicator	Figure
1	2	3
General		
USD Exchange rate	UAH/USD	36,5686
Euro Exchange rate	UAH/EUR	40,3461
Corporate Income Tax	coef.	0,18
Value Added Tax coef.	coef.	1,2
Value Added Tax rate, %		20%
Personal income Tax (ПДФО)		18%
MilitaryTax (Військовий збір)		1,5%
Start year		2023
Year of commissioning		2025
Load capacity in 2025		0,5
Time horizon	years	20
Working Days in Year	days	320
Prices and Costs		
Grain transshipment (handling) price	USD/t	9
Grain cleaning (processing) price	UAH/ton-%	45
Average percentage of grain cleaning	%	2,00
Customs clearance services price	USD/t	1,50
Fee for customs clearance services	USD/t	0,75
Phytosanitary document processing by DPSU costs	USD/t	0,16
Service fee by Ukrzaliznytsia (Ukrainian Railways)	UAH/t	25

costs		
Total cost of electricity for Class 1	UAH/MwH	6 600
Diesel fuel for locomotives	UAH/t	3 000
Market price of land	USD/ha	200 000
Normative monetary valuation per hectare	UAH	2 000 000
Volumes		
Grain handling volume	ton	500 000
Grain cleaning volume	ton	100 000
Customs clearance services	ton	500 000
Phytosanitary document processing	ton	500 000
Length of own railway track under construction	km	5,6
Number of locomotives	од.	2
Area of land plots in hectares	ha	7,5
Expenditure norms and cost of services		
Installed electrical power of equipment (KwH)	KwH	1 950
Utilization coefficient of equipment power		0,184
Electricity per ton of grain handling	KwH/ton	5
Electricity per ton of cleaning (aeration)	KwH/ton	2,5
Diesel fuel consumption	ton/year	200
Maintenance of railway track without sleepers (regulatory work)	UAH/km	400 000
Maintenance and current repair of diesel locomotives	USD/year	15 000
Equipment maintenance and current repairs	UAH/year	2 000 000
Laboratory certification	UAH/year	50 000
Scale certification, calibration	UAH/year	480 000
Fire safety measures, safety equipment, energy permits	UAH/year	100 000
Protective clothing	UAH/year	500 000
Fumigation/cleaning of equipment	UAH/year	100 000
Deratization	UAH/year	100 000
CapEx Funding		
Own capital, share	%	50%
Debt capital, share	%	50%
Loan		
Annual interest rate	%	8,00%
Credit acquisition date		01.01.2024
Credit repayment date		01.01.2029
Loan duration, years	years	5
Grace period	years	1
Cost of capital		
Equity	y%	20,00%
Debt	y%	8,00%
WACC (Discount rate)	y%	13,30%
MIRR reinvestment rate	y%	13%

The grain terminal will be registered as a legal entity with common conditions of taxation. The company will be a taxpayer of Corporate Income Tax (18%), Value Added Tax (20%), land Tax (1% of the normative monetary value of land in our case). The company also deducts Personal Income Tax and Military Tax from the paid wages, environmental tax for emissions of solid substances.

Forecasted Cash Flow/Discounted Cash Flow

Planning horizon of the financial model is 20 years. Cash flow forecasts for the period of 2023-2043 are presented in the Tables 10 below. Full data is presented in the financial model.

Table 10 Cash Flow, kUSD								
	2023	2024	2025	2026	2027	2028	2029	2030-2043 average
I. Cash Flow from Operating Activities								
Inflows:	0	0	4 302	5 496	5 496	5 496	5 496	5 496
Sales	0	0	2 748	5 496	5 496	5 496	5 496	5 496
Tax refunds (VAT)	0	0	1 553	0	0	0	0	0
Outflows:	1	16	1 626	3 156	3 156	3 171	3 189	3 227
Electricity and fuel	0	0	333	666	666	666	666	666
Technical maintenance and current repairs	0	0	160	160	160	160	160	160
Outsourced services	0	0	413	822	822	822	822	822
Uniform expenses	0	0	14	14	14	14	14	14
Payroll expenses	0	0	186	372	372	372	372	372
Social contribution payments	0	0	41	82	82	82	82	82
Administrative expenses excluding salaries	1	12	50	50	50	50	50	50
General expenses (taxes and insurance)	0	4	20	20	20	20	20	20
Marketing expenses	0	0	41	27	0	0	0	0
Payment of VAT obligations	0	0	290	626	631	631	631	631
Payment of income tax obligations	0	0	79	317	340	355	373	411
Net cash flow from operating activities	-1	-16	2 676	2 340	2 340	2 325	2 307	2 269
II. Cash flow from investment activities								
Incomes:	0	0	0	0	0	0	0	512
Cost of non-current assets								5 392
Cost of land plots								1 500
Increase in current assets								275
Expenses:	1 553	8 505	2 499	0	0	674	0	287
Buildings and structures	53	4 174	1 338	0	0	674	0	144
Equipment and machinery	0	4 331	887	0	0	0	0	142
Land plots	1500	0	0	0	0	0	0	0
Increase in current assets (debit accounts receivable + inventory)	0	0	275	0	0	0	0	0
Net cash flow from investing activities	-1 553	-8 505	-2 499	0	0	-674	0	225
III. Cash flow from financing activities								
Inflows:	1 600	10 957	0	0	0	0	0	0
Equity capital	1 600	4 678	0	0	0	0	0	0
Proceeds from loans	0	6 278	0	0	0	0	0	0
Outflows:	0	0	1 758	1 658	1 557	1 457	1 356	0
Repayment of loans	0	0	1 256	1 256	1 256	1 256	1 256	0
Payment of interest on loans	0	0	502	402	301	201	100	0
Payment of dividends*	0	0	0	0	0	0	0	0
Net cash flow from financing activities	1 600	10 957	-1 758	-1 658	-1 557	-1 457	-1 356	0
Net cash flow for the period	46	2 436	-1 582	682	783	195	951	2 495

Cash balance at the beginning of the year	0	46	2 482	900	1 582	2 365	2 560	782
Cash balance at the end of the year	46	2 482	900	1 582	2 365	2 560	3 511	2 077

The terminal forecasted net sales could reach \$4.58 million in 2026, with a net profit margin (net profit/net sales) of 32%. Average forecasted net profit margin is 38%, EBITDA margin is 58% - Table 11.

Efficiency Indicators

Table 11 Key Financials								
	2023	2024	2025	2026	2027	2028	2029	2030-2043 average
Net sales, kUSD	0	0	2 290	4 580	4 580	4 580	4 580	4 580
Gross profit, kUSD	0	0	1 051	2 251	2 251	2 234	2 234	2 344
EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) , kUSD	-1	-14	1 201	2 657	2 680	2 680	2 680	2 680
Net profit (loss), kUSD	-1	-14	374	1 446	1 547	1 616	1 698	1 871
Net profit margin, %	0%	0%	16%	32%	34%	35%	37%	41%
EBITDA margin, %	0%	0%	52%	58%	59%	59%	59%	59%
Long-term Debt/EBITDA ratio			4,18	1,42	0,94	0,47		

The project has good performance indicators. As the table shows, the NPV of the project is greater than 0, the internal rate of return and the modified internal rate of return are higher than the discount rate, and the profitability index is higher than 1. This all indicates the economic efficiency of the project, Table 12.

Table 12 Project efficiency indicators			
Indicator	Symbol	Value	Units
Net Present Value	NPV	2 995	k USD
Internal Rate of Return	IRR	17,0%	% annual
Modified Internal Rate of Return	MIRR	14,7%	% annual
Profitability Index	PI	1,28	coef.
Regular Payback	RPB	5,1	years
Discounted Payback	DPB	10,9	years

D. Sensitivity and scenario analysis

The main risks, which could influence the project efficiency, are:

- Debt capital costs growth.
- Decrease in grain handling prices.
- Decrease in handling volumes.
- Increase in electricity and diesel fuel prices.
- Personnel salaries growth in Ukraine in the event of the end of the war and accession to the EU.

Table 13 shows description the parameters of NPV sensitivity analysis to individual factors.

Table 13 Parameters of NPV sensitivity analysis to individual factors				
Variable	Units	-20%	Base level	20%
Loan cost	% annual	6,40%	8,00%	9,60%
Handling price	USD/t	7	9	11
Handling volume	ton	400 000	500 000	600 000
Electricity price	UAH/MwH	5 280	6 600	7 920
Diesel fuel price	UAH/t	24 800	31 000	37 200
Salary with social security contributions	kUSD	363	454	545

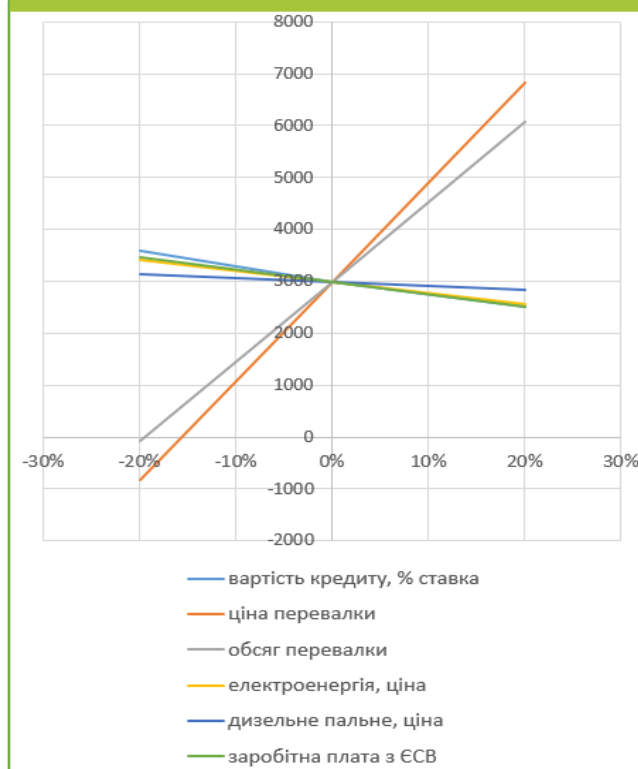
To analyze the individual impact of specific variable on project performance, a sensitivity analysis has been conducted – Table 14. Project's NPV is very sensitive to changes in the grain transshipment (handling) price and in the transshipment volumes. It's important to obtain forecasted levels of those variables if the project will be implemented. NPV break-even analysis shows that the grain transshipment volumes can drop to 402.5 thousand tons per year or transshipment price can drop to 7.59 USD/t before the project's NPV falls to zero.

NPV sensitivity graph (Figure 13) clearly presents the results of sensitivity analysis. The handling price and handling volume have the biggest impact on the project's effectiveness. Changes in other factors within a range of 20% from the baseline have a less pronounced impact.

Table 14 NPV and changes in individual factors of the project

Change in each variable:	loan cost	handling price	handling volume	electricity price	diesel fuel price	wages with social security contributions
20%	2519	6820	6071	2569	2849	2519
0	2995	2995	2995	2995	2995	2995
-20%	3598	-832	-83	3419	3139	3469

Figure 13 NPV sensitivity graph



For the scenario risk analysis, 4 scenarios are defined: pessimistic, basic, optimistic, as well as the scenario of change in prices and tariffs from the basic level over time (e.g. with price indices). For the last one, the change in prices and tariffs are reflected in the "Inflation" sheet of the financial model. Table 15 below summarizes three first scenarios with corresponding assumptions.

Table 15 Scenarios descriptions for financial analysis

Scenario parameter	Pessimistic	Base	Optimistic	Pess/Base, D%	Opt/Base, D%
Probability	0,15	0,65	0,2		
VAT reimbursement from the budget, kUSD	0	1553	1553	-100,0%	0,0%
Investment amount in 2023-2025, kUSD	12 557	12 557	11 870	0,0%	-5,5%

Handling price, USD/t	7,5	9,0	10,0	-16,7%	11,1%
Handling volume, tons	300 000	500 000	700 000	-40,0%	40,0%
Electricity price, UAH/MWh	7 200	6 600	6 000	9,1%	-9,1%
Diesel fuel price, UAH/ton	34 000	31 000	29 000	9,7%	-6,5%

Pessimistic scenario assumes that VAT reimbursement from the budget will not be received on time and will be compensated through future payments. Optimistic scenario also assumes that the investment amount does not include an additional 15% of unforeseen expenses that may arise depending on the characteristics of the land plot (such as the need for reinforced foundations and offsite networks, etc.). For all other scenarios, deviations from the base indicator are provided in the specified amounts in the table above.

Table 16 presents the results of the scenario analysis. Taking into consideration the scenario's probability, the project's expected NPV is 3.62 million USD.

Table 16 The scenario analysis results						
Indicator	Symbol	Units	Pessimistic	Base	Optimistic	Change in prices
Discount rate	dR	% annual	13,30%	13,30%	13,30%	13,30%
Net Present Value	NPV	k USD	-6 209	2 995	13 058	182
Internal Rate of Return	IRR	% annual	4,4%	17,0%	29,7%	13,3%
Modified Internal Rate of Return	MIRR	% annual	9,1%	14,7%	18,2%	13,3%
Profitability Index	PI	coef.	0,54	1,28	2,13	1,07
Regular Payback	RPB	years	17,2	5,1	2,8	6,6
Discounted Payback	DPB	years	> 20	10,9	4,2	17,8

The combination of negative changes in the model factors in the pessimistic scenario indicates that the project may be ineffective. It should be noted that the probability of simultaneous negative changes in all model factors is low. Additionally, the scenario analysis results include the forecasted changes in service prices and resource costs over the projected period. The Base scenario is built on unchanged base prices and other variables.

E. Analysis of the government options to ensure commercial viability of the project.

The analysis above preliminary shows that the project is commercially viable on baseline scenario, so it not require additional investments from the Government.

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Annex A: Market Analysis

General description of the AGMEMOD Model and Methodology

AGMEMOD is an econometric, dynamic, partial-equilibrium, multi-country, multi-market model. It covers all EU Members States, some non-EU countries (e.g., Balkan countries, Ukraine, Kazakhstan, Russian Federation, some African countries) and a stylised version of the rest of the world (RoW). The model provides annual projections (currently) until the year 2030 for markets of the main agricultural commodities at national and aggregated EU levels. AGMEMOD is based on a set of commodity-specific model templates and country-specific models. The template approach facilitates aggregation of the simulation results, analytical consistency across countries and comparison of policy impacts. The model does not only provide baseline projections, but as well allows analysing impacts of countries' agricultural policies (e.g., CAP) and macroeconomic changes on the agricultural markets (Salamon et al., 2019).

The commodity markets in AGMEMOD are represented by equations for supply and demand, stocks, international trade and market prices. They represent behavioural responses of economic agents to changes in prices and exogenous variables such as agricultural policy instruments, GDP, currency exchange rate, tariff rate quotas etc. The equations' parameters are usually estimated as time series regressions from the AGMEMOD database. The latter contains annual observations on the endogenous and exogenous variables. Depending on the country, these data range from 1973 until the latest available year. Most of the data is obtained from national statistics, Eurostat, Short-term Outlook and Commodity price dashboard of the European Commission (Salamon et al., 2017; Chantreuil et al., 2012).

Following the partial equilibrium approach, commodity prices adjust to clear each commodity market considered in AGMEMOD. Lagged endogenous variables introduce (recursive) dynamic behaviour when entered as determinants in the next period's equilibrium supply and/or demand. Closing of global commodity balances in AGMEMOD is achieved by forming world market prices in the RoW model. Commodity markets in a country are linked to each other by substitution or complementary parameters on the supply or demand side. Interactions between the crops and livestock sub-models are captured via the derived demand for feed. The various meat types, dairy products and crops are partly substitutes in demand, while cattle, pig, sheep and goat, and poultry compete for feed (Salamon et al., 2017; Chantreuil et al., 2012).

Each country model comprises markets for its main agricultural commodities. These commodities usually include six types of cereals, three types of oilseeds and their processed products (oil and meal), sugar beet and sugar, protein crops, potatoes, live animals such as cattle, sheep and goats, pigs and poultry and their products such as meat, milk, dairy and eggs. The projections for the crops sector cover area harvested, yield per hectare, total production as a product of area harvested and yield, domestic use, quantities imported and exported, stocks and domestic market price. Crops area is defined following the top-down approach. In particular, the total country land area is divided into woods, usable agricultural area (UAA) and other areas. UAA is split into permanent grassland, kitchen gardens, arable land, land under permanent crops, fodder from arable land and vegetable area.

The livestock sector in AGMEMOD comprises a complex system of total animal numbers, numbers of dairy and suckler cows, sows and ewes, livestock reproduction rates, total number of slaughtered animals, slaughter weight, death loss, numbers imported and exported. Meat production is determined by the number of slaughtered animals and their slaughter weight. Markets of milk and dairy products include milk delivered to dairies, consumed at the farm level and for human consumption, and milk fat and protein coefficients which are used in the equations of production of butter, cream, cheese, whole and skimmed milk powder (Salamon et al., 2017; Chantreuil et al., 2012).

As equations in AGMEMOD are estimated econometrically, the model does not require calibration. However, when it is used for producing the Agricultural Outlook for the EU countries, its EU country models are calibrated to projections of the EU Agricultural Outlook. In particular, the projected by AGMEMOD values of production, use and trade at the EU-14 and EU-N13 aggregate levels must, to the extent possible, reproduce the values of the EU

Outlook. Therefore, parameters of equations for the EU country models are accordingly modified (Salamon et al., 2017). This is not the case for the non-EU country models which generate projections based on the original, estimated and adjusted by the market experts, modelling parameters (Nykolyuk et al. 2021).

The AGMEMOD model produces market projections based on the functions representing behavior of the market agents and equalities. The latter are computations which represent production or market balances in equilibrium. For example, quantity of wheat produced equals yield per hectare and the acreage of wheat harvested. The behavioral equations, on the contrary, are estimated econometrically and refer to such variables as, for example, market prices, consumption per capita, quantities exported and imported, crop yields and areas, processing coefficients, etc. Real costs for producing crop commodities are included in the behavioural equations, which represent the supply side of the agricultural markets. These costs comprise payments for rented land and property, labour, fodder, seeds, fertilizers, fuel, depreciation, as well as expenses on additional materials such as disinfectants, services and veterinary treatment.

The database of the AGMEMOD Ukraine country-model starts from 1992. For the current study it has been updated until 2021 and, where possible, 2022. The series include observations on production (e.g., crops yields and area harvested, livestock number and crop, slaughter weight, production of oilseed oils and meals), domestic use (e.g., use for feed, human consumption and processing, losses), prices, change in stocks, import and export. Observations on most of the domestic market prices and supply components were obtained from the State Statistics Service of Ukraine. For quantities exported and imported, components of domestic use and domestic prices for oilseed oils and meals, FAOSTAT and statistics of the International Trade Centre were used. Data for 2022 were obtained from publicly available database of commodities prices and reports of the Ministry for Agrarian and Food Policy of Ukraine.

The projections of the agricultural commodity balances in AGMEMOD are based on the number of factors, including agricultural and trade policies, production costs, world market prices of the agricultural commodities, and macroeconomic indicators such as, for example, national GDP, GDP deflator, currency exchange rate and population. These are exogenous variables, i.e. variables that are not computed or projected by the model. Their observed and projected values are collected from various external sources and implemented into the model as a separate component representing modelling assumptions.

Although the model allows for running simulations for the values of the world market prices, the current study is conducted within the general frameworks of the OECD-FAO and the EU Agricultural Outlooks. Accordingly, the historical and projected values of the world market prices for the commodities analysed correspond to those of the EU Agricultural Outlook (see table above). Table below provides with sources for a selected set of variables:

Table 21 Sources for the selected set of variables

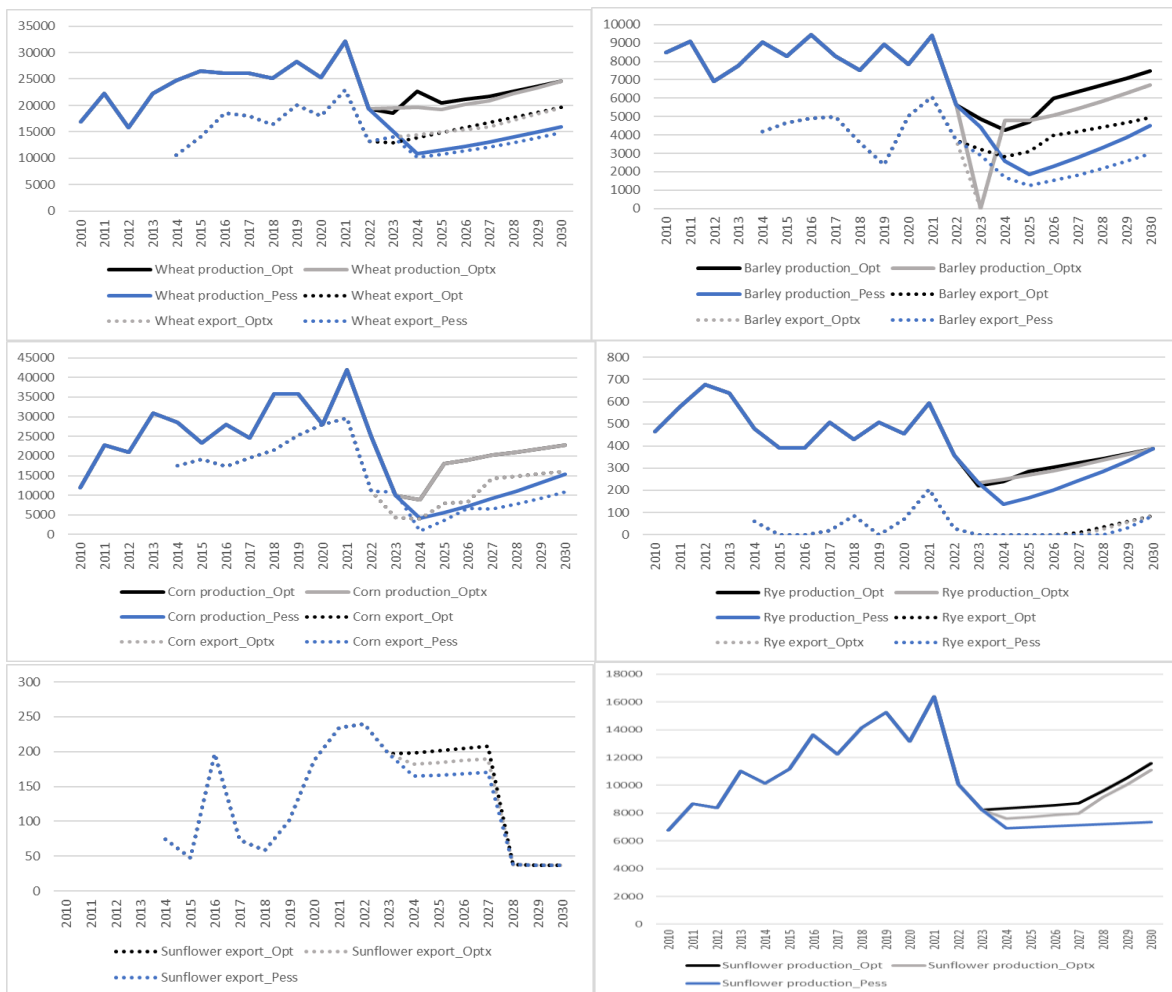
Domestic market prices in 2022	June 2022, open sources data June 2022, producers' questionnaire
Domestic market prices in 2023–2030	Defined by the model
World market prices in 2022–2030	OECD-FAO Outlook 2022
GDP projections 2022-2030 IMF, April 2022 SSSU projections Growth rate projected by USDA in 2021	2022-2023: - 35% compared to 2021 2024: rebound by 12.5% 2025-2030: +3.1% annually
GDP deflator As of July 2022, according to the National Bank of Ukraine According to the USDA 2021 projections	2022: 30 2023–2030: +5% annual growth
UAH/USD currency exchange rate As of July 2022, according to the National Bank of Ukraine According to the USDA 2021 projections	2022–2023: 36.6 2024–2030: +0.2% annual growth
Population Assuming 4 mil people left Ukraine considering 2021 USDA	2022-2023: -4 mil from the projected number 2024-2030: according to the former projections

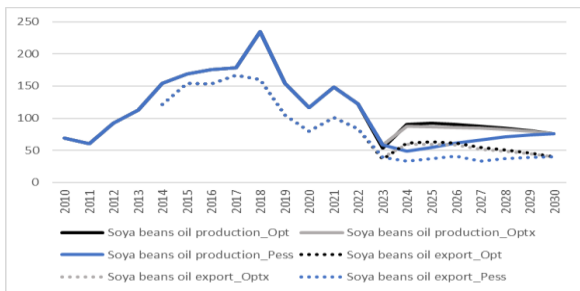
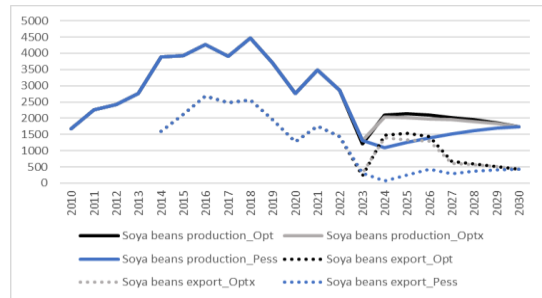
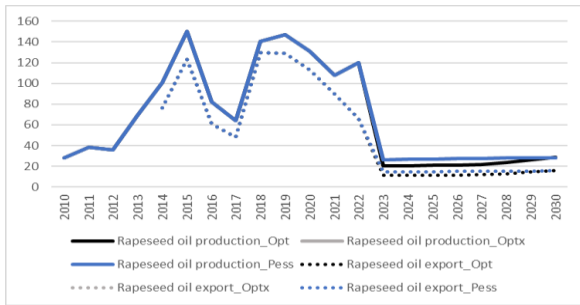
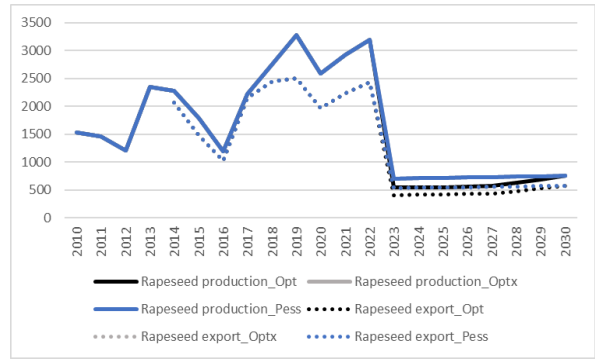
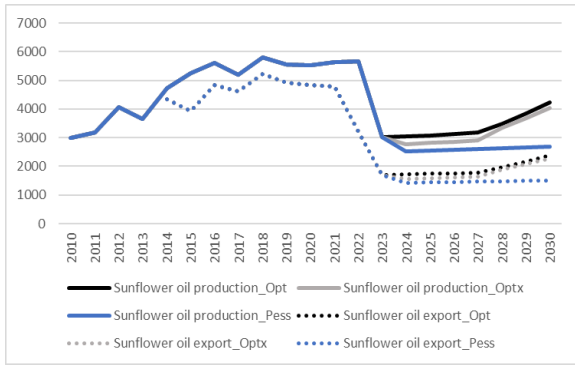
projections until 2030
Return of all the war refugees, according to 2021 USDA
projections until 2030

The agricultural trade policy of 2017 and beyond is represented in the database with FTA agreements, e.g., with the EU and Canada (FTA, 2017; FTA, 2014), and the law of Ukraine on customs duties (LoU, 2020d). Other factors such as, for example, values of foreign investments in agriculture and socio-political conditions are not directly represented in the model. Instead, their impacts are partially captured by the estimates of time series regressions, representing the behaviour of economic agents in agriculture.

Agricultural policy support in Ukraine targets specific farming/entrepreneurial activities (e.g., the partial refunding of interest paid for agricultural loans) or specific sectors or types of agricultural producers (e.g., payments to newly established farms and support of livestock production) (see section 3). Because the targets of this support have changed rather often (LoU, 2020c; LoU, 2019; LoU, 2018b; LoU, 2017), medium- and long-term effectiveness of such support may be limited, and conducting of the respective impact analysis merely possible. Furthermore, as some of the payments refer to rather specific farming activities and the respective data are not available at the commodity level, their quantification for the use in the model may be prone to considerable errors. Finally, according to OECD (2020), the producer support estimate (PSE) in Ukraine in 2011-2020 ranged from -3.86% to 2.96% of gross farm receipts. This is low compared to other countries, especially when compared to the PSE of the same period in the EU, which ranged from a minimum of 17.27% to a maximum of 19.66%, and in 'the OECD total', which ranged between 16.36% to 18.72%. Therefore, direct monetary support to the Ukrainian producers has not been included in the modelling assumptions, neither has been explicitly accounted for when estimating the equations.

Figure 13 Scenario projections of agricultural markets development in Ukraine, 1000 t





Source: adapted from KSE Agrocenter 2022d

Table 22 Scenario projections for production and export of selected crops and oils, 1000 t

	2018	2021	2022	2023	2024	2025	2026	2027	2030
Wheat production_Opt	25,070.92	32,075.57	19,364.00	18,525.35	22,677.46	20,502.68	21,118.57	21,674.64	24,581.49
Wheat production_Optx	25,070.92	32,075.57	19,364.00	19,538.68	19,713.37	19,301.48	20,140.05	20,949.30	24,611.59
Wheat production_Pess	25,070.92	32,075.57	19,364.00	15,144.38	10,924.77	11,550.93	12,283.61	13,052.26	15,930.79
Wheat export_Opt	16,373.40	22,909.48	13,160.00	12,987.51	13,933.83	14,880.15	15,826.47	16,772.79	19,688.28
Wheat export_Optx	16,373.40	22,909.48	13,160.00	13,992.51	14,474.47	14,956.43	15,438.38	15,920.34	19,567.75
Wheat export_Pess	16,373.40	22,909.48	13,160.00	14,078.76	10,156.05	10,738.15	11,419.28	12,133.84	14,809.83
Barley production_Opt	7,530.90	9,427.00	5,616.00	4,856.14	4,270.50	4,694.36	6,008.19	6,350.68	7,482.11
Barley production_Optx	7,530.90	9,427.00	5,616.00	1.00	4,771.86	4,771.86	5,068.24	5,439.93	6,698.73
Barley production_Pess	7,530.90	9,427.00	5,616.00	4,414.49	2,570.39	1,870.79	2,292.37	2,771.01	4,505.83
Barley export_Opt	3,597.50	6,078.48	3,705.70	3,204.31	2,817.88	3,097.56	3,964.49	4,190.48	4,937.05
Barley export_Optx	3,597.50	6,078.48	3,705.70	1.00	4,771.86	4,771.86	5,068.24	5,439.93	6,698.73
Barley export_Pess	3,597.50	6,078.48	3,705.70	2,912.89	1,696.06	1,234.44	1,512.61	1,828.44	2,973.16
Corn production_Opt	35,801.05	41,873.60	25,036.53	9,856.21	8,911.43	18,076.50	18,986.97	20,174.54	22,840.78
Corn production_Optx	35,801.05	41,873.60	25,036.53	9,856.21	8,911.43	18,076.50	18,986.97	20,174.54	22,840.78
Corn production_Pess	35,801.05	41,873.60	25,036.53	9,856.21	4,197.30	5,638.99	7,256.65	9,203.51	15,363.04
Corn export_Opt	21,440.60	29,599.69	10,973.30	4,319.89	3,905.81	7,922.78	8,321.83	14,261.02	16,145.73
Corn export_Optx	21,440.60	29,599.69	10,973.30	4,319.89	3,905.81	7,922.78	8,321.83	14,261.02	16,145.73
Corn export_Pess	21,440.60	29,599.69	10,973.30	10,750.22	899.05	3,619.07	6,741.68	6,505.79	10,859.85
Rye production_Opt	430.33	594.78	358.86	221.68	240.11	285.50	303.43	323.10	386.52
Rye production_Optx	430.33	594.78	358.86	232.52	250.58	267.53	288.58	311.57	386.79
Rye production_Pess	430.33	594.78	358.86	232.52	135.60	165.92	201.63	241.81	386.47
Rye export_Opt	86.96	205.52	28.05	0.02	0.04	0.04	0.04	7.34	85.83
Rye export_Optx	86.96	205.52	28.05	0.02	0.04	0.04	0.04	0.02	86.07
Rye export_Pess	86.96	205.52	28.05	0.02	0.04	0.04	0.04	0.02	85.78
Sunflower production_Opt	14,165.20	16,379.91	10,062.36	8,242.43	8,324.85	8,449.72	8,576.47	8,705.12	11,586.51
Sunflower production_Optx	14,165.20	16,379.91	10,062.36	8,242.43	7,621.30	7,735.62	7,851.66	7,969.43	11,089.46
Sunflower production_Pess	14,165.20	16,379.91	10,062.36	8,242.43	6,917.75	6,986.93	7,056.80	7,127.37	7,365.15
Sunflower export_Opt	58.70	234.13	240.00	196.59	198.56	201.54	204.56	207.63	36.88
Sunflower export_Optx	58.70	234.13	240.00	196.59	181.78	184.50	187.27	190.08	36.88
Sunflower export_Pess	58.70	234.13	240.00	196.59	165.00	166.65	168.31	170.00	36.88
Sunflower oil production_C	5,808.09	5,640.11	5,675.59	3,009.26	3,039.35	3,084.94	3,131.21	3,178.18	4,230.16
Sunflower oil production_C	5,808.09	5,640.11	5,675.59	3,009.26	2,782.49	2,824.23	2,866.59	2,909.59	4,048.69
Sunflower oil production_P	5,808.09	5,640.11	5,675.59	3,009.26	2,525.63	2,550.88	2,576.39	2,602.16	2,688.97
Sunflower oil export_Opt	5,223.69	4,778.84	3,200.00	1,696.67	1,713.64	1,739.35	1,765.44	1,791.92	2,385.04
Sunflower oil export_Optx	5,223.69	4,778.84	3,200.00	1,696.67	1,568.82	1,592.35	1,616.24	1,640.48	2,282.73
Sunflower oil export_Pess	5,223.69	4,778.84	3,200.00	1,696.67	1,423.99	1,438.23	1,452.62	1,467.14	1,516.09
Rapeseed production_Opt	2,750.60	2,923.80	3,190.00	539.90	545.30	553.48	561.78	570.21	758.95
Rapeseed production_Optx	2,750.60	2,923.80	3,190.00	704.62	711.67	718.78	725.97	733.23	755.45
Rapeseed production_Pess	2,750.60	2,923.80	3,190.00	704.62	711.67	718.78	725.97	733.23	755.45
Rapeseed export_Opt	2,440.56	2,228.30	2,431.18	411.47	415.59	421.82	428.15	434.57	578.42
Rapeseed export_Optx	2,440.56	2,228.30	2,431.18	537.01	542.38	547.80	553.28	558.82	575.75
Rapeseed export_Pess	2,440.56	2,228.30	2,431.18	537.01	542.38	547.80	553.28	558.82	575.75
Rapeseed oil production_O	140.44	107.79	119.77	20.27	20.47	20.78	21.09	21.41	28.49
Rapeseed oil production_O	140.44	107.79	119.77	26.45	26.72	26.99	27.26	27.53	28.36
Rapeseed oil production_P	140.44	107.79	119.77	26.45	26.72	26.99	27.26	27.53	28.36
Rapeseed oil export_Opt	129.58	89.99	66.00	11.17	11.28	11.45	11.62	11.80	15.70
Rapeseed oil export_Optx	129.58	89.99	66.00	14.58	14.72	14.87	15.02	15.17	15.63
Rapeseed oil export_Pess	129.58	89.99	66.00	14.58	14.72	14.87	15.02	15.17	15.63
Soya beans production_Op	4,460.80	3,478.99	2,869.68	1,207.80	2,089.21	2,145.73	2,091.35	2,026.13	1,746.13
Soya beans production_Op	4,460.80	3,478.99	2,869.68	1,321.65	2,033.06	2,009.02	1,987.34	1,952.34	1,746.13
Soya beans production_Pes	4,460.80	3,478.99	2,869.68	1,321.65	1,099.19	1,245.60	1,388.50	1,515.53	1,746.13
Soya beans export_Opt	2,552.88	1,763.77	1,439.48	228.34	1,469.50	1,536.14	1,437.55	661.96	432.08
Soya beans export_Optx	2,552.88	1,763.77	1,439.48	312.85	1,394.87	1,339.79	1,287.95	608.83	432.08
Soya beans export_Pess	2,552.88	1,763.77	1,439.48	312.85	63.83	248.37	429.56	295.03	432.08
Soya beans oil production_	235.02	148.21	122.74	53.26	90.11	92.47	90.20	87.47	75.77
Soya beans oil production_	235.02	148.21	122.74	58.02	87.76	86.76	85.85	84.39	75.77
Soya beans oil production_	235.02	148.21	122.74	58.02	48.72	54.84	60.82	66.13	75.77
Soya beans oil export_Opt	160.00	100.90	83.56	36.26	61.35	62.96	61.41	54.71	39.91
Soya beans oil export_Optx	160.00	100.90	83.56	39.50	59.75	59.06	58.45	51.62	39.91
Soya beans oil export_Pess	160.00	100.90	83.56	39.50	33.17	37.34	41.40	33.36	39.91

Table 23 Wheat: regional outlook, 000 t

	Observed share	Projected shares according to year and scenario																	
		Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx
Ukraine	2021	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030
Vynnytsya	5.6%	1,042.9	1,276.6	1,154.2	1,188.9	1,220.2	1,383.8	1,099.9	1,109.8	1,086.6	1,133.8	1,179.3	1,385.5	852.6	615.0	650.3	691.5	734.8	896.8
Volyn	2.3%	419.9	514.1	464.8	478.7	491.3	557.2	442.9	446.9	437.5	456.5	474.9	557.9	343.3	247.6	261.8	278.4	295.9	361.1
Dnipropetrovsk	7.5%	1,397.1	1,710.3	1,546.3	1,592.7	1,634.6	1,853.9	1,473.6	1,486.7	1,455.7	1,518.9	1,579.9	1,856.1	1,142.1	823.9	871.1	926.4	984.4	1,201.5
Donetsk	4.8%	881.7	1,079.3	975.8	1,005.1	1,031.6	1,169.9	929.9	938.2	918.6	958.5	997.0	1,171.3	720.8	519.9	549.7	584.6	621.2	758.2
Zhytomyr	2.6%	475.0	581.5	525.7	541.5	555.8	630.3	501.0	505.5	494.9	516.4	537.2	631.1	388.3	280.1	296.2	315.0	334.7	408.5
Zakarpattia	0.2%	44.4	54.3	49.1	50.6	51.9	58.9	46.8	47.2	46.2	48.2	50.2	58.9	36.3	26.2	27.7	29.4	31.3	38.1
Zaporizhzhya	8.3%	1,545.7	1,892.1	1,710.7	1,762.1	1,808.5	2,051.0	1,630.2	1,644.8	1,610.5	1,680.4	1,747.9	2,053.5	1,263.6	911.5	963.8	1,024.9	1,089.0	1,329.2
Ivano-Frankivsk	0.7%	138.5	169.6	153.3	157.9	162.1	183.8	146.1	147.4	144.3	150.6	156.6	184.0	113.2	81.7	86.4	91.8	97.6	119.1
Kyiv	3.3%	611.9	749.0	677.2	697.6	715.9	811.9	645.4	651.1	637.5	665.2	692.0	812.9	500.2	360.8	381.5	405.7	431.1	526.2
Kirovohrad	5.8%	1,076.9	1,318.2	1,191.8	1,227.6	1,260.0	1,428.9	1,135.8	1,145.9	1,122.0	1,170.7	1,217.8	1,430.7	880.3	635.1	671.5	714.0	758.7	926.1
Luhansk	3.1%	572.9	701.3	634.0	653.0	670.2	760.1	604.2	609.6	596.9	622.8	647.8	761.1	468.3	337.8	357.2	379.8	403.6	492.6
Lviv	2.5%	472.2	578.1	522.6	538.3	552.5	626.6	498.1	502.5	492.0	513.4	534.0	627.4	386.1	278.5	294.4	313.1	332.7	406.1
Mikolayiv	6.2%	1,140.3	1,395.9	1,262.0	1,299.9	1,334.1	1,513.1	1,202.7	1,213.4	1,188.1	1,239.7	1,289.5	1,514.9	932.2	672.5	711.0	756.1	803.4	980.6
Odesa	8.3%	1,546.3	1,892.8	1,711.3	1,762.7	1,809.1	2,051.8	1,630.8	1,645.4	1,611.0	1,681.0	1,748.6	2,054.3	1,264.1	911.9	964.1	1,025.3	1,089.4	1,329.7
Poltava	3.7%	692.6	847.9	766.6	789.6	810.4	919.1	730.5	737.1	721.7	753.0	783.3	920.2	566.2	408.5	431.9	459.3	488.0	595.6
Rivne	1.7%	312.5	382.6	345.9	356.3	365.6	414.7	329.6	332.6	325.6	339.7	353.4	415.2	255.5	184.3	194.9	207.2	220.2	268.7
Sumy	2.9%	537.7	658.2	595.1	612.9	629.1	713.4	567.1	572.2	560.2	584.5	608.0	714.3	439.5	317.1	335.2	356.5	378.8	462.4
Ternopil	3.6%	663.0	811.6	733.8	755.8	775.7	879.7	699.3	705.5	690.8	720.8	749.8	880.8	542.0	391.0	413.4	439.6	467.1	570.1
Kharkiv	8.7%	1,614.5	1,976.3	1,786.8	1,840.5	1,888.9	2,142.3	1,702.8	1,718.0	1,682.1	1,755.2	1,825.7	2,144.9	1,319.8	952.1	1,006.7	1,070.5	1,137.5	1,388.4
Kherson	6.5%	1,208.2	1,479.0	1,337.2	1,377.3	1,413.6	1,603.2	1,274.3	1,285.7	1,258.8	1,313.5	1,366.3	1,605.2	987.7	712.5	753.3	801.1	851.3	1,039.0
Khmelnytsky	4.2%	770.6	943.3	852.8	878.4	901.6	1,022.5	812.7	820.0	802.9	837.7	871.4	1,023.7	629.9	454.4	480.5	510.9	542.9	662.6
Cherkasy	3.8%	710.8	870.1	786.7	810.3	831.6	943.2	749.7	756.4	740.6	772.7	803.8	944.3	581.1	419.2	443.2	471.3	500.8	611.2
Chernivtsi	0.6%	103.0	126.1	114.0	117.4	120.5	136.7	108.6	109.6	107.3	112.0	116.5	136.8	84.2	60.7	64.2	68.3	72.6	88.6
Chernihiv	3.0%	546.8	669.4	605.2	623.4	639.8	725.6	576.7	581.9	569.7	594.5	618.4	726.5	447.0	322.5	341.0	362.6	385.3	470.2

Table 24 Barley: regional outlook, 000 t

	Observed share	Projected shares according to year and scenario																		
		Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Pess	Scenario_Pess	Scenario_Pess	Scenario_Pess	Scenario_Pess	Scenario_Pess
Ukraine	2021	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030	
Vinnitsya	4.7%	228.8	201.2	221.1	283.0	299.2	352.5	0.0	224.8	224.8	238.7	256.3	315.6	208.0	121.1	88.1	108.0	130.5	212.3	
Volyn	1.2%	56.4	49.6	54.5	69.7	73.7	86.8	0.0	55.4	55.4	58.8	63.1	77.7	51.2	29.8	21.7	26.6	32.2	52.3	
Dnipropetrovsk	8.5%	413.7	363.8	399.9	511.8	541.0	637.4	0.1	406.5	406.5	431.8	463.4	570.7	376.1	219.0	159.4	195.3	236.1	383.9	
Donetsk	3.7%	179.8	158.1	173.8	222.4	235.1	277.0	0.0	176.7	176.7	187.6	201.4	248.0	163.4	95.2	69.3	84.9	102.6	166.8	
Zhytomyr	1.3%	64.1	56.4	62.0	79.3	83.8	98.8	0.0	63.0	63.0	66.9	71.8	88.4	58.3	33.9	24.7	30.3	36.6	59.5	
Zakarpattia	0.1%	2.8	2.5	2.8	3.5	3.7	4.4	0.0	2.8	2.8	3.0	3.2	3.9	2.6	1.5	1.1	1.3	1.6	2.6	
Zaporizhzhya	7.0%	341.6	300.4	330.2	422.7	446.7	526.3	0.1	335.7	335.7	356.5	382.7	471.2	310.5	180.8	131.6	161.3	194.9	317.0	
Ivano-Frankivsk	1.2%	57.0	50.1	55.1	70.6	74.6	87.9	0.0	56.0	56.0	59.5	63.9	78.7	51.8	30.2	22.0	26.9	32.5	52.9	
Kyiv	3.0%	146.7	129.1	141.9	181.6	191.9	226.1	0.0	144.2	144.2	153.2	164.4	202.4	133.4	77.7	56.5	69.3	83.7	136.2	
Kirovohrad	5.7%	279.0	245.4	269.7	345.2	364.9	429.9	0.1	274.2	274.2	291.2	312.5	384.9	253.6	147.7	107.5	131.7	159.2	258.9	
Luhansk	1.1%	54.6	48.0	52.8	67.5	71.4	84.1	0.0	53.6	53.6	57.0	61.1	75.3	49.6	28.9	21.0	25.8	31.1	50.6	
Lviv	1.9%	91.7	80.6	88.6	113.4	119.9	141.2	0.0	90.1	90.1	95.7	102.7	126.4	83.3	48.5	35.3	43.3	52.3	85.0	
Mikolayiv	12.0%	583.2	512.8	563.7	721.5	762.6	898.5	0.1	573.0	573.0	608.6	653.3	804.4	530.1	308.7	224.7	275.3	332.8	541.1	
Odesa	16.2%	785.5	690.7	759.3	971.8	1,027.2	1,210.2	0.2	771.8	771.8	819.8	879.9	1,083.5	714.0	415.7	302.6	370.8	448.2	728.8	
Poltava	3.5%	168.0	147.8	162.4	207.9	219.7	258.9	0.0	165.1	165.1	175.4	188.2	231.8	152.7	88.9	64.7	79.3	95.9	155.9	
Rivne	1.9%	90.2	79.3	87.2	111.6	117.9	138.9	0.0	88.6	88.6	94.1	101.0	124.4	82.0	47.7	34.7	42.6	51.4	83.7	
Sumy	1.4%	67.6	59.5	65.4	83.7	88.4	104.2	0.0	66.5	66.5	70.6	75.8	93.3	61.5	35.8	26.1	31.9	38.6	62.7	
Ternopil	4.0%	194.1	170.7	187.6	240.1	253.8	299.0	0.0	190.7	190.7	202.6	217.4	267.7	176.4	102.7	74.8	91.6	110.7	180.1	
Kharkiv	5.3%	256.6	225.7	248.1	317.5	335.6	395.4	0.1	252.2	252.2	267.8	287.5	354.0	233.3	135.8	98.9	121.1	146.4	238.1	
Kherson	8.7%	424.6	373.4	410.5	525.4	555.3	654.2	0.1	417.3	417.3	443.2	475.7	585.7	386.0	224.8	163.6	200.4	242.3	394.0	
Khmelnitskiy	3.5%	169.1	148.7	163.5	209.2	221.1	260.5	0.0	166.2	166.2	176.5	189.4	233.2	153.7	89.5	65.1	79.8	96.5	156.9	
Cherkasy	2.5%	120.2	105.7	116.2	148.7	157.2	185.2	0.0	118.1	118.1	125.4	134.6	165.8	109.3	63.6	46.3	56.7	68.6	111.5	
Chernivtsi	0.7%	36.1	31.8	34.9	44.7	47.3	55.7	0.0	35.5	35.5	37.7	40.5	49.8	32.8	19.1	13.9	17.1	20.6	33.5	
Chernihiv	0.9%	44.8	39.4	43.3	55.4	58.6	69.0	0.0	44.0	44.0	46.8	50.2	61.8	40.7	23.7	17.3	21.2	25.6	41.6	

Table 25 Corn: regional outlook, 000 t

	Projected shares according to year and scenario																		
	Observed share	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx
Ukraine	2021	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030
Vynnytsya	10.6%	1,049.4	948.8	1,924.7	2,021.6	2,148.1	2,432.0	1,049.4	948.8	1,924.7	2,021.6	2,148.1	2,432.0	1,049.4	948.8	1,924.7	2,021.6	2,148.1	2,432.0
Volyn	1.2%	118.9	107.5	218.1	229.1	243.4	275.6	118.9	107.5	218.1	229.1	243.4	275.6	118.9	107.5	218.1	229.1	243.4	275.6
Dnipropetrovsk	3.8%	378.2	341.9	693.5	728.5	774.0	876.3	378.2	341.9	693.5	728.5	774.0	876.3	378.2	341.9	693.5	728.5	774.0	876.3
Donetsk	0.6%	61.2	55.3	112.3	117.9	125.3	141.9	61.2	55.3	112.3	117.9	125.3	141.9	61.2	55.3	112.3	117.9	125.3	141.9
Zhytomyr	5.8%	571.2	516.5	1,047.6	1,100.4	1,169.2	1,323.8	571.2	516.5	1,047.6	1,100.4	1,169.2	1,323.8	571.2	516.5	1,047.6	1,100.4	1,169.2	1,323.8
Zakarpattia	0.6%	57.7	52.1	105.8	111.1	118.1	133.7	57.7	52.1	105.8	111.1	118.1	133.7	57.7	52.1	105.8	111.1	118.1	133.7
Zaporizhzhya	0.7%	68.3	61.7	125.2	131.5	139.7	158.2	68.3	61.7	125.2	131.5	139.7	158.2	68.3	61.7	125.2	131.5	139.7	158.2
Ivano-Frankivsk	1.4%	138.4	125.1	253.8	266.5	283.2	320.6	138.4	125.1	253.8	266.5	283.2	320.6	138.4	125.1	253.8	266.5	283.2	320.6
Kyiv	7.7%	754.7	682.4	1,384.2	1,453.9	1,544.8	1,749.0	754.7	682.4	1,384.2	1,453.9	1,544.8	1,749.0	754.7	682.4	1,384.2	1,453.9	1,544.8	1,749.0
Kirovohrad	5.7%	560.3	506.6	1,027.7	1,079.4	1,146.9	1,298.5	560.3	506.6	1,027.7	1,079.4	1,146.9	1,298.5	560.3	506.6	1,027.7	1,079.4	1,146.9	1,298.5
Luhansk	0.4%	38.3	34.6	70.3	73.8	78.4	88.8	38.3	34.6	70.3	73.8	78.4	88.8	38.3	34.6	70.3	73.8	78.4	88.8
Lviv	1.6%	155.7	140.8	285.6	300.0	318.8	360.9	155.7	140.8	285.6	300.0	318.8	360.9	155.7	140.8	285.6	300.0	318.8	360.9
Mikolayiv	1.5%	147.4	133.3	270.3	283.9	301.7	341.5	147.4	133.3	270.3	283.9	301.7	341.5	147.4	133.3	270.3	283.9	301.7	341.5
Odesa	2.1%	203.9	184.4	374.0	392.8	417.4	472.6	203.9	184.4	374.0	392.8	417.4	472.6	203.9	184.4	374.0	392.8	417.4	472.6
Poltava	10.1%	999.0	903.3	1,832.2	1,924.5	2,044.9	2,315.2	999.0	903.3	1,832.2	1,924.5	2,044.9	2,315.2	999.0	903.3	1,832.2	1,924.5	2,044.9	2,315.2
Rivne	2.0%	193.7	175.1	355.2	373.1	396.4	448.8	193.7	175.1	355.2	373.1	396.4	448.8	193.7	175.1	355.2	373.1	396.4	448.8
Sumy	7.4%	724.5	655.1	1,328.8	1,395.7	1,483.0	1,679.0	724.5	655.1	1,328.8	1,395.7	1,483.0	1,679.0	724.5	655.1	1,328.8	1,395.7	1,483.0	1,679.0
Ternopil	3.8%	379.0	342.6	695.0	730.0	775.7	878.2	379.0	342.6	695.0	730.0	775.7	878.2	379.0	342.6	695.0	730.0	775.7	878.2
Kharkiv	3.7%	367.4	332.2	673.8	707.8	752.0	851.4	367.4	332.2	673.8	707.8	752.0	851.4	367.4	332.2	673.8	707.8	752.0	851.4
Kherson	1.3%	126.2	114.1	231.4	243.1	258.3	292.4	126.2	114.1	231.4	243.1	258.3	292.4	126.2	114.1	231.4	243.1	258.3	292.4
Khmelnytskyi	7.5%	741.3	670.3	1,359.6	1,428.1	1,517.4	1,717.9	741.3	670.3	1,359.6	1,428.1	1,517.4	1,717.9	741.3	670.3	1,359.6	1,428.1	1,517.4	1,717.9
Cherkasy	8.2%	807.9	730.5	1,481.7	1,556.3	1,653.7	1,872.2	807.9	730.5	1,481.7	1,556.3	1,653.7	1,872.2	807.9	730.5	1,481.7	1,556.3	1,653.7	1,872.2
Chernivtsi	1.1%	111.2	100.5	203.9	214.2	227.6	257.6	111.2	100.5	203.9	214.2	227.6	257.6	111.2	100.5	203.9	214.2	227.6	257.6
Chernihiv	11.2%	1,102.4	996.7	2,021.9	2,123.7	2,256.5	2,554.7	1,102.4	996.7	2,021.9	2,123.7	2,256.5	2,554.7	1,102.4	996.7	2,021.9	2,123.7	2,256.5	2,554.7

Table 26 Rye: regional outlook, 000 t

	Projected shares according to year and scenario																		
	Observed share	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx
Ukraine	2021	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030
Vinnysya	2.5%	5.4	5.9	7.0	7.4	7.9	9.5	5.7	6.1	6.6	7.1	7.6	9.5	5.7	3.3	4.1	4.9	5.9	9.5
Volyn	12.0%	26.6	28.8	34.2	36.4	38.7	46.3	27.9	30.0	32.1	34.6	37.4	46.4	27.9	16.3	19.9	24.2	29.0	46.3
Dnipropetrovsk	1.1%	2.5	2.7	3.2	3.4	3.6	4.3	2.6	2.8	3.0	3.2	3.5	4.3	2.6	1.5	1.9	2.3	2.7	4.3
Donetsk	1.4%	3.1	3.4	4.0	4.2	4.5	5.4	3.2	3.5	3.7	4.0	4.4	5.4	3.2	1.9	2.3	2.8	3.4	5.4
Zhytomyr	14.5%	32.0	34.7	41.3	43.8	46.7	55.9	33.6	36.2	38.7	41.7	45.0	55.9	33.6	19.6	24.0	29.1	34.9	55.8
Zakarpattia																			
Zaporizhzhya	0.9%	1.9	2.1	2.5	2.6	2.8	3.4	2.0	2.2	2.3	2.5	2.7	3.4	2.0	1.2	1.4	1.7	2.1	3.3
Ivano-Frankivsk	0.8%	1.7	1.9	2.2	2.3	2.5	3.0	1.8	1.9	2.1	2.2	2.4	3.0	1.8	1.0	1.3	1.6	1.9	3.0
Kyiv	10.4%	23.0	24.9	29.6	31.4	33.5	40.1	24.1	26.0	27.7	29.9	32.3	40.1	24.1	14.1	17.2	20.9	25.1	40.0
Kirovohrad	1.9%	4.2	4.5	5.4	5.7	6.1	7.3	4.4	4.7	5.1	5.4	5.9	7.3	4.4	2.6	3.1	3.8	4.6	7.3
Luhansk	1.3%	2.8	3.0	3.6	3.8	4.1	4.9	2.9	3.2	3.4	3.6	3.9	4.9	2.9	1.7	2.1	2.5	3.0	4.9
Lviv	3.3%	7.3	7.9	9.4	9.9	10.6	12.7	7.6	8.2	8.8	9.5	10.2	12.7	7.6	4.4	5.4	6.6	7.9	12.7
Mikolayiv	0.4%	0.8	0.9	1.0	1.1	1.2	1.4	0.8	0.9	1.0	1.0	1.1	1.4	0.8	0.5	0.6	0.7	0.9	1.4
Odesa	0.8%	1.8	2.0	2.4	2.5	2.7	3.2	1.9	2.1	2.2	2.4	2.6	3.2	1.9	1.1	1.4	1.7	2.0	3.2
Poltava	4.2%	9.3	10.1	12.0	12.8	13.6	16.2	9.8	10.5	11.2	12.1	13.1	16.3	9.8	5.7	7.0	8.5	10.2	16.2
Rivne	10.3%	22.8	24.6	29.3	31.1	33.2	39.7	23.9	25.7	27.5	29.6	32.0	39.7	23.9	13.9	17.0	20.7	24.8	39.7
Sumy	5.4%	12.0	13.0	15.5	16.4	17.5	20.9	12.6	13.6	14.5	15.6	16.9	20.9	12.6	7.3	9.0	10.9	13.1	20.9
Ternopil	1.1%	2.4	2.6	3.1	3.3	3.5	4.2	2.5	2.7	2.9	3.1	3.3	4.2	2.5	1.5	1.8	2.2	2.6	4.2
Kharkiv	1.2%	2.7	2.9	3.5	3.7	4.0	4.7	2.9	3.1	3.3	3.5	3.8	4.7	2.9	1.7	2.0	2.5	3.0	4.7
Kherson	0.8%	1.9	2.0	2.4	2.5	2.7	3.2	1.9	2.1	2.2	2.4	2.6	3.2	1.9	1.1	1.4	1.7	2.0	3.2
Khmelnytsky	2.7%	6.1	6.6	7.8	8.3	8.8	10.6	6.4	6.9	7.3	7.9	8.5	10.6	6.4	3.7	4.5	5.5	6.6	10.6
Cherkasy	1.0%	2.3	2.5	2.9	3.1	3.3	3.9	2.4	2.6	2.7	2.9	3.2	3.9	2.4	1.4	1.7	2.1	2.5	3.9
Chernivtsi	0.4%	0.9	1.0	1.2	1.3	1.3	1.6	1.0	1.0	1.1	1.2	1.3	1.6	1.0	0.6	0.7	0.8	1.0	1.6
Chernihiv	21.8%	48.3	52.3	62.2	66.1	70.4	84.2	50.7	54.6	58.3	62.9	67.9	84.3	50.7	29.5	36.1	43.9	52.7	84.2

Table 27 Sunflower seeds, 000 t

	Projected shares according to year and scenario																		
	Observed share	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx
Ukraine	2021	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030
Vinnitsya	6.3%	520.2	525.4	533.3	541.3	549.4	731.3	520.2	481.0	488.2	495.6	503.0	699.9	520.2	436.6	441.0	445.4	449.9	464.9
Volyn	0.6%	50.6	51.1	51.9	52.6	53.4	71.1	50.6	46.8	47.5	48.2	48.9	68.1	50.6	42.5	42.9	43.3	43.8	45.2
Dnipropetrovsk	8.5%	703.6	710.6	721.2	732.1	743.0	989.0	703.6	650.5	660.3	670.2	680.2	946.6	703.6	590.5	596.4	602.3	608.4	628.7
Donetsk	4.9%	400.4	404.4	410.4	416.6	422.8	562.8	400.4	370.2	375.8	381.4	387.1	538.7	400.4	336.0	339.4	342.8	346.2	357.8
Zhytomyr	2.2%	182.0	183.8	186.5	189.3	192.2	255.8	182.0	168.2	170.8	173.3	175.9	244.8	182.0	152.7	154.2	155.8	157.3	162.6
Zakarpattia	0.0%	2.8	2.8	2.8	2.9	2.9	3.9	2.8	2.6	2.6	2.6	2.7	3.7	2.8	2.3	2.3	2.4	2.4	2.5
Zaporizhzhya	6.4%	530.6	535.9	544.0	552.1	560.4	745.9	530.6	490.7	498.0	505.5	513.1	713.9	530.6	445.4	449.8	454.3	458.9	474.2
Ivano-Frankivsk	0.6%	46.2	46.7	47.4	48.1	48.8	64.9	46.2	42.7	43.4	44.0	44.7	62.2	46.2	38.8	39.2	39.6	40.0	41.3
Kyiv	3.8%	314.8	318.0	322.7	327.6	332.5	442.6	314.8	291.1	295.5	299.9	304.4	423.6	314.8	264.2	266.9	269.5	272.2	281.3
Kirovohrad	9.7%	797.4	805.3	817.4	829.7	842.1	1120.9	797.4	737.3	748.3	759.6	771.0	1072.8	797.4	669.2	675.9	682.7	689.5	712.5
Luhansk	4.6%	380.1	383.9	389.7	395.5	401.4	534.3	380.1	351.5	356.7	362.1	367.5	511.4	380.1	319.0	322.2	325.4	328.7	339.7
Lviv	0.6%	50.3	50.8	51.6	52.4	53.1	70.7	50.3	46.5	47.2	47.9	48.7	67.7	50.3	42.2	42.7	43.1	43.5	45.0
Mikolajiv	6.8%	563.4	569.0	577.6	586.2	595.0	792.0	563.4	521.0	528.8	536.7	544.8	758.0	563.4	472.9	477.6	482.4	487.2	503.4
Odesa	5.8%	477.4	482.2	489.4	496.8	504.2	671.1	477.4	441.4	448.0	454.8	461.6	642.3	477.4	400.7	404.7	408.7	412.8	426.6
Poltava	5.9%	489.7	494.6	502.0	509.5	517.2	688.4	489.7	452.8	459.6	466.5	473.5	658.8	489.7	411.0	415.1	419.2	423.4	437.6
Rivne	0.6%	50.3	50.8	51.5	52.3	53.1	70.7	50.3	46.5	47.2	47.9	48.6	67.6	50.3	42.2	42.6	43.0	43.5	44.9
Sumy	5.0%	411.7	415.8	422.0	428.4	434.8	578.7	411.7	380.7	386.4	392.2	398.1	553.9	411.7	345.5	349.0	352.5	356.0	367.9
Ternopil	1.7%	138.0	139.3	141.4	143.6	145.7	193.9	138.0	127.6	129.5	131.4	133.4	185.6	138.0	115.8	117.0	118.1	119.3	123.3
Kharkiv	8.7%	717.0	724.2	735.0	746.1	757.3	1007.9	717.0	663.0	672.9	683.0	693.3	964.7	717.0	601.8	607.8	613.9	620.0	640.7
Kherson	4.1%	337.4	340.8	345.9	351.1	356.4	474.3	337.4	312.0	316.7	321.4	326.2	454.0	337.4	283.2	286.0	288.9	291.8	301.5
Khmelnytskyi	3.2%	259.7	262.3	266.3	270.3	274.3	365.1	259.7	240.2	243.8	247.4	251.1	349.4	259.7	218.0	220.2	222.4	224.6	232.1
Cherkasy	5.0%	414.7	418.9	425.2	431.6	438.0	583.0	414.7	383.5	389.2	395.1	401.0	558.0	414.7	348.1	351.6	355.1	358.6	370.6
Chernivtsi	0.4%	32.2	32.5	33.0	33.5	34.0	45.2	32.2	29.7	30.2	30.6	31.1	43.3	32.2	27.0	27.3	27.5	27.8	28.7
Chernihiv	4.5%	372.0	375.7	381.3	387.1	392.9	522.9	372.0	343.9	349.1	354.3	359.7	500.5	372.0	312.2	315.3	318.5	321.7	332.4

Table 28 Rapeseeds, 000 t

	Observed share	Projected shares according to year and scenario																	
		Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx
Ukraine	2021	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030
Vinnitsya	7.4%	39.8	40.2	40.8	41.4	42.0	55.9	51.9	52.4	52.9	53.5	54.0	55.6	51.9	52.4	52.9	53.5	54.0	55.6
Volyn	5.3%	28.7	29.0	29.4	29.9	30.3	40.3	37.4	37.8	38.2	38.6	39.0	40.1	37.4	37.8	38.2	38.6	39.0	40.1
Dnipropetrovsk	6.7%	36.0	36.3	36.9	37.4	38.0	50.6	46.9	47.4	47.9	48.4	48.8	50.3	46.9	47.4	47.9	48.4	48.8	50.3
Donetsk	0.3%	1.7	1.7	1.7	1.7	1.8	2.4	2.2	2.2	2.2	2.3	2.3	2.4	2.2	2.2	2.2	2.3	2.3	2.4
Zhytomyr	3.8%	20.4	20.6	21.0	21.3	21.6	28.7	26.7	26.9	27.2	27.5	27.8	28.6	26.7	26.9	27.2	27.5	27.8	28.6
Zakarpattia																			
Zaporyzhzha	6.1%	32.8	33.1	33.6	34.1	34.6	46.1	42.8	43.2	43.6	44.1	44.5	45.8	42.8	43.2	43.6	44.1	44.5	45.8
Ivano-Frankivsk	2.3%	12.4	12.6	12.7	12.9	13.1	17.5	16.2	16.4	16.5	16.7	16.9	17.4	16.2	16.4	16.5	16.7	16.9	17.4
Kyiv	3.4%	18.6	18.8	19.1	19.3	19.6	26.1	24.3	24.5	24.7	25.0	25.2	26.0	24.3	24.5	24.7	25.0	25.2	26.0
Kirovohrad	2.4%	13.2	13.3	13.5	13.7	13.9	18.5	17.2	17.3	17.5	17.7	17.9	18.4	17.2	17.3	17.5	17.7	17.9	18.4
Luhansk																			
Lviv	6.0%	32.3	32.6	33.1	33.6	34.1	45.4	42.1	42.5	43.0	43.4	43.8	45.1	42.1	42.5	43.0	43.4	43.8	45.1
Mikolayiv	5.3%	28.8	29.1	29.6	30.0	30.5	40.5	37.6	38.0	38.4	38.8	39.2	40.3	37.6	38.0	38.4	38.8	39.2	40.3
Odesa	10.2%	54.9	55.4	56.3	57.1	58.0	77.1	71.6	72.3	73.1	73.8	74.5	76.8	71.6	72.3	73.1	73.8	74.5	76.8
Poltava	1.2%	6.6	6.7	6.8	6.9	7.0	9.3	8.6	8.7	8.8	8.9	8.9	9.2	8.6	8.7	8.8	8.9	8.9	9.2
Rivne	2.9%	15.8	15.9	16.2	16.4	16.6	22.2	20.6	20.8	21.0	21.2	21.4	22.1	20.6	20.8	21.0	21.2	21.4	22.1
Sumy	2.4%	13.0	13.1	13.3	13.5	13.7	18.2	16.9	17.1	17.3	17.4	17.6	18.2	16.9	17.1	17.3	17.4	17.6	18.2
Ternopil	8.6%	46.7	47.1	47.8	48.6	49.3	65.6	60.9	61.5	62.1	62.8	63.4	65.3	60.9	61.5	62.1	62.8	63.4	65.3
Kharkiv	0.3%	1.6	1.6	1.6	1.6	1.7	2.2	2.0	2.1	2.1	2.1	2.1	2.2	2.0	2.1	2.1	2.1	2.1	2.2
Kherson	8.4%	45.1	45.5	46.2	46.9	47.6	63.4	58.8	59.4	60.0	60.6	61.2	63.1	58.8	59.4	60.0	60.6	61.2	63.1
Khmelnytsky	10.2%	54.9	55.5	56.3	57.2	58.0	77.2	71.7	72.4	73.1	73.9	74.6	76.9	71.7	72.4	73.1	73.9	74.6	76.9
Cherkasy	1.8%	9.7	9.8	10.0	10.1	10.3	13.7	12.7	12.8	13.0	13.1	13.2	13.6	12.7	12.8	13.0	13.1	13.2	13.6
Chernivtsi	1.1%	5.9	5.9	6.0	6.1	6.2	8.2	7.6	7.7	7.8	7.9	7.9	8.2	7.6	7.7	7.8	7.9	7.9	8.2
Chernihiv	3.9%	21.1	21.3	21.6	22.0	22.3	29.7	27.6	27.8	28.1	28.4	28.7	29.5	27.6	27.8	28.1	28.4	28.7	29.5

Table 29 Soybeans, 000 t

	Projected shares according to year and scenario																		
	Observed share	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Opt	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Optx	Scenario_Pess	Scenario_Pess	Scenario_Pess	Scenario_Pess	Scenario_Pess	Scenario_Pess
Ukraine	2021	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030	2023	2024	2025	2026	2027	2030
Vinnitsya	7.3%	87.8	151.8	156.0	152.0	147.3	126.9	96.1	147.8	146.0	144.4	141.9	126.9	96.1	79.9	90.5	100.9	110.2	126.9
Volyn	2.9%	35.0	60.5	62.1	60.5	58.6	50.5	38.3	58.8	58.1	57.5	56.5	50.5	38.3	31.8	36.1	40.2	43.9	50.5
Dnipropetrovsk	0.3%	3.4	5.9	6.1	5.9	5.7	4.9	3.7	5.7	5.7	5.6	5.5	4.9	3.7	3.1	3.5	3.9	4.3	4.9
Donetsk	0.0%	0.5	0.9	1.0	0.9	0.9	0.8	0.6	0.9	0.9	0.9	0.9	0.8	0.6	0.5	0.6	0.6	0.7	0.8
Zhytomyr	8.7%	105.0	181.5	186.5	181.7	176.1	151.7	114.8	176.7	174.6	172.7	169.7	151.7	114.8	95.5	108.2	120.7	131.7	151.7
Zakarpattia	0.7%	8.9	15.5	15.9	15.5	15.0	12.9	9.8	15.1	14.9	14.7	14.5	12.9	9.8	8.1	9.2	10.3	11.2	12.9
Zapizhzhya	1.2%	14.2	24.5	25.2	24.6	23.8	20.5	15.5	23.9	23.6	23.3	22.9	20.5	15.5	12.9	14.6	16.3	17.8	20.5
Ivano-Frankivsk	3.5%	41.8	72.3	74.3	72.4	70.1	60.4	45.7	70.4	69.5	68.8	67.6	60.4	45.7	38.0	43.1	48.1	52.5	60.4
Kyiv	6.6%	79.8	138.0	141.8	138.2	133.9	115.4	87.3	134.3	132.7	131.3	129.0	115.4	87.3	72.6	82.3	91.7	100.1	115.4
Kirovohrad	4.2%	51.1	88.5	90.9	88.6	85.8	73.9	56.0	86.1	85.1	84.2	82.7	73.9	56.0	46.5	52.7	58.8	64.2	73.9
Luhansk	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lviv	7.5%	90.0	155.7	159.9	155.9	151.0	130.1	98.5	151.5	149.7	148.1	145.5	130.1	98.5	81.9	92.8	103.5	113.0	130.1
Mikolayiv	0.3%	3.8	6.5	6.7	6.5	6.3	5.5	4.1	6.4	6.3	6.2	6.1	5.5	4.1	3.4	3.9	4.3	4.7	5.5
Odesa	0.4%	4.8	8.2	8.5	8.2	8.0	6.9	5.2	8.0	7.9	7.8	7.7	6.9	5.2	4.3	4.9	5.5	6.0	6.9
Poltava	7.2%	86.5	149.5	153.6	149.7	145.0	125.0	94.6	145.5	143.8	142.2	139.7	125.0	94.6	78.7	89.2	99.4	108.5	125.0
Rivne	4.0%	47.8	82.6	84.9	82.7	80.1	69.1	52.3	80.4	79.5	78.6	77.2	69.1	52.3	43.5	49.3	54.9	59.9	69.1
Sumy	4.3%	52.2	90.3	92.7	90.4	87.6	75.5	57.1	87.9	86.8	85.9	84.4	75.5	57.1	47.5	53.8	60.0	65.5	75.5
Ternopil	7.0%	84.3	145.7	149.7	145.9	141.3	121.8	92.2	141.8	140.2	138.6	136.2	121.8	92.2	76.7	86.9	96.9	105.7	121.8
Kharkiv	1.2%	14.2	24.6	25.3	24.6	23.9	20.6	15.6	23.9	23.7	23.4	23.0	20.6	15.6	12.9	14.7	16.3	17.8	20.6
Kherson	7.8%	94.7	163.8	168.2	163.9	158.8	136.9	103.6	159.4	157.5	155.8	153.0	136.9	103.6	86.2	97.6	108.8	118.8	136.9
Khmelnytsky	12.0%	145.1	250.9	257.7	251.2	243.4	209.7	158.8	244.2	241.3	238.7	234.5	209.7	158.8	132.0	149.6	166.8	182.0	209.7
Cherkasy	5.8%	70.6	122.1	125.4	122.2	118.4	102.0	77.2	118.8	117.4	116.1	114.1	102.0	77.2	64.2	72.8	81.1	88.6	102.0
Chernivtsi	4.6%	55.2	95.4	98.0	95.5	92.6	79.8	60.4	92.9	91.8	90.8	89.2	79.8	60.4	50.2	56.9	63.4	69.2	79.8
Chernihiv	2.6%	31.3	54.1	55.6	54.2	52.5	45.2	34.2	52.7	52.1	51.5	50.6	45.2	34.2	28.5	32.3	36.0	39.3	45.2

Annex B: Technical Analysis

Figure 14 Starzhava

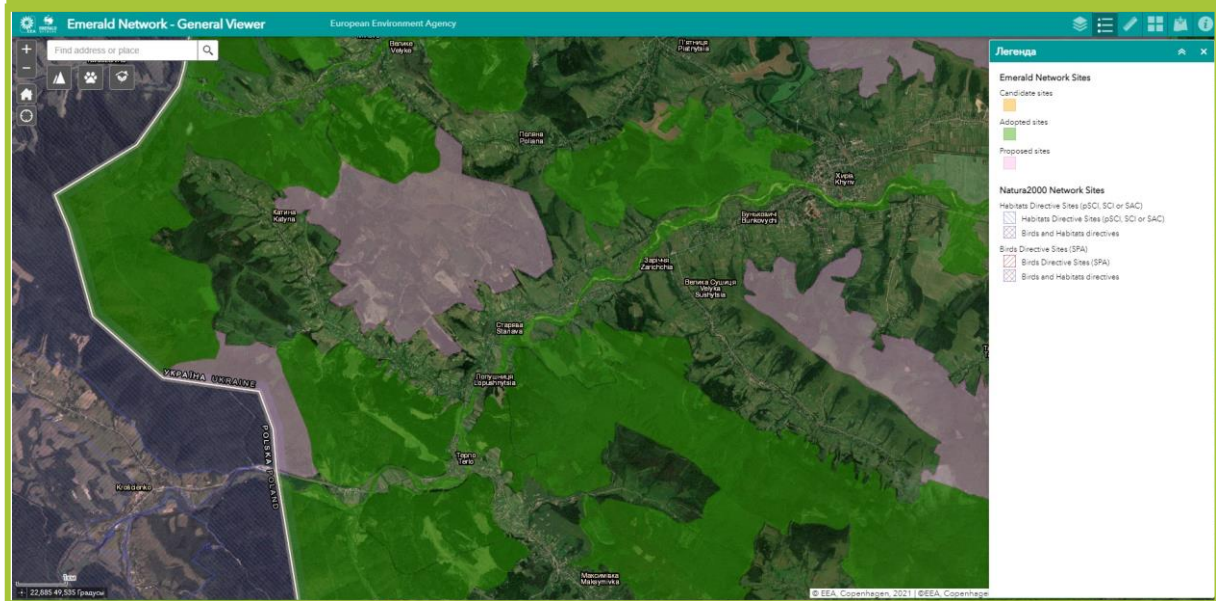


Figure 15 Rava-Ruska

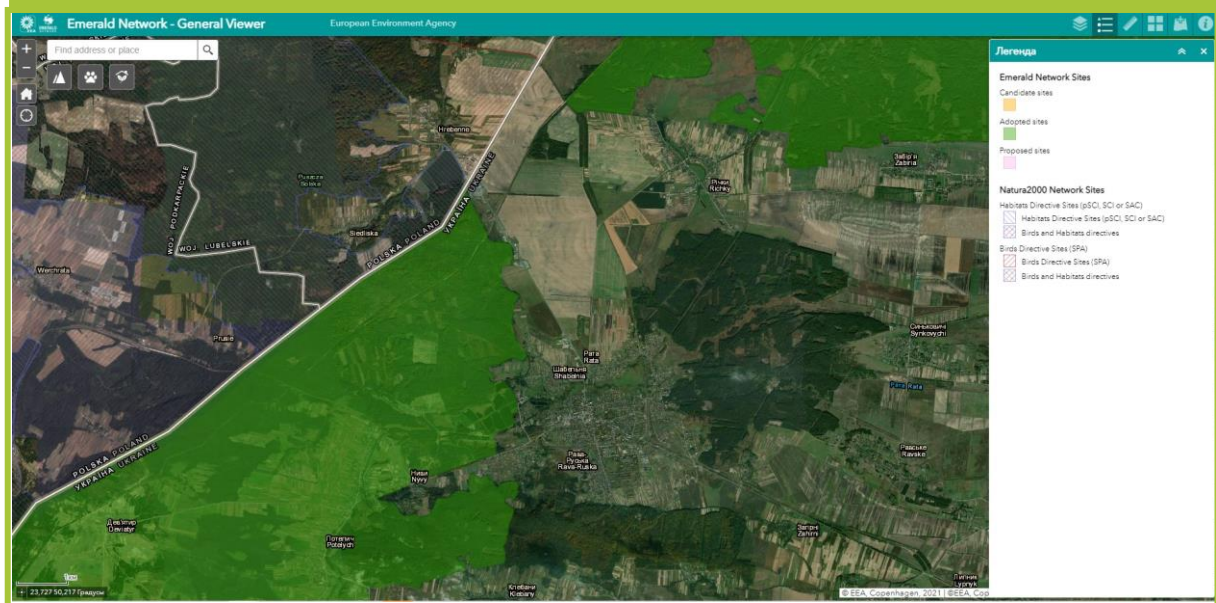


Table 30 List of rooms in administrative building

Тамбур	4м2, для прохідної та по нормам ДБН
Коридор	15м2 , загальне планування споруд ДБН
КПП	12м2 Біля кімнати охорони, при вході у будівлю.
Медпункт	11м2 обов'язковий по нормам ДБН
Кімната вагарів	10м2 обов'язково з віддістю ваг та електронним таблом.
Кабінет Інженера з охорони праці та сис. Адмін.	11м2 , комп'ютерна та побутова техніка
Кабінет майстрів, головного енергетика, нач. Охор	11м2 комп'ютерна та побутова техніка
Майстерня	30м2 , стелажі , доступ до 380В, обладнання для ремонту, повинно бути не у межах основної будівлі, відокремлено
Кімната прийому їжі	15м2 Загальна кімната прийому їжі, холодильник, свч, побутова вода
Чоловіча роздягальня	30м2 Обладнана шафами для робочого одягу, та лавами .
Душова	5м2 Стандартні душові кабінки для робочого персоналу .
Сан вузол	4м2
Підсобне приміщення	3м2
Теплогенераторна	15м2 Відокремлене звукоізольоване приміщення , для розміщення котельної, вводів води на електрики на Адмін
Лабораторія Контролю сировини	45м2
Приміщення приймання проб	7м2
Кабінет директора	12м2
Кабінет бухгалтерії	20м2
Кабінет головного інженера	13м2
Сан вузол	4м2
Комора зразків	25м2
Гардеробна Лабораторії	15м2

Annex C: Financial analysis

Financial model calculations are available and provided in a separate Excel file (*Annex 2 Grain Terminal_Fin Model_v4*).



Table 31 Documentations, design, permissions

№	Категорія	Сторінк, міл.	Витрати, тис.дollar
3.0	Земельна ділянка, в т.ч.:		
3.1	придбання та оформлення прав	0,25	3
3.2	земельна документація і внесення даних в ДЗК	0,25	3
3.0	Містобудівна документація, в т.ч.:		
3.1	Отримання рішень ОМС на розробку документів	0,25	37
3.2	Розробка Плану просторового розвитку, зонитгу, ДПН, ОМД	2	16
3.3	Запобіжні документи	0,5	5
3.4	Отримання рішень ОМС на зміну функціонального призначення	0,25	5
3.5	Земельна документація і внесення даних в ДЗК	0,25	2
3.6	Отримання МКУО, витягу з містобудівної документації М1/000, плану червоної лінії	0,25	1
3.0	Витрати дані, в т.ч.:		
3.1	ПУ, в т.ч.:		
3.1.1	Об'єкту	1	3
3.1.2	Узд	1	3
3.2	Дослідження та вишукування, в т.ч.:		
3.2.1	накази/замовлення М1/500	0,5	4
3.2.2	протокол/акт вишукування та акт	0,5	4
4.0	Проект (ІІ, розробки та креслення), в т.ч.:	4	120
4.1	Генплан, в т.ч.:		
4.1.1	генплан (будівлі, споруди, технологічні та інженерні спорудження, автодороги, ЗД колій, майданчики, баланси територій, ТЕП)		
4.1.2	зонавання		
4.1.3	зведений план мереж		
4.1.4	вирішальні рішення та інженерний захист		
4.1.5	бізнес-план та оцінювання		
4.2	ТХ, в т.ч.:		
4.2.1	інвентаризація, перекази, збірники, завантажувальні червонок/с/к культур		
4.2.2	Перегони та інші побутові заборони. Технічні документи.		
4.3	АБР (по кількісму з будівель та споруд Комітету: міліція, нафти, вантажно-вантажової пристрої, Бюро Бюро, АПК, КПП, КПД, гараж, склад), в т.ч.:		
4.3.1	Правила поведінки, година (якщо є), даху		
4.3.2	завантажувальні		
4.3.3	Порядок перевірки		
4.3.4	Вузли		
4.3.5	Паспорта стін, підлог, стелі		
4.3.6	Паспорта складових фондів		
4.3.7	Відомості дощорічного водовідведення		
4.3.8	Фундаменти		
4.3.9	Конструктивні заборони		
4.3.10	Конструктивні заборони		
4.3.11	Інженерно-технічна та сертифікація інженерно-технічної		
4.5	ОВК, в т.ч.:		
4.5.1	нагрів		
4.5.2	охолодження		
4.5.3	вентиляція		
4.6	ВК, в т.ч.:		
4.6.1	водопостачання		
4.6.2	водовідведення		
4.6.3	заповнювальні резервуари		
4.7	Противопожарні системи, в т.ч.:		
4.7.1	пожежна сигналізація		
4.7.2	заборони пожежогасіння		
4.8	Газові та технічні рішення та інженерні заборони, в т.ч.:		
4.8.1	мережі, щитові		
4.8.2	охолодження		
4.8.3	Висновок захисту		
4.8.4	регістри пожежогасіння, докмет до регулювання		
4.9	Слабострумні мережі системи, в т.ч.:		
4.9.1	охороно та доступ		
4.9.2	ІІ мережі		
4.9.3	ІІ мережі		
4.10	Зоніровані територіальні адміністративні споруди та мережі, в т.ч.:		
4.10.1	Водопостачання, в т.ч.:		
4.10.1.1	побутові мережі		
4.10.1.2	технічні мережі		
4.10.1.3	протипожежні водопроводи, гідранти, насосна		
4.10.1.4	смазковина, насосна		
4.10.1.5	протипожежний резервуар		
4.10.2	Водовідведення, в т.ч.:		
4.10.2.1	мережі, насосна		
4.10.2.2	ЛДС		
4.10.3	Зливово-каналізація, в т.ч.:		
4.10.3.1	мережі, насосна		
4.10.3.2	ЛДС		
4.10.3.3	компенсаційна мережа зливових стоків, підвісний фільтр		
4.10.4	Електропостачання, в т.ч.:		
4.10.4.1	мережі		
4.10.4.2	освітлення		
4.10.4.3	щитові		
4.10.4.4	трансформаторна		
4.10.4.5	ДРГ		
4.10.5	Енергетичні ГСМ		
4.10.6	Автодороги та майданчики, в т.ч.:		
4.10.6.1	дороги		
4.10.6.2	парковки		
4.10.6.3	ворота, шлагбауми, огорожені вулиці та проїзди		
4.10.6.4	навігатори/карти		
4.10.7	Залізничні колії та споруди, в т.ч.:		
4.10.7.1	1524 колія, в т.ч.:		
4.10.7.1.1	колій, стрілки, горня		
4.10.7.1.2	ворота, шлагбауми, огорожені вулиці та проїзди		
4.10.7.1.3	ваги		
4.10.7.1.4	ваги		
4.10.7.2	1435 колія, в т.ч.:		
4.10.7.2.1	колій, стрілки, горня		
4.10.7.2.2	ворота, шлагбауми, огорожені вулиці та проїзди		
4.10.7.2.3	ваги		
4.10.8	Міждержавні, в т.ч.:		
4.10.8.1	технологічні відходи		
4.10.8.2	побутові відходи		
4.10.8.3	побутові відходи		
4.10.8.4	Слабострумні мережі системи, в т.ч.:		
4.10.8.1	охороно та доступ		
4.10.8.2	ІІ мережі		
4.10.8.3	ІІ мережі		
4.10.8.4	ІІ мережі		
4.10.9	Сторож		
4.10.10	Підвісні стіни		
4.11	Зоніровані територіальні адміністративні споруди та мережі (на ТУ), в т.ч.:		
4.11.1	Автодороги та майданчики, в т.ч.:		
4.11.1.1	дороги		
4.11.1.2	парковки		
4.11.1.3	ваги/важкодільники на дорогах місцевого чи/та державного значення		
4.11.1.4	ваги/важкодільники на дорогах місцевого чи/та державного значення		
4.11.2	Залізничні колії та споруди, в т.ч.:		
4.11.2.1	1524 колія, в т.ч.:		
4.11.2.1.1	колій, стрілки, горня		
4.11.2.1.2	ваги/важкодільники на дорогах місцевого чи/та державного значення		
4.11.2.1.3	ваги/важкодільники на дорогах місцевого чи/та державного значення		
4.11.2.2	1435 колія, в т.ч.:		
4.11.2.2.1	колій, стрілки, горня		
4.11.2.2.2	ваги/важкодільники на дорогах місцевого чи/та державного значення		
4.11.2.2.3	ваги/важкодільники на дорогах місцевого чи/та державного значення		
4.11.3	ЕП, в т.ч.:		
4.11.3.1	мережі		
4.11.3.2	трансформаторна		
4.12	ОВК		
4.13	ЛДС		
5.0	Експертизи	1	10
6.0	Декларація на початок підготовчих робіт, в т.ч.:	0,25	8
6.1	проект зняття родовища нафти та реконструкції	1	8
6.2	підготовка проекту	1	2
6.3	декларація на початок підготовчих робіт	0,5	1
7.0	Декларація на початок будівельних робіт	0,25	1
8.0	Будівельні роботи: проектування організації та виконання документації, в т.ч.:	17	60
8.1	авторський нагляд		25
8.2	технічний нагляд		35
8.3	будівельні роботи		
8.4	монтажні роботи		
8.5	пуско-наладочні роботи		
9.0	Підготовка до складу експлуатації, в т.ч.:	1	12
9.1	Отримання дозволу на сертифікований склад зберігання ПММ.		1
9.2	Отримання дозволу для Експлуатації		1
9.3	Отримання Дозволу з Експлуатації проєкту		3
9.4	Отримання Дозволу на виконання з використанням експлуатації від високого напруження.		1
9.5	Атестація робочих місць (згідно умов праці)		4
9.6	Отримання дозволу на виконання стаціонарних дозвільних		25
10.0	Декларація про ввід в експлуатацію	0,25	
		22	297

Table 32 Equipment

Обладнання та машини	Технологічне призначення	Кількість/Коментарі	Вартість, USD	Встановлена електрична потужність, кВт
Металічні силоси та бункери : конусні Силоси 1400м3 -	Приймання та зберігання зерна після та пере вивантаженням.	Кількість одиниць буде залежати від майданчику	980 000	280
Металічні силоси оперативні : (150м3)	Приймання та зберігання зерна після та пере вивантаженням.	4 од.	60 000	30
Транспортери скребкові (10-15 одиниць)	GSI или украинский аналог типа Вариант/KMZ	20 од	600 000	550
Норії стрічкові (4-6 одиниць) (350м3/год)	GSI или украинский аналог типа Вариант/KMZ	06.Лип	250 000	245
Машина для попереднього очищення RUBERG RUV 400 Або аналог + аспіраційні колонки	Buhler SMA206 или аналог .	2	415 722	320
Металопрокат та профіль (металоконструкції)		120-150т	450 000	0
Рейки, шпали та стрілочні переводи	2 гілки + 2 гілки перспектива (вузькокол) + 1 ширококол.	Кількість одиниць буде залежати від майданчику (1 км - 300-	1 684 505	0
Кабель, з'єднувальні коробки, лотки, труби, світильники, вимикачі тощо	уточнення по аналогам	комплект	200 000	0
Самопливне обладнання та футерування до нього	уточнення по аналогам	80-100 м.п	60 000	0
Клапани та засувки	уточнення по аналогам	20-40 одиниць	100 000	120
Вагове обладнання (автомобільне)	Техноваги 14м- 80т	2	50 000	15
Вагове обладнання (залізничне)	Техноваги 18м-150т	2	70 000	15
Пробовідборники зерна	Gamet USA или аналог	2	65 000	5
Лабораторне обладнання	расписать отдельно по юнитам .	Базове обладнання для аналізів вологості, натурі, клейковини. Foss, GAC, сушільні шафи , тощо .	200 000	45
Машини для первинної обробки зерна (скрінінг)	моделі	2	90 000	60
Тепловозна тяга (тепловоз ТГМ 4Б)		2	300 000	0
Противожежне обладнання	написать подробнее и прикинуть по аналогам	системи раннього оповіщення, пожежна насосна	80 000	70
Електрокомутаційне обладнання (+трансформаторна)	трансформатори 2 шт по 600 кВ+обладнання	серверні в операторській , комутаційне обладнання	270 000	0
Обладнання АСУ ТП	Пульты управління, блок резервного живлення, тощо	PLC , SCADA	250 000	80
Обладнання з очистки стічних побутових вод	для офісного приміщення	Септик	25 000	5
Внутрішньогосподарський автотракторний парк (автомобіль-самоскид, трактор) мікроавтобус для персоналу	спринтер на 12 осіб	JCB ковш 2м3 + для підлогового складу	150 000	0
Огорожі, ворота, вуличне освітлення		Периметр+в'зна група	150 000	0
Відспостереження та інші охоронні засоби (СКД)		камери+ комутаційне обладнання, сервер, тощо.	150 000	40
Бункера відходів		4 од.	80 000	10
Господарсько-побутове та санітарно-гігієнічне обладнання.		офісне обладнання (комп'ютери, тощо)	100 000	30
Дизель-Генератор	300-400кВ для резервного живлення	дизель генераторна установка типу Perkins 550 потужністю 550кВт, 380В, 50Гц. Паливо - дизельне за ДСТУ 3869-99. витрата палива - 97	35 000	0
Склад Паливно-мастильних матеріалів	закритий , 10м2, металопрофіль.		15 000	0
Емність для ГСМ	підземна для ДТ	60м3	25 000	15
Бомбосховище - обладнання	закритий підземне з вентиляцією та іншими нормами	40м2	50 000	15
			6 955 227	1950

Table 32 Buildings and constructions

Будівлі і споруди	Додаткова інформація	Орієнтовна вартість, USD	вимоги нормативно-правових актів
Адміністративно-побутовий комплекс	Фундамент- стрічковий, підлога - бетонна, стіни газоблок, кровля- плоска з мембраною. Загальна площа приміщень: 300м2.	350 000	ДБН В.2.2-28:2010 Будинки і споруди. Будинки адміністративного та побутового призначення
Норійна вежа	площині 6м на 6м. З освітленням та майданчиками для ремонту обладнання фундамент - конструктивний , можливо потрібне пальове поле	215 000	https://td-uelevator.com/uk/equipment/noria/ м верха фундаменту приблизно 30-50м. До складу зазначеної
Операторська норійної вежі	Одноповерхова, загальна площа -30м2. Стіни-Газоблок, стрічковий фундамент, для інвентарю та змінного одягу	25 000	розмірами по осі в плані 4,0 м x 5,0м. Висота будівлі (від верху покриття площадки до верху покриття) складає 2,7 м. Споруда монтується на
Електрощитова	Одноповерхова, загальна площа 15-20м2 , стіни - газоблок, стрічковий фундамент	15 000	стрічковий фундамент
Трансформаторна підстанція	розділена на дві секції - понижуюча 10кВ- на 0,4кВ та комірці під ввідні секції загальна квадратура двох приміщень -20-25 метрів. пандусом для обслуговування трансформаторів	70 000	розмірами по осі в плані 4,5 м x 11,0 м. Технологічні та будівельні
Силова зберігання зерна	Фундаменти + пальове поле .	250 000	https://td-uelevator.com/uk/equipment/silos/konusnye/
Автоприймом Станція розвантаження автомобілів.	Поділений на два проїзди для автомобілей, оснащений вертикальними розвантажувачами Має бетонні пандуси на в'їзді та виїзді з будівлі.	220 000	uragan/ До складу вказаної споруди входить навіс з металоконструкції з майданчиками обслуговування і операторськими, приймальні бункера завальної ями, та балочна клітка над бункерами завальної ями,
Автозагова	Одноповерхова будівля, стрічковий фундамент по контуру, конструктивний під бункер	176 000	
Оперативні Бункера	8 шт по 150м3 по 2 бункера на кожну культуру (кукурудза, соняшник, пшениця, соя)	125 000	завантаження зерна у залізничні вагони (являє собою рамно-в'їздовий
Станція З.Д Відвантаження та приймання	Має дві електронні ваги , оперативні бункери для завантаження вагонів, Металоємність - 40т. Фундаменти - точкові.	125 000	завантаження зерна у залізничні вагони (являє собою рамно-в'їздовий
Насосна станція пожежогасіння	Підземне виконання, живлення повинно бути з двох вводів, основного та дизель-генератора Обладнання типу Grundfos або Vilo, кулькові крани та інша запірна арматура. Каркас споруди -бетонний, із накриттям з оцинкованого профлю. Площа 2х3м.	25 000	9,27 м. Висота будівлі (від верху фундаменту до верху парапету) складає
Пожежні резервуари	Бетонний каркас, ємність розраховується згідно розмірів ставка випаровувача. Гідроізоляція по контуру та отворі для підводу металічних труб для води	70 000	м x 10,4 м. Висота будівлі (від верху плити фундаменту до верху плити розрахунку 20 ліс на 3 години горіння. Відкавлення вади для завільського
Ставок Випаровувач	рельєфу та розміру майданчика. Гідроізоляція отворів та вводів труб.	90 000	
Очисні споруди дощових вод	Для фільтрації стоків після автомобільного транспорту, підземне розташування. Ввід сточної та дощової каналізації повинен бути під'єднаний до сепаратору.	35 000	
Тепловозне Діло	Каркас - металоконструкції, накриття- сендвіч панелі, розміри 25 на 6м для 1 тепловоза Обладнати оглядовою ямою для ремонтів а також приміщенням для персоналу Обладнати приміщення для зберігання ГСМ та інструментів для ремонту .	150 000	
Зона відпочинку	Обладнати зону бесідками та зонами для паління для персоналу	10 000	форми вписаної в коло діаметром 6.0 м. Висота будівлі (від верху
Лабораторія	Обладнана приміщенням для оператора провіддїбрника, зоною виконання аналізів та	25 000	Одноповерхова споруда комплектної поставки, прямокутної форми з розмірами по осі в плані 4,0 м x 5,0м. Висота будівлі (від верху покриття площадки до верху покриття) складає 2,7 м. Споруда монтується на
Бункера Зерновідходів	4-5 бункерів , конусний тип , 50-70м3 об'єм. Розташовані на конструктивних фундаментах поряд з обладнанням для очистки зерна, палі-фундаменти	60 000	
Дизель-генераторна	Окрема будівля біля Норійної вежі, для забезпечення аварійних ситуацій. Розміри 3x4 м, Металевий каркас, оцинкований проф.настил.	10 000	див п. 24
Гостьова парковка	асфальтована або плита бетонна ПАГ18 до 60т навантаження Загальна площа 200-250м2, зливової каналізація, ЛОС	33 000	розмір земельної ділянки 30 м кв на 1 м/м ДБН В.2.3-15:2007
Парковка вантажних автомобілів	асфальтована або плита бетонна ПАГ18 до 60т навантаження - (5,25м2*300плит) 1500м	81 000	розмір земельної ділянки 507 м кв на 1 м/м
Побутові приміщення для водіїв		15 000	
	Разом	2 050 000	

Annex D: List of building rules, regulations, codes etc

- ДБН А.2.2-3:2014 Склад та зміст проектної документації на будівництво
- ДБН А.2.2-1:2021 Склад і зміст матеріалів оцінки впливів на навколишнє середовище (ОВНС)
- ДБН А.2.1-1-2008 Інженерні вишукування для будівництва
- ДБН Б.1.1-14:2021 Склад та зміст містобудівної документації на місцевому рівні
- ДБН Б.2.2-12:2018 Планування і забудова територій
- ДСТУ 8855:2019 Будівлі та споруди. Визначення класу наслідків (відповідальності)
- ДБН В.2.3-19-2018 Споруди транспорту. Залізничні колії 1520 мм. Норми проектування
- ДСТУ Б А.2.4-33:2008 Система проектної документації для будівництва. Колії залізничні. Робочі креслення
- ДБН В.2.2-12-2003. Будівлі і споруди для зберігання і переробки сільськогосподарської продукції
- ДБН В.2.6-221:2021 Конструкції силосів з гофрованою стінкою для зерна. Основні положення
- ДСТУ-Н Б EN 1993-4-1:2012 Єврокод 3. Проектування сталевих конструкцій. Частина 4-1. Силоси (EN 1993-4-1:2007, IDT).
- ДБН В.2.2-12-2003 Будівлі і споруди для зберігання і переробки сільськогосподарської продукції
- ДБН В.2.3-4:2015 Автомобільні дороги. Частина I. Проектування. Частина II. Будівництво
- ДБН В.2.3-15:2007 Споруди транспорту. Автостоянки і гаражі для легкових автомобілів.
- ДБН В.2.2-28:2010 Будинки і споруди. Будинки адміністративного та побутового призначення
- ДБН В.2.2-40:2018 Інклюзивність будівель і споруд. Основні положення
- ДБН В.2.2-5-97 Будинки і споруди. Захисні споруди цивільного захисту.
- ДСТУ 8773:2018 Склад та зміст розділу інженерно-технічних заходів цивільного захисту в складі проектної документації на будівництво об'єктів. Основні положення
- ДБН В.1.2-2:2006 Навантаження і впливи. Норми проектування
- ДБН В.2.6-198:2014 Сталеві конструкції. Норми проектування
- ДБН В.2.6-98:2009 Бетонні та залізобетонні конструкції. Основні положення
- ДБН В.1.2-11:2021 Основні вимоги до будівель і споруд. Енергозбереження та енергоефективність
- ДБН В.2.6-31:2021 Теплова ізоляція та енергоефективність будівель
- ДБН В.2.5-64:2012 Внутрішній водопровід та каналізація
- ДСТУ Б А.2.4-32:2008 Система проектної документації для будівництва. Водопровід і каналізація. Робочі креслення
- ДБН В.2.5-74:2013 Водопостачання. Зовнішні мережі та споруди. Основні положення проектування
- ДСТУ Б А.2.4-31:2008 Система проектної документації для будівництва. Водопостачання і каналізація. Зовнішні мережі. Робочі креслення
- ДБН В.2.5-67:2013 Опалення, вентиляція та кондиціонування
- ДСТУ Б А.2.4-41:2009 Система проектної документації для будівництва. Опалення, вентиляція і кондиціонування повітря. Робочі креслення
- ДСТУ-Н Б В.2.5-80:2015 Настанова з проектування систем електропостачання промислових підприємств
- ДБН В.2.5-28:2018 Природне і штучне освітлення
- ДСТУ Б А.2.4-24:2008 Система проектної документації для будівництва. Внутрішнє електричне освітлення. Робочі креслення
- ДСТУ Б А.2.4-18:2008 Система проектної документації для будівництва. Електричне освітлення території промислових підприємств. Робочі креслення
- ПУЕ Правила улаштування електроустановок
- ДСТУ Б А.2.4-21:2008 Силове електрообладнання. Робочі креслення
- ВСН 51-3-85 Відомчі будівельні норми. Проектування промислових сталевих трубопроводів (ВСН 51-2.38-85)
- НАПБ А.01.001-2014 Правила пожежної безпеки в Україні
- ДБН В.1.1-7:2016 Пожежна безпека об'єктів будівництва
- ДБН В.2.5-56:2014 Системи протипожежного захисту
- ДСТУ SEN/TS 54-14:2021 Системи пожежної сигналізації та оповіщення. Частина 14. Настанови щодо побудови, проектування, монтування, пусконаладжування, введення в експлуатацію,
- НАПБ В.01.058-2008/112. Правила пожежної безпеки для об'єктів зберігання, транспортування та реалізації нафтопродуктів
- Правила технічної експлуатації та охорони праці на стаціонарних, контейнерних і пересувних автозаправних станціях
- ВБН В.2.2-58.1-94 Проектування складів нафти та нафтопродуктів з тиском насичений парів не

- вище 93,2 кПа
- ВСН 11-73 Вказівки з визначення експлуатаційних витрат при оцінюванні проектних рішень будівель
 - ВБН А.2.2-00018201.02-96 Проведення відомчої експертизи проектів, кошторисів і ТЕО інвестицій в будівництві
 - ДСТУ Б А.2.4-29:2008 Система проектної документації для будівництва. Автомобільні дороги. Земляне полотно і дорожній одяг. Робочі креслення
 - ГБН В.2.3-37641918-559:2019 Автомобільні дороги. Дорожній одяг нежорсткий. Проектування
 - ГБН В.2.3-37641918-549:2018 Автомобільні дороги. Майданчики для стоянки транспортних засобів і відпочинку учасників дорожнього руху. Загальні вимоги проектування
 - ГБН В.2.3-37641918-557:2016 Автомобільні дороги. Дорожній одяг жорсткий. Проектування
 - ГБН В.2.3-37641918-556:2015 Автомобільні дороги. Споруди шумозахисні. Вимоги до проектування
 - ГБН В.2.3-218-007:2012 Споруди транспорту. Екологічні вимоги до автомобільних доріг. Проектування
 - В.2.3-21476215-863:2015 Рекомендації з проектування дорожнього одягу автомобільних доріг загального користування
 - ДСТУ 9186:2022 Настанова з проектування земляного полотна автомобільних доріг
 - ГБН В.2.3-37472062-1:2012 Споруди транспорту. Сортувальні пристрої залізниць. Норми проектування
 - Порядок виконання підготовчих та будівельних робіт
 - Положення про порядок формування, проектування, планування й фінансування будівництва групи підприємств із загальними об'єктами (промислового вузла)
 - Положення про проектування й будівництво експериментальних об'єктів
 - ДСТУ ISO 15686-1:2020 Будівлі та об'єкти нерухомого майна. Планування терміну служби. Частина 1. Основні принципи та методологія (ISO 15686-1:2011, IDT)
 - ДСТУ ISO 15686-5:2020 Будівлі та об'єкти нерухомого майна. Планування строку експлуатації. Частина 5. Оцінювання вартості життєвого циклу (ISO 15686-5:2017, IDT)
 - ДСТУ-Н Б В.1.1-33:2013 Настанова з розрахунку та проектування захисту від шуму сельбищних територій

Annex F: Services

Товар: - товар нейтральний зерно

Класифікатор NHM/ ГНГ — 10

Країна походження — Україна

Призначення – продовольче, фуражне

Тип контракту - експорт

Варіанти

- Зерно в біг-бегах в полувагонах вагою бдизько 1,0 тонни
- Зерно насипом в вагонах зерновозах (типу Хоппер) для нижнього вивантаження машинами RVM

Кількість: у середньому 29 вагонів на день, завантаження — 54 т/вагон

Маршрути:

Україна – Комплекс: завантажений вагон по колії 1534

Комплекс – Україна: порожній вагон по колії 1534

Україна – Комплекс: завантажений автомобіль

Комплекс – Україна: порожній автомобіль

Комплекс – Польща: завантажений вагон по колії 1435

Польща – Комплекс: порожній вагон по колії 1435

Таблиця 10 Перелік послуг

№	Послуга	Розрахунковий період		Коментар
1	2	3		5
1	Перевантаження зерна в біг-бегах з власних напіввагонів			
2	Перевантаження зерна насипом з вагонів зерновозів – автомобіль			
3	Перевантаження зерна насипом з вагона зерновоза – напіввагон			
4	Перевантаження зерна в біг-бегах з напіввагонів			
5	Перевантаження зерна насипом з вагона зерновоза – автомобіль			
6	Перевантаження зерна насипом з вагона зерновоза – напіввагон			
7	Зважування автомобілів			
8	Зважування вагонів			
9	Зберігання зерна			
10	Очищення зерна			
	...			

- Залежно від митного статусу товару, що транспортується, можливі додаткові складання документів та оплати послуг TSL-Комплекс орієнтовний тариф яких подано для інформації:
- Митна процедура Імпорт у Х (стандарт);
- Митна процедура імпорту (допуск до реалізації) із застосуванням ст. 33а;
- Складання заяви для митного контролю, WIJHARS тощо, збирання та доставка документів після контролю;
- Участь співробітника митного агентства TSL Комплекс у митних процесах
- Митна ревізія товарів (робота уповноваженої особи/митника) – ставки згідно з тарифами органів, що проводить ревізію + рахунок буде виставлено на замовника
- Для товарів у митному транзиті:
- Підготовка декларації до процедури транзиту Т1 (надання гарантій – за домовленістю). Оформлення процедури Т1 – можливе лише за умови Перевантаження товарів на вантажні автомобілі надані через експедицію TSL-Комплекс (оформлення Т1 – у місці завантаження/розвантаження автомобілів);
- Подання заяви на отримання від митного органу статусу для перевалочного терміналу, що дозволяє перевалку товару в транзиті JUMO (застосовується до Перевантаження щодо вагон-автомобіль);
- Подання заяви до митного органу та отримання дозволу на Перевантаження товару у транзиті – відповідно до прайсу митного органу + рахунок буде виставлено на Замовника.

Подання інтересів Замовника – за наданою Довіреністю від Замовника на прямі та непрямі дії у процесі реалізації транспортування товару.

Ставки включають:

- узгодження маршруту перевезення,
- Залізничний фрахт X-X1 – завантажений вагон 1524/1435 мм,
- вставлення на термінал завантаженого вагона 1524/1435 мм,
- Перевантаження зерна щодо вагон – автомобіль,
- Перевантаження біг-бегів,
- Перевантаження зерна з вагона на вагон,
- оформлення документів PDS
- привізні залізничні та автомобільні документи
- вставлення на станцію вагона порожнього, СМГС на порожній вагон,
- Залізничний фрахт X-X1 на порожній вагон,
- простий вагон на залізничному терміналі Славкув - макс. 36 Н у ставці,
- зважування та тарування вагонів/автомобілів відповідно до ставок,
- митне та експедиційне обслуговування на кожному етапі реалізації послуги.

Ставки не включають:

- залізничний фрахт та користування вагоном по УЖ,
- збори на станції X/X1, простої вагонів, додаткові контролю вантажу митними органами та пов'язані з цим витрати, митне оформлення тощо,
- витрати на прикордонний, митний, екологічний, фітосанітарний контроль та супутні витрати,
- простої вагонів під Перевантаженням не більше 36 Н,
- постої вагонів на прикордонному пункті з причин незалежної від Експедитора,
- простої вагонів і автомобілів у дорозі – з незалежних від Експедитора причин,
- всі додаткові маніпуляції вагоном 1524/1435 мм,
- контроль якості товару;
- витрати на затримку та простої з вини відправника/одержувача/замовника вантажу,
- витрати, що виникли через неправильну інформацію в торгових та транспортних документах, у запиті на ставку,
- витрати пов'язані з неправильною або пошкодженою упаковкою (матеріалом для пакування), додатковий дерев'яний укладальний матеріал, витрати на додаткові контролю,
- витрати пов'язані із завантаженням товару нестандартним способом, що ускладнює або робить неможливим вивантаження вантажу,
- користування вагоном по території X на стороні відправника,
- митні процедури – згідно з прайсом митної агенції,
- простої вагона в очікуванні вставки на станцію,
- подача автомобілів або вагонів під перевантаження товару та доставка до місця призначення — індивідуально в кожний конкретний маршрут,
- страхування вантажу,
- податки та ПДВ,
- інше, не зазначене у пропозиції.

Contact ▸

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