



# Shifting into Higher Gear

## Recommendations for Improved Grain Logistics in Ukraine



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## ABBREVIATIONS AND ACRONYMS

AGP	Agriculture Global Practice
BCR	Benefit/Cost Ratio
CTS	Center for Transport Strategy
ECA	Europe and Central Asia
ERR	Economic Rates of Return
EU	European Union
FAO	Food & Agriculture Organization
GoU	Government of Ukraine
GDP	Gross Domestic Product
GHG	Greenhouse Gas
ICT	Information and Communication Technologies
LPI	Logistics Performance Index
MoAPF	Ministry of Agricultural Policies and Food
Mol	Ministry of Infrastructure
NGLC	National Grain Logistics Council
NGLS	National Grain Logistics Strategy
NPV	Net Present Value
SFGC	State Food and Grain Corporation
SOE	State-Owned Enterprise
UZ	<i>Ukrzaliznytsia</i> , the State-owned Rail Company

## BACKGROUND

This study was conceived on the basis of a request by Ukraine’s Ministry of Agricultural Policies and Food (MoAPF). In 2013, the MoAPF explored the World Bank’s interest for investing in grain hoppers, following a deficit of hoppers and concerns about related difficulties for grain transport. In response, the World Bank secured resources from the Multi Donor Trust Fund for Trade and Development (TF016693) to carry out a review of grain logistics in Ukraine in order to better understand the challenges facing the sector. The objectives of the present study are to assess the functioning of the grain logistics system, identify bottlenecks and put forward practical recommendations for investments and reform. The study intends to inform the policy dialogue between the World Bank and the Government of Ukraine and to help identify priority interventions along the grain value chain.

## ACKNOWLEDGEMENTS

The study was prepared by a team led by Maurizio Guadagni including Maria Claudia Pachon, Aliya Karakulova, Oleg Niviyevskiy, Kairat Nazhmidenov (FAO), Anatol Gobjila, Mzia Giogobiani, and Marko Bucik. It is based on two background analyses prepared by the *Center for Transport Strategy* (CTS, <http://en.cfts.org.ua>) and *APK-Inform* (<http://www.apk-inform.com/en>). Kairat Nazhmidenov developed the preliminary investment packages, with support from Dmitry Prikhodko (FAO), who also contributed to the *APK-Inform* report, in particular to the section on grain storage.

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## EXECUTIVE SUMMARY

**Ukraine has established itself as one of the leading global exporters of grains and forecasts project continued growth.**<sup>1</sup> By 2014, Ukraine had become the third largest global exporter of maize and barley, the sixth largest exporter of wheat and one of the most important global producers of sunflower seeds and oil. Within the last decade alone, the total production of grains has increased by over 50% and reached 79 million tons in 2014, while exports of grains and related processed products have grown by 250% and totaled 35 million tons. Looking ahead, Ukraine could be producing up to 90 million tons of grain per year and exporting up to 50 million tons per year within the next two decades. However, forecasting is made challenging due to pronounced inter-annual variability and the risks associated with the ongoing crisis.

**To realize its potential, the grain sector in Ukraine needs the support of an efficient and competitive logistics system.** At present, this is not the case. The logistics costs for moving grain from Ukrainian farms to the Black Sea ports are approximately 40% higher than costs for comparable services in France and Germany, and about 30% higher than costs in the United States.<sup>2</sup> As a result, farmers in Ukraine receive lower shares of world market prices and shoulder the costs of inefficiencies in logistics that, according to different estimates, result in foregone revenues in the range of US\$600 million to US\$1,600 million each year, or 20-50% of the current volume of bank loans to agriculture. This has important negative implications for investment and competitiveness of the sector.

**The objectives of this report are to assess the functioning of the grain logistics system, identify bottlenecks and put forward practical recommendations for investments and reform.** Research points to five key drivers of current high logistics costs: (i) lack of regulatory clarity and sub-optimal management of public assets that create barriers to private investments; (ii) underutilization of river transport, (iii) underinvestment in rail transport; (iv) inefficiencies in storage management, and (v) excessive use of road transport. However, there are two important limitations of the report that should be taken into account. First, the ongoing crisis remains a source of uncertainty. It has so far had limited impact on grain production and logistics, yet access to finance has become more difficult and other impacts might arise in the future. Second, there are two areas that the report does not address: customs and ports. Both are important elements of logistics costs and deserve a comprehensive analysis in the future.

**Grain logistics in Ukraine face a dual challenge in the form of present-day high costs and insufficient capacity to cope with future growth.** High costs are diminishing the competitiveness of Ukraine's grain production and reducing the revenue flows to farmers, with negative impacts

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<sup>1</sup> Throughout the report, the term 'grain' is used to encompass a selection of most important (and statistically relevant) grains and oilseeds: corn (maize), wheat, barley, and sunflower seeds.

<sup>2</sup> Throughout the report, the term 'logistics costs' includes costs related to transportation, warehousing, storage, cleaning, drying, handling, document processing, duties, packaging, security, and any fees, tariffs and duties associated with the export of grain.

on sector investment – much needed to raise productivity. The limited capacity of logistics, on the other hand, is projected to become an important bottleneck to future growth, unless addressed in time. This dual challenge calls for a holistic investment and reform agenda.

#### PROVIDING REGULATORY CLARITY AND GOOD GOVERNANCE

**As other sectors of the economy, grain logistics would benefit from a clearer and predictable regulatory environment and good governance.** There are three key practical aspects that can stimulate the much needed private investment in the sector: (i) rules should be transparent and reflect a public policy objective; (ii) rules should be enforced; and (iii) public institutions and State-Owned Enterprises (SOEs) should perform their functions and manage public assets responsibly and transparently. At present, some rules are complex (e.g., issuing of export documents), some opaque (e.g.; allocation of grain hoppers), while others are not enforced (e.g., axle load limitations for trucks). Recent investigations and reports<sup>3</sup>, including those targeting the State Food and Grain Corporation, showed corruption and mismanagement among public institutions and SOEs. The current Government has made progress in reducing compliance costs (e.g., by cancelling certification of grain quality and storages, switching to voluntary issuance of quarantine certificates), but a lot more needs to be done.

**Apart from improving governance, the key issue for the Government of Ukraine is defining the role of public institutions and SOEs involved in grain logistics.** The case of three SOEs involved in grain marketing and logistics – the State Food and Grain Corporation, the “Agrarian Fund of Ukraine” and the Public Joint Stock Company “Agrarian Fund” – is a telling example: they all suffer from an unclear mandate and lack of transparency, yet hold significant assets, have important liabilities, and continue to drain public resources. While managing food reserves may be a public objective, storage and trading of grain is a private activity. Competition in grain trading is strong, with several national and international private operators such as Nibulon, Topfer International (ADM), Louis Dreyfus, Kernel Trade, Serna Glencore, Sundrate (Bunge Ukraine) sharing the grain export markets in relatively similar quotas. Therefore, public investments in grain trade where a healthy competition exists might be considered as a public encroachment on private activities. Instead, the option to privatize or liquidate the State Food and Grain Corporation should be considered.

#### STIMULATING INVESTMENT IN RIVER TRANSPORT

**The importance of river transport in Ukraine has diminished dramatically since independence and today represents a big untapped potential.** In 1990, 66 million tons of goods were transported on rivers, by 2013 only 4 million tons. Merely 3% of exported grain is at present moved on rivers, yet these, especially the longest among them, the Dnipro River, represent a

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<sup>3</sup> For instance, the State Security Services of Ukraine “detected of embezzlement of almost US\$0.5 million dollars of budget funds by the officials of the “State Food and Grain Corporation of Ukraine”  
[http://www.sbu.gov.ua/sbu/control/en/publish/article;jsessionid=F085BA0AFECD6676A48FD46F7C75D11F.app1?art\\_id=140154&cat\\_id=140089](http://www.sbu.gov.ua/sbu/control/en/publish/article;jsessionid=F085BA0AFECD6676A48FD46F7C75D11F.app1?art_id=140154&cat_id=140089).

formidable opportunity to transport bulk agriculture products reliably and at low cost. There is a set of four key public interventions that would stimulate competition and private investment in river transport, both vessels and river infrastructure (e.g., elevators and port storage): (i) dredging of Dnipro's shallow bed to eliminate physical bottlenecks; (ii) the alignment of the winter navigation closure with real weather conditions to allow for a longer navigation period during the key period for grain transport (November – March); (iii) reforming the system for pilotage, lock passage and opening of moveable bridges; and (iv) attracting foreign vessels to Ukraine's inland waterways by lowering the burden of the entry permits requirement and changing the port fee structure for intercoastal and international navigation.

#### LIBERALIZING RAIL TRANSPORT

**Railways are currently the means of choice for grain transport accounting for more than 60% of volume moved each year, yet they severely lack investment.** The rolling stock of grain hoppers owned by *Ukrzaliznytsia* (UZ), the state-owned rail company, is old and in need of renewal. Without greater private sector participation, the financial burden will fall exclusively on UZ, if the wagons' capacity is to match the increasing volume of grain exports. Three regulatory measures are key: (i) the tariffs for accessing railway infrastructure should be set through a transparent, market-based and non-discriminatory process that will remove existing barriers to private investments in grain hoppers. Charging an "empty run" fee only to privately owned hoppers (and not to those owned by UZ) is discriminatory and creates obstacles to private investments in hoppers; (ii) access to hoppers owned by UZ also needs to be more transparent; and (iii) seasonal tariffs for the use of infrastructure could be considered, as they would give incentive to better distribution of demand throughout the year and stimulate investment in storage. Seasonal tariffs for the use of grain hoppers are not discriminatory: UZ needs to invest in infrastructure to store grain hoppers and locomotives when these are not used. A more evenly distributed use throughout the year would reduce storage costs and lead to increased UZ efficiency.

**There is an additional challenge that the Government needs to address: transforming UZ from a vertically integrated *de-facto* monopolist to a commercially-oriented company that provides fair access to private companies.** At present, UZ manages rail infrastructure, as well as provides freight services. Models of functional division introduced elsewhere, most notably in the European Union, show that separation of infrastructure management from freight services provision leads to increased competition for freight transport services – something that would be beneficial for Ukraine's grain logistics. UZ and the railway sector more widely are currently undergoing major reform that introduces significant governance changes, and most importantly, outlines access to railway infrastructure services and facilities on a non-discriminatory basis. If successfully implemented, the reform would stimulate investment in grain hoppers.

## IMPROVING ROAD ASSET MANAGEMENT AND INVESTING IN ACCESS ROADS TO PORTS

**Road transport is an essential element of grain logistics, as it provides the necessary flexibility and carrying capacity.** However, the growth in its share in Ukraine – currently around 36% of all grain transported – has been secured not only through the growing professionalism of the industry, but also through the practice of truck overloading. Overloading has three effects: (i) it makes road transport more competitive on longer distances; (ii) it leaves room for traffic police corruption; and (iii) it causes road damage, pollution and a decrease in traffic safety and flow. In response, stricter enforcement of axle load rules is essential, yet it should be implemented simultaneously with other measures, the combination of which would lead to a structural shift towards more transport by railways and river. In addition, targeted investments in access roads to ports deserve attention, as these would improve traffic conditions around ports, especially in congested urban areas.

## MODERNIZING STORAGE EQUIPMENT AND INCREASING STORAGE CAPACITY

**Storage facilities are a key weakness of grain logistics in Ukraine.** While there are numerous storage providers, many facilities are old and the drying, loading/unloading, weighing, as well as testing equipment is energy-intensive and time-consuming, resulting in higher storage-related costs. For example, it can currently take up to 10 days to load a full train (54 grain hoppers) with older equipment, while modern storage facilities and equipment can complete it within a single day, speeding up turnover time of wagons and trucks. Reforms and investment in other areas of logistics (e.g., river, rail and road transport) will create incentives for new investment in storage, leading to important efficiency gains (e.g., faster loading/unloading, lower grain losses, energy-efficient drying), but also enabling farmers to time their sales with higher prices. In addition, investments in new storage capacities are needed to account for the projected growth in grain production. These could be stimulated by deregulating the system of construction permits and by streamlining regulations for operating grain storages.

**The scale and number of challenges require a holistic reform and investment agenda to improve grain logistics.** Above all, the Government should focus on creating a regulatory environment in which the private sector is eager to invest and where consequently logistics costs are progressively lowered and revenue of farmers increased. Most importantly, the regulatory changes should be coordinated. For example, a stricter enforcement of axle load limitations on its own might increase the price of logistics further, not lower it. However, if done in parallel with the reforms in rail and river transport, it will achieve the set goals.

**Table 1. Overview of reform and investment recommendations**

Issue / Area	Reform / Investment Recommendation
<b>REGULATORY IMPROVEMENTS</b>	
<ul style="list-style-type: none"> <li>• Limited coordination among various ministries</li> <li>• Complex certification procedures</li> <li>• Outdated Documentation Management</li> </ul>	<ol style="list-style-type: none"> <li>1. Create a National Grain Logistics Council</li> <li>2. Improve documents processing utilizing ICT</li> <li>3. Ensure key agencies (certification, laboratories and customs) are working 24/7 during the peak season of grain exports</li> </ol>
<b>RIVER AND PORTS</b>	
<ul style="list-style-type: none"> <li>• Limited navigation period</li> <li>• Obstacles to foreign vessels' entry onto Ukraine's inland waterways</li> <li>• Costly pilotage services</li> <li>• Dnipro's shallow river bed</li> <li>• Limited river storage capacities and river fleet</li> <li>• High sea-port costs</li> </ul>	<ol style="list-style-type: none"> <li>1. Finalize the <i>Law on Inland Water Transport</i> including:               <ol style="list-style-type: none"> <li>(a) Flexibility in the calendar of river navigation</li> <li>(b) Facilitate obtaining permits for foreign vessels</li> <li>(c) Change the structure of port fees for coastal and international navigation</li> <li>(d) Reform the system of pilotage, locks, and moveable bridges tariffs.</li> </ol> </li> <li>2. Improve navigation conditions on Dnipro (e.g., through dredging, use of groins and sills)</li> <li>3. Expand capacity of port railway stations and improve access to road transport</li> <li>4. Remove obstacles to expand river fleet</li> <li>5. Introduce competition in port management</li> </ol>
<b>RAILWAYS</b>	
<ul style="list-style-type: none"> <li>• Non-transparent access to grain hoppers during peak season</li> <li>• Non-transparent tariffs for private hoppers</li> <li>• Highly seasonal demand</li> <li>• Old age of grain hopper fleet</li> </ul>	<ol style="list-style-type: none"> <li>1. Set transparent, market-based, non-discriminatory rail fees</li> <li>2. Consider introducing seasonal tariffs for grain shipment</li> <li>3. Improve transparency of access to grain hoppers</li> <li>4. Improve the track and trace system</li> <li>5. Replacement of grain hoppers at end of service life or extension for additional 15 years with major maintenance</li> </ol>
<b>ROADS</b>	
<ul style="list-style-type: none"> <li>• Truck overloading and related damage to public roads</li> <li>• Poor access roads to ports and roadside services</li> </ul>	<ol style="list-style-type: none"> <li>1. Improve axle load controls (automatic weighing stations, weigh-in-motion)</li> <li>2. Improve the track and trace system</li> <li>3. Consider introducing a system of toll roads</li> <li>4. Improve the Road Asset Management System</li> </ol>
<b>STORAGE</b>	
<ul style="list-style-type: none"> <li>• Outdated and insufficient grain storage</li> <li>• Excessive state involvement in grain markets</li> <li>• Lack of information on storage</li> </ul>	<ol style="list-style-type: none"> <li>1. Support private sector investments in grain storage</li> <li>2. Consider privatizing or liquidating the State Food and Grain Corporation and the Agrarian Fund</li> <li>3. Develop a regular survey to monitor storing capacity and quality</li> </ol>

## I. UKRAINE'S GRAIN PRODUCTION, EXPORTS AND LOGISTICS

### i.) UKRAINE'S IMPRESSIVE GROWTH OF GRAIN PRODUCTION AND EXPORTS

**Exceptional natural endowments and a favorable geographical position have provided the foundation for Ukraine's expansion of crop production.** One third of the world's stock of the most fertile black soils is located on its territory and is coupled with favorable temperatures and precipitation regimes – a unique combination that

*Supported by exceptional natural endowments and impressive growth rates, Ukraine has established itself as one of the leading global exporter of grains.*

facilitates large-scale production of crops. Large fertile agricultural plains dominate the landscape over much of Ukraine's territory, providing livelihood to more than five million rural people and generating value added equal to 10% of Ukraine's GDP.<sup>4</sup> Ukraine's geographical position is also key: its exporting opportunities are facilitated by the access to key markets in the Middle East and North Africa through the Black Sea.

**Over the last 15 years, Ukraine has established itself as one of the world's top producers and exporters of grains, yet has made limited progress in higher value-added agricultural products.**

Supported by high growth rates since 2000, Ukraine has become the third largest global exporter of maize (17.6 million tons in 2014) and barley (4.2 million tons), and the sixth largest exporter of wheat (10.5 million tons).<sup>5</sup> In parallel, Ukraine has also emerged as one of the most important global producers of sunflower seeds and oil, with global market shares of 23% and 26% respectively in 2012.<sup>6</sup> Within the last decade alone, the total grain and oilseed production has increased by 56% and reached a record-breaking 79 million tons in 2014. During the same period, exports of grains, oilseeds and their processed products have grown by 250% and totaled 35 million tons in 2014, notwithstanding the tumultuous events that began to engulf Ukraine at the beginning of that year. However, the agricultural sector remains dominated by the production of grains, while higher value-added livestock and horticulture represent a much smaller share of the sector.

**The developments over the last year and ongoing crisis in Ukraine has affected grain production and logistics, yet its impacts remain limited.** The areas affected (*Crimea, Donetsk and Luhansk Oblasts*), account for around 10% of Ukraine's total grain production and regions bordering on Russia are important for grain transport and transit and host storage facilities. However, grain transit from Russia has started decreasing substantially in 2008/2009 and has dropped from 2.3

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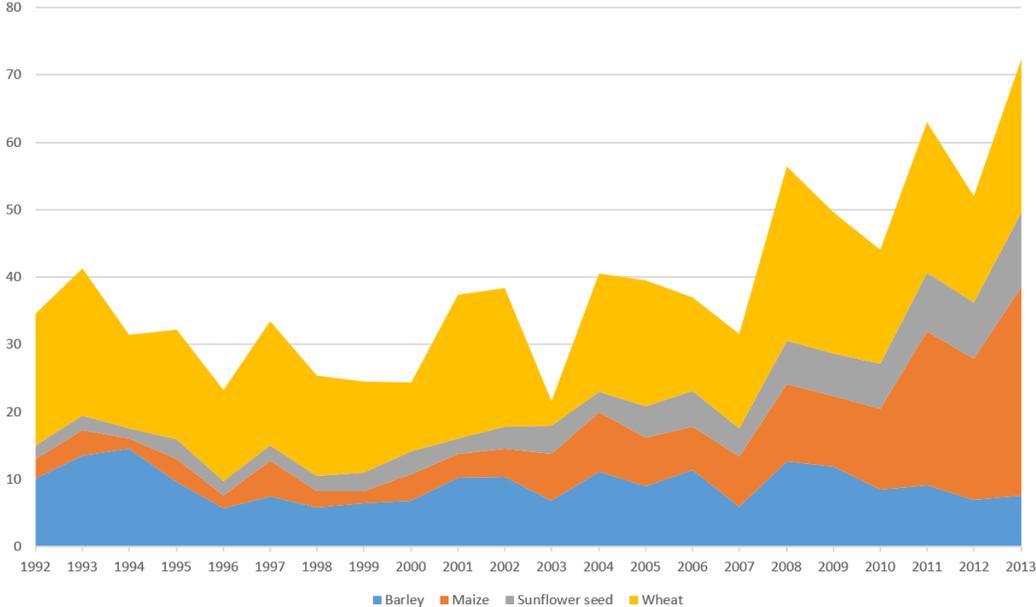
<sup>4</sup> Sources: ILO, World Bank.

<sup>5</sup> Source: UN Comtrade.

<sup>6</sup> Source: FAOSTAT via Eastagri ([http://www.eastagri.org/sector\\_detail.asp?id=9](http://www.eastagri.org/sector_detail.asp?id=9)).

million tons in 2008 (around 7% of exports) to less than 0.4 million tons in 2013 (around 1% of exports). The loss of storage capacity due to the events of 2014 and ongoing crisis is estimated at 10.7% (Crimea: 3.5% of Ukraine’s total storage capacity; *Donetsk* and *Luhansk Oblasts*: 3.7% and 3.5% respectively).<sup>7</sup>

**Figure 1. Ukraine: Grain Production volumes and Year-to-Year Variability (million tons, 1992 – 2013)**

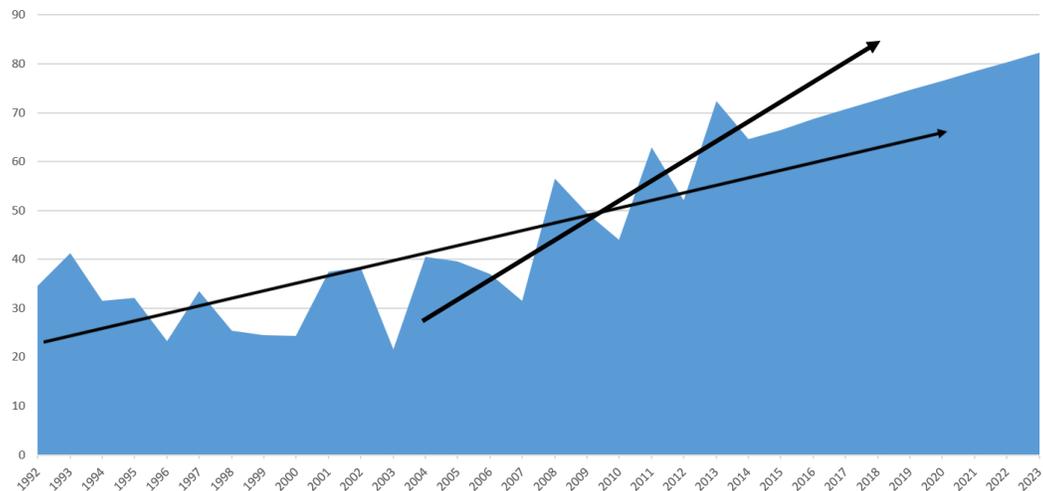


Source: FAOSTAT.

**Despite the significant year-to-year volatility, the growth in production and exports is expected to continue.** Due to variable weather conditions, the volume of grain production fluctuates significantly from one marketing year to another. However, yields in Ukraine remain about half of those in the most agriculturally developed countries within the European Union and those in the United States, despite benefitting from comparable (or better) agro-climatic conditions – fueling the expectations of continued improvements in productivity. If these were to materialize, Ukraine could be producing between 80 and 90 million tons of grain per year (*Figure 2*). With domestic consumption remaining largely unchanged, exports of grain are projected to increase significantly over the next two decades, from approximately 32 million tons to 50 million tons (*Figure 3*).

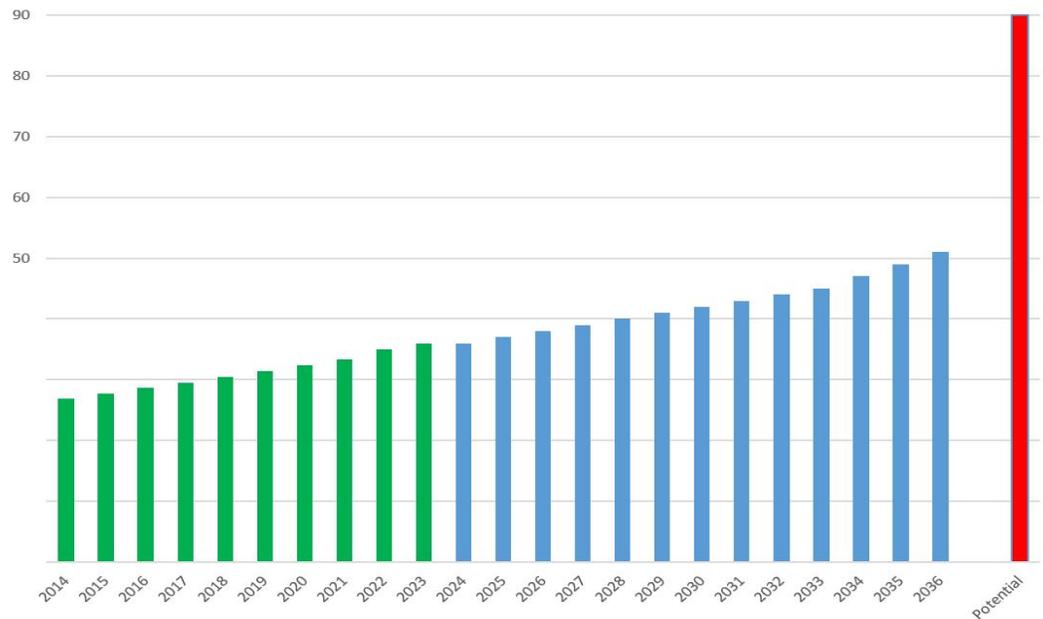
<sup>7</sup> For a more comprehensive review of the impact of the crisis, in particular on eastern regions of Ukraine see: European Union, United Nations and The World Bank (2015) *Ukraine: Recovery and Peacebuilding Assessment – Analysis of crisis impacts and needs in Eastern Ukraine*.

**Figure 2. Ukraine: Grain Production forecast (million tons, 1992 – 2023)**



Source: OECD-FAO Agricultural Outlook 2014-2023.

**Figure 3. Ukraine: Export Growth forecast (million tons, 2014 – 2036)**

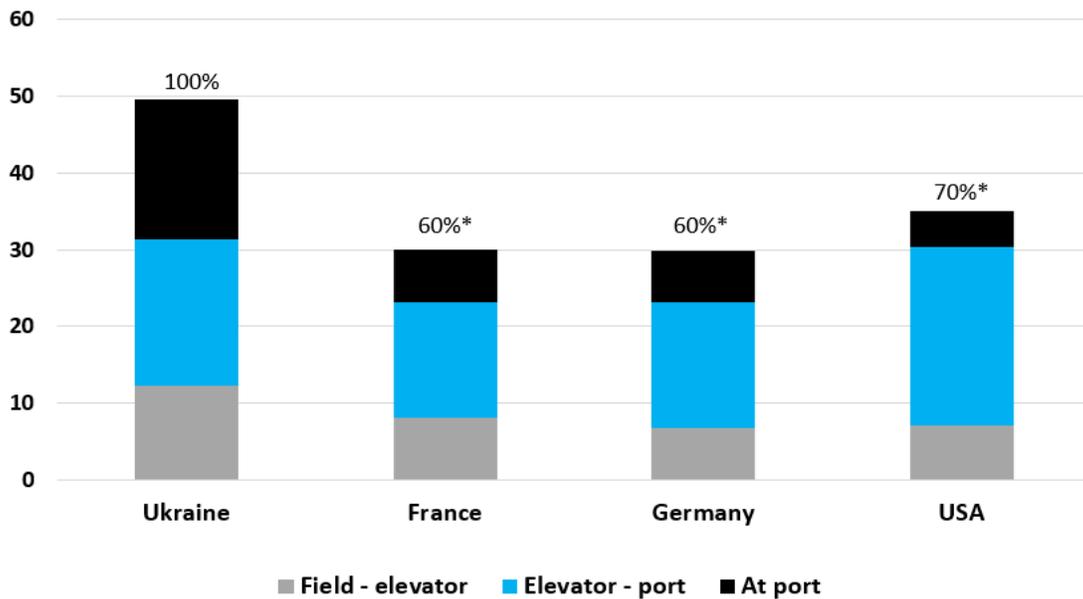


Sources: OECD-FAO Agricultural Outlook 2014-2023 (until 2023, in green); own calculations; Ukrainian Grain Association (for potential).

**ii.) THE DUAL CHALLENGE OF UKRAINE’S GRAIN LOGISTICS: PRESENT-DAY COSTS AND FUTURE CAPACITY**

**Despite significant recent growth, the grain sector in Ukraine continues to suffer from inefficiencies along the supply chain.** In fact, due to sub-optimal transport and storage infrastructure and operation, as well as regulatory burdens, the grain logistics costs in Ukraine are unjustifiably high when compared to those in other major grain producing economies. As a result, Ukrainian farmers receive a smaller share of export prices, with significant implications for their revenue and investment capacity.

**Figure 4. Wheat Logistics Costs: selected countries (US\$/ton, 2010)**



\* as % of the cost in Ukraine

Sources: ISU extension service; open sources.

**In part, high costs are the result of poor logistics.** The World Bank 2014 Logistics Performance Index (LPI) for Ukraine is almost 30% lower than the value of the top performer, Germany (2.98 vs. 4.12).<sup>8</sup> Poland, Ukraine’s neighbor, outperforms Ukraine in all components of the LPI. In practice, the costs of moving grain from Ukrainian farms to the Black Sea ports are approximately 40% higher than costs for comparable logistics in France and Germany, and 30% higher than costs in the United States (*Figure 4*).

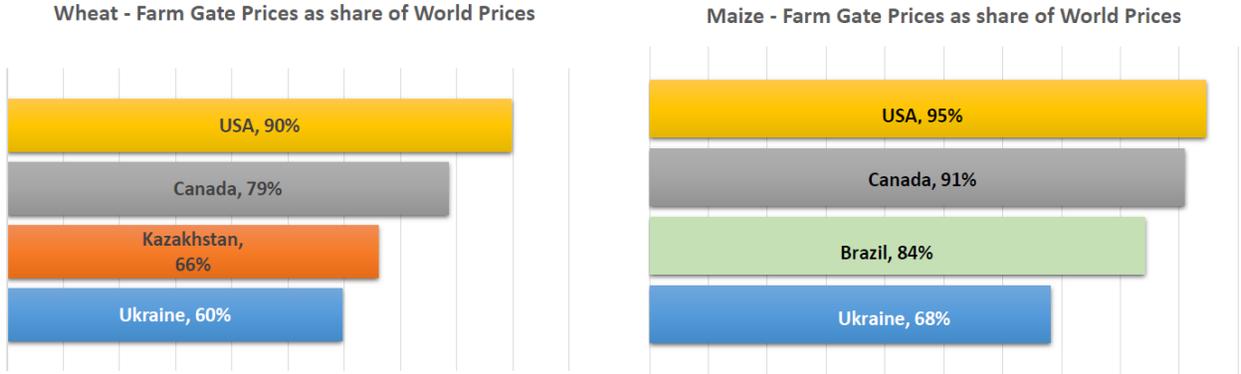
*High costs of logistics undercut farmers’ revenue by an estimated US\$600 million per year and impact their investment decisions.*

**As a result, farmers in Ukraine receive lower shares of world market prices and thus shoulder the costs of inefficiencies in logistics estimated at US\$20 per ton.** With an annual export of 30 million tons, this causes an overall annual forgone revenue to farmers of US\$600 million. A different approach provides an even higher estimate. If Ukrainian farmers could get the same farm gate prices of US farmers, they would earn additional US\$1,600 million more per year for

<sup>8</sup> The LPI consists of both qualitative and quantitative measures, which allows for comparisons across 160 countries. The components analyzed in the International LPI are: (i) the efficiency of customs and border management clearance; (ii) the quality of trade and transport infrastructure; (iii) the ease of arranging competitively priced shipments; (iv) the competence and quality of logistics services — trucking, forwarding, and customs brokerage; (v) the ability to track and trace consignments; and (vi) the frequency with which shipments reach consignees within scheduled or expected delivery times.

wheat and maize alone (Figure 5). With gradual reform and investment part of these potentials can be exploited.

**Figure 5. Farm Gate vs. World Prices of Wheat and Maize: selected countries**



Sources: OECD (Farm Gate Prices); World Bank (World Prices, FOB); own calculations.

**These estimates deserve explanation.** The first estimate – with forgone revenue of US\$600 million – is estimated on the basis of the higher logistics costs in Ukraine as compared to France and Germany. The estimated loss of US\$20 per ton is caused by inefficiencies in logistics and natural factors such as the distance from ports and the fact that Ukrainian grains require more drying than France and Germany because of climatic conditions. The second, larger, estimate – with forgone revenue of US\$1,600 million – is calculated on the basis of the price differential between world prices and farm-gate prices in Ukraine and USA.<sup>9</sup> In this case, the price received by farmers is affected by several other marketing and reputational factors (in addition to the logistics costs included under the first estimate) such as reliability of supply, reputational risks, business environment, uncompetitive market structures, price transfers, and other. For instance, the pronounced annual variability of production affects the reliability of Ukraine’s grain delivery and this in turn affects negatively producers’ capacity to get the best prices. However, a thorough analysis of these numerous factors is beyond the scope of the present study, which is focused on logistics. The estimates should serve as guidance on the potential increase in revenue to farmers that is realistic, taking into account that not all of the increase will reach farmers, as there will be a re-distribution along the supply chain. Although these potential savings are large in absolute amounts, they are less impressive in relative terms. To put things into perspective: if 50% of inefficiencies would be eliminated, a saving of US\$10 per ton (out of theoretically possible US\$20 per ton) would increase revenue along the supply chain of US\$300 million per year. While US\$300 million might appear small, representing approximately 4% of the total value of grain production,

<sup>9</sup> The price differential between world prices and farm-gate prices in Ukraine and USA is estimated at US\$75 per ton of wheat and US\$50 per ton of corn (averages for the 2009-2012 period). When multiplied by 10 million tons of wheat exports and 17 million tons of corn exports, the price differential results in forgone revenue of US\$750 million for wheat and US\$850 million for corn, or US\$1,600 million for both crops.

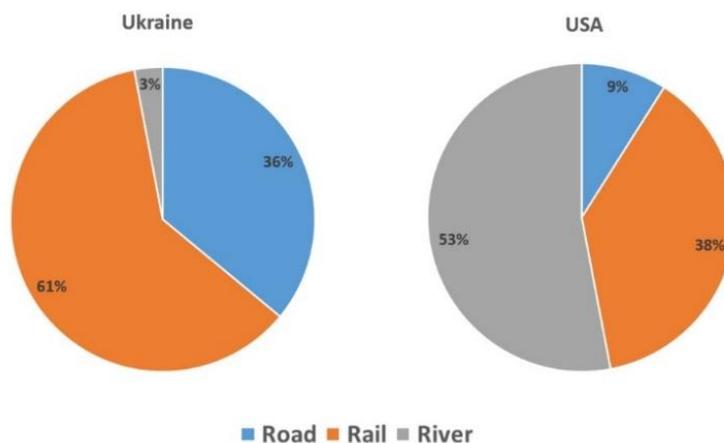
it represents 21% of the annual capital investments in agriculture in 2014. Indeed, the \$1,600 million estimated foregone revenue is more than the total amount of investments in agriculture, estimated at around \$1,400 million in 2014.

**The costs of logistics are affected by the underutilization of river transport, inefficiencies in rail transport, high share of road transport, deficient storage management and high port fees.** At present, most of the grain is transported by rail (61%), followed by road (36%), while river transport only accounts for a marginal share (3%). Yet, river transport is the most cost-efficient method for

*Expected increases in grains production and exports volumes might soon overload Ukraine's transport system.*

transporting bulk agriculture products. The Mississippi river system in the United States is a telling example: it delivers more than half of all US grain exports to the ports in the Gulf of Mexico at a low cost, ensuring that logistics expenses are contained. Much like Mississippi, the Dnipro River in Ukraine flows through the country's key grain producing regions and thus represents a great navigation asset that has been put to good use in the past. In addition, high logistics costs are partly also caused by inefficiencies in rail transport: limited access to grain hoppers and tariffs that deter private investments. Poor storage management is also a source of inefficiencies: scarce storage volumes, inadequate weighing capacity, outdated drying, loading/unloading and testing equipment are all contributing to increasing logistics costs. Finally, sea port fees in Ukraine are 2-3 times higher than in the EU or the United States – a hardly justifiable gap.<sup>10</sup>

**Figure 6. Shares of various transport modes in grain exports**

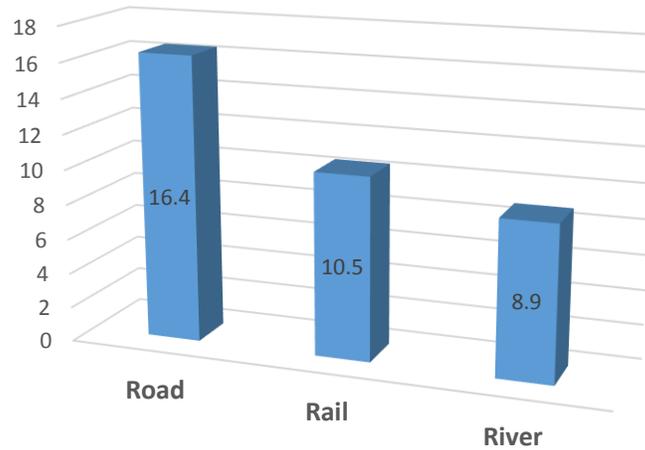


Source: Ukrainian State Statistics Service; United Soybean Board<sup>11</sup>.

<sup>10</sup> The present report does not include an extensive review of port fees. However, the international comparisons show that this remains an important area for future research.

<sup>11</sup> *America's Locks & Dams: A Ticking Time Bomb for Agriculture*, Report prepared for United Soybean Board by the Center for Ports and Waterways, Texas Transportation Institute and Texas A&M University (December 2011).

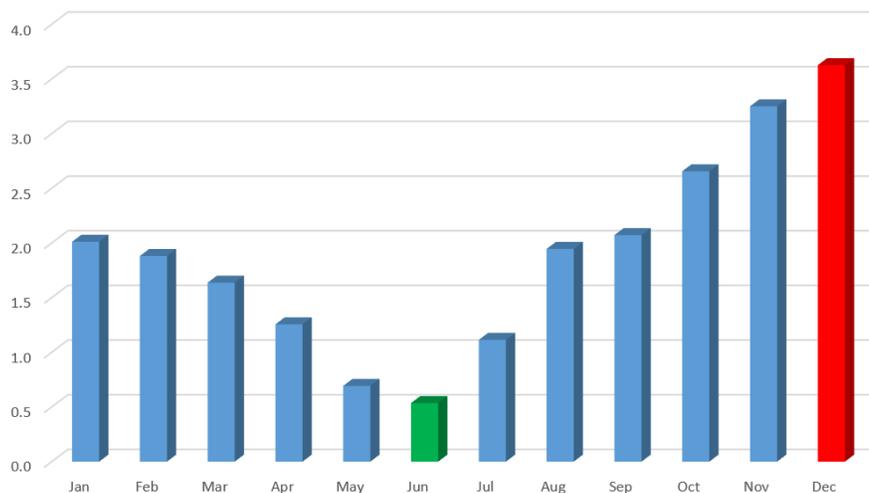
**Figure 7. Grain transport costs in Ukraine (US\$/ton)**



Note: The cost is calculated for the route Kremenchug – Mykolaiv.  
Source: Nibulon.

**The extensive use of road transport is in part driven by its flexibility, but also by the lax application of road freight rules.** Ukraine’s road network is well developed, while truck operating companies provide grain producers with a sizeable truck fleet. Most importantly, the use of roads is highly subsidized and there is insufficient enforcement of weight controls. In fact, due to poor enforcement of controls (e.g. lack of appropriate weighting stations and corruption) truck overloading in excess of 50% above the maximum allowed is common. This lowers the cost per unit and increases the range of profitability. However, overloading damages the road network, and thus shifts part of the cost on the taxpayer. In addition, road transport is also a source of pollution and reduced traffic safety.

**Figure 8. Seasonality of railway grain transportation in Ukraine (2013, million tons)**



Sources: Ukrzaliznytsia; CFTS calculations.

**In addition to annual variability, grain logistics in Ukraine face pronounced seasonality** (Figure 8). Barley and wheat are harvested in July and August, sunflower and corn between September and November. As a result, most of the transport takes place in autumn and winter, with June and December representing the two yearly extremes: the volume of grain transport in June amounts to merely 0.5 million tons, while the December volume is seven times larger at 3.5 million tons. Such pronounced variability of transport demand throughout the year has important implications for the investment and operation of logistics and its overall costs.

**Yet the difficulties facing grain logistics in Ukraine extend beyond the present-day high costs.**

Projections of growth in production and exports outline a future where Ukraine's transport and storage capacity will soon be inadequate to manage increased volumes of grain. The current storage capacity of 41 million tons was sufficient to handle production and exports in 2014, yet it was insufficient to enable farmers to align selling dates to best market prices – with increased volumes the pressure on faster turnaround and immediate sales will only increase. Similarly, rail infrastructure was able to process the 2014 volumes, yet outdated grain hoppers will need to be substituted or rehabilitated to avoid shortages in the future. Without appropriate investment, poor logistics will soon become a bottleneck to sector development.

*Without appropriate investment, poor logistics will become a bottleneck to sector development, rather than a vehicle of trade facilitation.*

## II. ADDRESSING A DUAL CHALLENGE: REMOVING INEFFICIENCIES AND INCREASING CAPACITY

**Grain logistics in Ukraine therefore faces a dual challenge.** On the one hand, present-day costs are undercutting farmers' incomes and hurting investment. On the other hand, projected future volumes of grain production and trade will overload the capacities of the current logistics infrastructure, if these remains unchanged.

**While no silver bullet is readily available, there is a number of achievable reforms and investments that could drive a positive change.** Five key components of a balanced package of reforms and investment would put the sector on a sustainable path: (i) improved regulatory environment (ii) greater use of river transport; (iii) the removal of inefficiencies in rail transport and increase of its capacity, (iv) effective road asset management and investment in access roads to ports; and (v) increased storage volume and operational performance.

### i.) GRAIN LOGISTICS REGULATIONS

**Grain storage, handling, and trading regulations were recently simplified, also thanks to World Bank Group support.** Specifically: (i) the mandatory requirement to register export contracts with the Agrarian Exchange was eliminated in October 2012; (ii) certification of grain quality and grain storage services was made voluntary and without an expiry date, and obligatory grain certification for inland shipments was cancelled in April 2014; and (iii) issuance of plant quarantine certificate for domestic movement from one quarantine zone to another became voluntary in March 2015, while the time to issue the quarantine certificate (for domestic movement) and phytosanitary certificate (for exports) was reduced from 5 days to 24 hours after loading the transport vehicle. The International Finance Corporation (IFC) estimates that the above simplifications will generate an annual cost compliance saving of almost US\$160 million.

#### a. *Complex certification procedures*

**Work is undergoing to improve the *Law on Plant Quarantine*.** This will: (i) introduce risks analysis for adopting phytosanitary measures; (ii) bring phytosanitary inspections to production sites (i.e. at the farm); (iii) introduce traceability; and gradually (iv) outsource phytosanitary controls to the private sector; (v) eliminate import quarantine permits, and (vi) focus domestic measures to the requirements of the importing country. The World Bank Group is supporting this work.

#### b. *Outdated documentation management*

**The use of Information Technology for processing documentation in Ukraine is scarce, making the handling of paper transport documents costly and time consuming.** For instance, railway

grain shipments are accompanied by electronic copies of documents in addition to original papers. However, sea ports require original hard-copy papers to receive grain from hoppers, which requires additional time for the administrative process to be completed. Paper-less electronic interchange of data between railways, customs, transport operators/freight-forwarders, ports, and other stakeholders, could be further developed to collect, process, and exchange data and permits.

### *c. Perception of corruption*

**Addressing corruption is a key challenge for Ukraine.** According to the Transparency International's Corruption Perception Index, Ukraine ranked 142<sup>nd</sup> out of 175 countries in 2014. Reducing the compliance costs by simplifying grain logistics regulations would also reduce the opportunities for corruption. The Government of Ukraine is addressing this problem and the two ministries directly involved in grain logistics – the Ministry of Infrastructure and the Ministry of Agricultural Policies and Food – have been ranked as the two public institutions most open to reform.<sup>12</sup>

### **ii.) RIVER TRANSPORT**

**The quantity of commodities transported on inland waterways in Ukraine has dramatically diminished since independence.** If 66 million tons of goods were transported on rivers in 1990, by 2013 the amount dropped to a meagre 4 million tons. There is a set of reasons why such a drastic drop has occurred, but at present the most important task is to assess the potential of river transport to meet current and future needs of Ukraine's agriculture and other industries.

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<sup>12</sup> The ranking of 19 ministries/public institutions was conducted by a platform of organizations (VoxUkraine, Kiev School of Economics, Index of Monitoring Reforms, Reanimation Package of Reforms, and the Reform Support Centre) in March 2015, after the new Government's first 100 days in office. The ranking is based on a mix of public perception and experts' opinions.

**Table 2. SWOT analysis of River Transport in Ukraine**

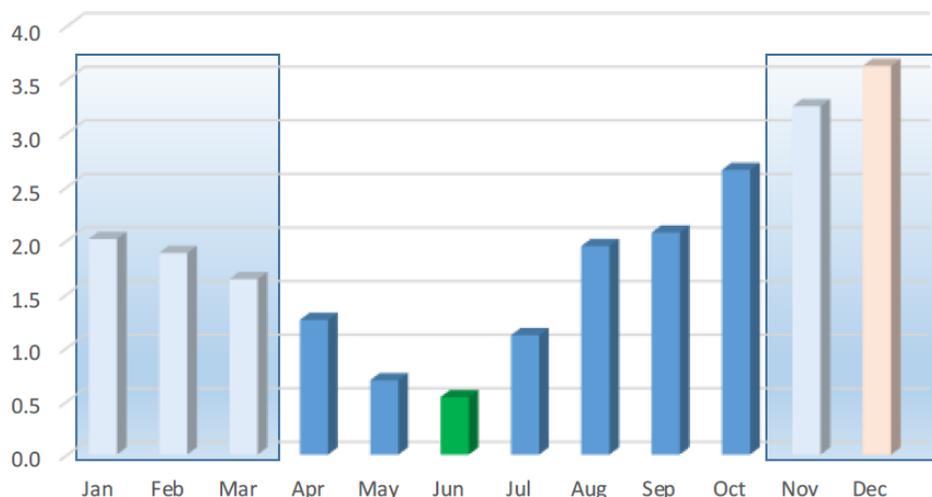
STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>• Lowest unitary cost</li> <li>• Old tradition</li> <li>• Environmental efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Unclear public/private roles</li> <li>• Outdated infrastructure and management</li> <li>• Challenging organization</li> <li>• Due to freezing, navigation is prohibited in winter, when demand is highest</li> </ul>
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>• Potential to increase efficiency</li> <li>• Change in tariffs technically relatively simple</li> <li>• Improved regulation can improve quality of services even without significant investments</li> </ul>	<ul style="list-style-type: none"> <li>• Outdated infrastructure requires significant investments</li> <li>• Tariffs and operations create obstacles to private sector investment</li> </ul>

**The increase in river transport is key to a sustainable grain logistics mix of the future.** As mentioned earlier, despite river transport being the least expensive option, currently only 3% of grain are delivered to ports by barges. A number of obstacles remain in the way of increasing the volume moved by rivers, the most important ones are outlined below.

*a. Limited navigation period on the Dnipro River*

**Because of freezing, the navigation on Dnipro River is currently prohibited in winter months.** The upper river locks are closed from November to the end of March, while navigation in the lower part is closed from December to beginning of March. Coincidentally, the period of navigation closure is also the period with the strongest grain transport demand, when 55% of annual grain are transported by rail. Yet, recent trends in winter average temperatures show that navigation in winter could be extended, or managed according to real weather conditions. According to companies operating on the Dnipro River, the navigation period of the 2014-15 winter could have been extended by almost two months.

**Figure 9. The current navigation ban and grain transport volume on railways**



Note: The shaded part marks the months during which the navigation ban is in effect on the Northern part of Dnipro River (million tons of grain per month, 2013).

Sources: Ukrzaliznytsia; CFTS calculations.

### *b. Limited availability of barges*

**The existing stock of barges capable to transport grain is limited.** The main company that offers river transport in Ukraine is the Joint Stock Shipping Company (“*Ukrriichflot*”) with declared capacities to move 0.6 million tons per year – not enough to transport even 1% of the grain harvest in Ukraine. The company Nibulon, one of the largest domestic producers and exporters of agricultural products, runs its own fleet of barges and declares the transportation of 1.3-1.5 million tons per year. However, Nibulon only transports its own cargo.

### *c. Obstacles to foreign vessels’ access to Ukraine’s inland waterways*

**The access of foreign vessels to inland waterways of Ukraine is hampered by the requirement that foreign vessels need to obtain a permit every single time they enter river ports of Ukraine.**<sup>13</sup> In addition, the structure of port fees does not favor the use of special “river-sea” vessels (i.e., smaller vessels that can navigate both sea and rivers). These could be used to bring cargo from Ukraine’s inland to the interior of some destination countries (e.g., inside Egypt through the Nile river). These type of vessels can be very efficient in the Dnipro-Nile River Corridor or similar ones. However the port fees that vessels need to pay is fixed (i.e., unrelated to the vessel size). Since river-sea vessel have small tonnage, their port fee per unit of cargo becomes prohibitive. These, and similar, obstacles in practice prevent the foreign fleet from operating on inland waterways in Ukraine. Since there is *de facto* no domestic river fleet, this protective measures damage traders without any benefit.

<sup>13</sup> Depending on the vessels type, a one-time permit may cost between US\$300 and US\$600.

#### *d. Sub-optimal provision of pilotage services*

**There are dangerous navigation areas along the Dnipro River where piloting is necessary to get the vessels safely through.** At present, pilotage services on inland waterways are only provided by a single state-owned company. Its clients report problems due to rigid service provision and high tariffs.

#### *e. Dnipro's shallow river bed*

**Dnipro's river bed has not been properly maintained and is in some locations unfit for safe navigation.** There are currently at least five spots on the Dnipro where the river bed is too shallow for barges/vessels with a carrying capacity of more than 3,000 tons. Navigation conditions need to be improved by dredging or other engineering interventions (groins/sills).<sup>14</sup>

#### *f. Poor public infrastructure and provision of public services*

**There are six locks and two movable bridges along the Dnipro that are in poor technical condition and would require repair.** Poor maintenance of locks hampers navigation and constitutes an environmental risk. In addition, movable bridges open at a prohibitive costs that range between US\$1,000 and US\$2,000 for a single passage. In addition to lowering the fee, a fixed schedule for openings should be considered, as this would facilitate planning and lower costs.

#### *g. Limited river elevator and storage capacities*

**Since river transport has become of marginal importance, little investment has been made into river elevators and storage infrastructure.** As a result, only 3.8% of the total storage capacity is at present connected to the river transport network.

### **iii.) RAIL TRANSPORT**

**Railways are currently the most widely used means for grain transport, yet considerable scope for improvements remains.** Ukraine has the 13<sup>th</sup> largest railway network in the world that can easily absorb the transportation of grains to sea ports and across land borders. The main

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<sup>14</sup> Groins and sills are both hydraulic structures that alter the pattern of river flow (or sea movements). When man-made, groins are usually constructed from wood or stone in order to limit the impact of currents and waves on the coast, preventing erosion and opening the coastal area to multiple-use. Sills are river (or sea) bed barriers that also limit the strength of waves or currents and thus limit water movement and prevent erosion and siltation.

challenges ahead of the sector are the renewal and expansion of the fleet, as well as the liberalization of infrastructure.

**Table 3. SWOT analysis of Rail Transport in Ukraine**

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>• Low unitary cost<sup>15</sup></li> <li>• Good rail network</li> <li>• Large market share for grain at 61%</li> <li>• Established tradition</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of competition in railways freight services</li> <li>• Organizing and managing a large network of railways with several purposes is challenging</li> <li>• Tariffs do not create incentives for private investment</li> <li>• Seasonal demand for infrastructure</li> </ul>
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>• Potential to increase efficiency and hence modal share through non-discriminatory and transparent pricing</li> </ul>	<ul style="list-style-type: none"> <li>• Outdated infrastructure requires significant investment</li> <li>• Slow pace of reforms</li> </ul>

*a. Hindered access to grain hoppers*

During the months when most grain is transported, there is a shortage of supply of grain hoppers operated by the State Administration of Railways Transport of Ukraine (*Ukrzaliznytsia* or **UZ**). Delays are common and allegedly sometimes unofficial payments are required. This is accentuated by inefficient loading/unloading infrastructure next to railways, resulting in slower loading/unloading operations. Outdated loading equipment can load/unload around 5 hoppers per day – while modern equipment can manage more than 50 – and long turnover time increases grain hoppers shortages.

*b. High average age of an obsolete grain hopper fleet*

**The UZ fleet is old and in need of renewal or rehabilitation.** The average age of grain hoppers in is 27 years, while the standard operation period is 30 years. According to the UZ plans, 82% of the current fleet is to be disposed during 2014-2019, unless major capital investments are undertaken. There are other private providers, but these control a much smaller fleet (17% of the total volume available). Because of limited access to UZ grain hoppers, private owners expanded their fleet during 2013-2014 by adding almost 1,400 new grain hoppers, yet a much

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<sup>15</sup> Railway shipments are normally used on longer transportation legs – when the transport distance is shorter than 200 km, the cost of rail transport in Ukraine start to become similar to those of road transport. However, due to truck overloading, these division lines are blurred, as the costs of road transport can be competitive even within a range of 600 km, if weight rules are broken. The difficulty to use rail transport has gradually increased the share of grain transported on road and the distance when trucks are used.

larger expansion is required to meet future needs and renew the obsolete fleet. These private sector investments have emerged largely due to the difficult and non-transparent access to UZ hoppers, as mentioned above, and poor service provided by UZ.<sup>16</sup>

### *c. Tariffs discourage private investments in grain hoppers*

**The current railway tariffs for private hoppers are higher than those for UZ-owned hoppers.** Tariffs for the use of private hoppers are US\$3-7/ton higher than for UZ hoppers and thus discourage further expansion of the private fleet. According to economic logic, the tariff pricing should be reversed: the tariff paid to UZ for transport service using private fleet should be lower than the tariff to use UZ-owned hoppers.<sup>17</sup> However, until the tariff-setting process is market-based, transparent, and non-discriminatory, it remains difficult to draw conclusions on the current disparities. The new draft of the Railway Law gives reason for optimism, as it requires non-discriminatory access to railway infrastructure and facilities.

### *d. Lack of tariff flexibility*

**Grain transport tariffs are fixed for the entire year.** However, the amount of grain transported throughout the year varies considerably: the transported volume in December is usually seven times larger than in June. Introducing “seasonal” tariffs that would account for these differences could create incentives for a more evenly distributed use of the infrastructure and for investments in storage. Flexibility can also facilitate tariff negotiation: for instance, reducing the January-June tariff by 20% while increasing it by 10% during July-December would generate the same annual revenue for UZ, yet create incentives to transport more during the low season, when railways infrastructure is underutilized.

#### **Box 1. The ongoing reforms at *Ukrzaliznytsia* (UZ)**

*Ukrzaliznytsia* (UZ) is the State Administration of Railways Transport of Ukraine and transports approximately 260 billion ton-km of freight and manages around 450 million passenger trips each year. The Ukrainian railways are the world’s 6<sup>th</sup> most densely operated railway, measured as the sum of ton-km and length of passengers travel. UZ is also the largest employer in Ukraine with about 350,000 staff.

UZ is subordinated to the Ministry of Infrastructure and is the managing body for state owned entities engaged in provision of railway transport services and infrastructure in Ukraine. There is significant underinvestment, with 70% of the rolling stock purchased in the 1980s and urgently needing

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<sup>16</sup> Private investment in grain hoppers occurred despite the fact that tariffs for private hoppers are higher than tariffs for UZ hoppers.

<sup>17</sup> The tariff for private hoppers is reportedly higher because it includes the charge for the “empty run”, while UZ hoppers are exempt from it.

replacement. Railway transportation tariffs are relatively low as they are state controlled, and passengers' tariffs are subsidized at expenses of freight tariffs.

The Government of Ukraine (GoU) has embarked on a major reform to modernize UZ. The reforms seek to increase railways efficiency through automation, right sizing of assets, restructuring of assets and reorganization of service delivery. A Reform Law for the Railway Sector was adopted by Parliament in 2013 enabling the creation of a joint stock company for public railway transport. GoU has developed a three-stage reform plan. The first stage, which is currently ongoing, involves a massive restructuring whereby the six current regional units of *Ukrzaliznytsia* will be merged into one legal entity along with 80 support enterprises including medical, educational and other support units. The new entity will be constituted as a state owned Joint Stock Company.

With respect to non-core assets, UZ has almost completed the transfer of over 100 medical facilities from UZ to GoU, with only about 10 profitable hospitals and clinics remaining under the control of UZ. The focus is now shifting to the ownership, operation and management of non-profitable regional passenger services and overall sectoral/corporate governance. In order to maintain its important role in grain logistics and to increase rail share of grain transport, the UZ needs to evolve into a commercially-oriented company providing reliable and high quality services.

#### iv.) ROAD TRANSPORT

**Due to its flexibility, grain road transport has been increasing significantly.** Ukraine has a dense network of roads, which are paved to a very large extent (95%). Road transport remains key in the first stage of transport (from field to first storage), yet it is also able to compete on longer distances, partly due to poor enforcement of road freight rules. The main challenges of road transport call for improved management of public roads and targeted investment into new infrastructure.

**Table 4. SWOT analysis of Road Transport in Ukraine**

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>• Good road network</li> <li>• Developed truck industry</li> <li>• Flexible management of trucks</li> <li>• Simple small investments</li> <li>• Free infrastructure (good for users, bad for the public purse)</li> </ul>	<ul style="list-style-type: none"> <li>• High unitary cost</li> <li>• Modern, larger trucks require modern supporting infrastructure (e.g. longer weighing stations)</li> <li>• Relatively high maintenance costs for roads</li> <li>• Old truck fleet</li> </ul>
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>• Potential to increase efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term damage to the road network</li> <li>• Poorer road safety and greater environmental impact</li> </ul>

- High interest rates and persistent budgetary deficit make constant investments challenging

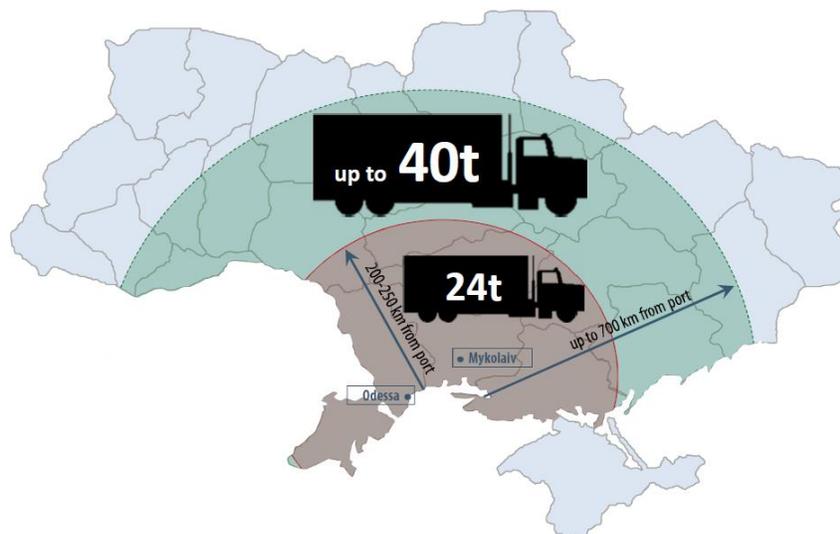
#### *a. Truck overloading and related damage to public roads*

**Truck overloading is common, since enforcement of axle-load limitations is lax.** As a result, excessive load is damaging public roads, while also extending the competitiveness of road transport to longer distances than would be the case if rules were strictly applied (Figure 10).

#### *b. Poor access roads to ports and roadside services*

**Access roads to several river and sea ports are in poor condition.** There is also a shortage of parking/waiting space and rest areas for trucks near the ports. In the absence of bypasses of towns in several routes, grain truckers traverse through urbanized areas, which has its impact on time and cost, but also on road safety, social and environmental issues.

**Figure 10. The extension of profitability of road transport through increased load**



#### **v.) STORAGE**

**Insufficient and outdated storage facilities are a key weakness of grain logistics.** While there are numerous providers, most of the facilities are outdated, particularly in terms of complementary infrastructure such as loading and unloading facilities, drying, weighing stations, and testing. They are also insufficient as they can accommodate only about half of the annual grain production.

**Table 5. SWOT analysis of Storage Infrastructure**

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>• Network of 1,200 warehouses distributed across the country</li> <li>• 27% of these are independent</li> <li>• Overall competitive service provision (with some localized exceptions)</li> <li>• High turnover in private elevators</li> </ul>	<ul style="list-style-type: none"> <li>• Storage capacity in place only for half annual production</li> <li>• Large share (46%) of obsolete flat/floor storage</li> <li>• Outdated complementary infrastructure: loading/unloading and drying equipment, testing equipment and weighing stations</li> <li>• Excessive State involvement in grain markets</li> <li>• Low turnover in state-owned elevators</li> </ul>
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>• Production increase will drive the need for quality storage</li> <li>• High rate of return in ports create incentives for the development of port infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Limited private sector investment capacity</li> <li>• Low rate of return, especially in facilities close to production</li> <li>• Some localized monopolies may drive storage costs up</li> </ul>

*a. Outdated storage facilities*

**Many storage facilities have been designed and built 50 years ago or more.** As a result, (i) they are unable to accommodate modern large-sized trucks, (ii) they often consist of floor storage (46% of total storage in Ukraine) that undermines quality and increases costs, (iii) they are equipped with old and energy inefficient dryers, as well as with outdated weighing, sampling and testing equipment. To put things into perspective: modern loading/unloading equipment can load a train of 54 hoppers in one day, while most facilities need up to 10 days to load the same train. In practice this means that 54 hoppers are blocked unnecessarily for 9 days, increasing costs and contributing to hoppers deficits during peak demand times.

*b. Insufficient capacity to time sales and accommodate increased grain production*

**The current capacity of grain warehouses is about 41 million tons which represented around 56% of the 2013 total grain production in Ukraine.** The challenge in this case is twofold. First, due to a lack of storage, the timing of sales is more difficult – if storage was easily available (and affordable), producers could time their sales better to get the best price for their grain. At present, they simply sell as soon as the grain is ready for export. Second, future projections show that the current storage volume (and the type of facilities) will become a significant bottleneck if capacity is not increased.

### *c. State involvement in grain markets*

**Two State Owned Enterprises (SOEs) play an important role in grain marketing and logistics: the State Food and Grain Corporation and the Agrarian Fund of Ukraine<sup>18</sup> (also called the Intervention Fund).** Both of them suffer from an unclear mandate, lack of transparency, which contributes to the perception that pervasive state involvement in grain marketing fuels corruption. Both SOEs own significant assets (10% of certified storage facilities, 12% of port grain terminals), have important liabilities, and continue to drain public expenditures.

**The appropriateness of public sector investments through the SOEs to address the inefficiencies outlined above, is questionable.** Rather, the public sector could strengthen the incentives for private sector investments. Storage facilities are not a public good where the rationale for public intervention would be justifiable.<sup>19</sup> Therefore, private sector investments are likely to be more efficient – this particularly holds for Ukraine where the private sector is quite strong and the public sector suffers from important institutional weaknesses.

### *d. Lack of information on storage facilities*

**At present, there is no system to monitor quantity and quality of grain storage in Ukraine.** Before April 2014, the government administered a system of storage registration that had a partial database of storages authorized to provide services to third parties (i.e. excluding those storages not authorized to provide third parties services). Following reforms adopted in April 2014, the system has been abolished, but policy-making would benefit from regular surveys.

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<sup>18</sup> At the moment there are two Agrarian Funds of Ukraine: (i) the State Joint Stock Company 'Agrarian Fund of Ukraine' and (ii) the State Budget Agency 'Agrarian Fund of Ukraine'. Only the 'Agrarian Fund of Ukraine' is functioning at the moment, while the State Budget Agency is virtually bankrupt and will be liquidated. For simplicity of discussion, we do not distinguish in this paper between the two enterprises.

<sup>19</sup> A public good is defined in economic terms as both non-rival and non-excludable.

### III. PRELIMINARY INVESTMENT PACKAGES

A preliminary evaluation of investment options to improve grain logistics was undertaken for three key areas<sup>20</sup>: (i) river infrastructure; (ii) grain hoppers for railways; and (iii) grain storage facilities and equipment. These preliminary estimates are not based on site-specific investments and only provide a first level of approximation whose main conclusion is that Economic Rates of Return (ERR) for all three packages are solid. The packages include estimates for the main economics costs and benefits, however, not all costs and benefits have been quantified. A more detailed economic analysis should be carried out

The packages were developed in order to respond to an earlier request by the Ministry of Agriculture to invest in grain hoppers and because of diverging opinions on the importance of various bottlenecks. While the estimates show that the needs are higher for storage than river and railways, the ERR for the three packages are similar.<sup>21</sup> This implies that all main components of grain logistics face challenges and attempting to address only one of them will not be sufficient to address the problem in its complexity.

#### PACKAGE #1: Improvement of river infrastructure

**The first package is based on the premise that shifting greater volumes of grain towards river transport would help the profitability of the sector and relieve some of the pressure from roads and railways.** The rehabilitation and improvement of river infrastructure can lead to an increase of river transportation volume of export grain from the current 1-1.5 million tons per year to 7 million tons by 2022. The investment plan is built on the following assumptions: (i) the use of road transport services, and to a lesser extent rail, will decrease; (ii) the grain loading/unloading capacities next to rivers will require strengthening; (iii) cabotage shipping of grain on the river will increase; (iv) traffic on roads to river ports will increase.

**Table 6. Overview of the first investment package: river transport**

RIVER INVESTMENTS		
<i>Activity</i>	<i>Amount</i>	<i>Public / Private</i>
River bed dredging <sup>22</sup>	US\$10 million	Public or Private
New or improved river ports with grain terminals	US\$270 million	Private
New river barges and tugboats <sup>23</sup>	US\$300 million	Private
Repair / construction of roads leading to new or existing river terminals	No estimate	
Cargo handling infrastructure for sea to river vessels loading/unloading	No estimate	

<sup>20</sup> The chapter was drafted by Kairat Nazhmidenov of FAO

<sup>21</sup> The economic rate of return (ERR) takes into account all economic benefits and costs for the whole economy (society) of the country while the internal rate of return (IRR) takes into account only the financial benefits (revenues) and costs for a concrete enterprise or investment project. ERR usually includes IRR, but with deduction

<sup>22</sup> The assumption in this case is that works will start in 2017, gradual increase in freight traffic on the river will begin in 2018 and that the full economic benefits will be achieved in 2022.

<sup>23</sup> The cost of a barge is estimated at US\$1 million and a tugboat at US\$4 million. The assumption is that 100 barges and 50 tugboats will be required to handle the transportation of additional 5.5-6 million tons of grain.

Lower navigation tariffs	No estimate	
<b>Total</b>	<b>US\$580</b>	
<b>ECONOMIC BENEFITS</b>		<b>ECONOMIC COSTS</b>
Increase in river transport by 5.5-6 million tons of grain at lower rates than road or rail by 2022 (about US\$38 million per year)	Increased costs for maintenance of those roads facing growing use due to transport from field to river terminals (no estimate)	
30% reduction in costs associated with road damage by 2022 (about US\$28 million per year)	Less longer-distance road transport will result in economic costs for operators and unemployment – likely mitigated by the increase in demand for shorter-distance transport	
15% reduction in load on the railway infrastructure by 2022 and thus associated costs, due to lower volume of grain transported by rail (estimated at about US\$0.5 million per year)		
Mitigation of grain hoppers deficits in peak months will lead to reduction in costs associated with delays		
Spillover benefits from river infrastructure investments to other economic areas		
Local (pollution) and global (GHG emission reduction) environmental benefits due to shifting the transport mode from roads to railways		

**The preliminary economic assessment of the first investment plan shows that it would yield a good economic return.** The ERR is estimated at 21% – well above the discount rate of 12%, the Economic Net Present Value (NPV) at US\$241 million over a 20-year period and the Benefit/Cost Ratio (BCR) at 1.7 in the “base case”. However, in case the navigation period on Dnipro River is extended allowed in November and in March (increasing river grain transportation of grain by another 2 million tons), the overall return would be even better, as the ERR would increase to 24%, the NPV to US\$337 million and the BCR to 1.9.

**PACKAGE #2: Optimization of railway tariffs as incentive for private investment**

**The second investment package assumes that a new system of railway tariffs would be put in place whereby tariffs would be market-based, transparent and non-discriminatory and would lead to private sector investment in the purchase of 8,500 new hoppers.**<sup>24</sup> The share of grain transported by rail would grow from the current 61% to about 75% by 2022. In this case, it is assumed that the share of cargo flow on the roads will be reduced from the current 36% to about 22% by 2022. The volume of grain exports transported by private grain hoppers/railway

<sup>24</sup> The estimated number of hoppers required would be lower if better utilization of hoppers during the summer season is achieved.

companies will grow from the estimated 3 million tons/year to about 10-11 million tons/year by 2022. It is assumed that the volume of grain moved by UZ grain hoppers will increase by about 3 million tons (from current 12 million tons to 15 million tons by 2022).

**Table 7. Overview of the second investment package: rail transport**

<b>RAILWAY INVESTMENTS</b>		
<i>Activity</i>	<i>Amount</i>	<i>Public / Private</i>
Investments in the purchase/construction of about 8,500 grain hoppers	US\$640 million	Mostly private
Repair/construction of some roads leading to the railway terminals used by private railway companies.	No estimate	Mostly private
Some volume of investments in the construction of new and expansion/improvement of existing railway stations/terminals to enhance access to the railway by the private railway companies.	No estimate	Mostly public
Some volume of investments in the development of loading /unloading infrastructure that takes loads from the railway in seaports.	No estimate	Public/private
Optimization of UZ tariffs for grain transportation.	No estimate	
Overhaul (maintenance) of existing grain hoppers.	No estimate	Public
<b>Total</b>	<b>US\$640 million</b>	
<b>ECONOMIC BENEFITS</b>		<b>ECONOMIC COSTS</b>
The volume of grain transported by railways by private grain hoppers increases from the current 3 million tons to 10-11 million tons by 2022	Some increase of railway traffic will lead to an increase in the cost of railroad repair and maintenance.	
Reduction of road repair and maintenance costs due to lower volume of grain transported by about 1 million tons (i.e. from the current 9 to 8 million tons by 2022).	The decline of grain transported by road will negatively affect some truck companies and increase unemployment among drivers	
Increase of the availability of grain hoppers and optimization of their turnover, which in turn will lead to the growth of revenues of grain traders and producers due to more timely deliveries		
Growth of general economic activity due to improvement in road conditions		
Local (pollution) and global (GHG emission reduction) environmental benefits due to shifting the transport mode from roads to railways		

**The preliminary economic analysis of the second package focused on railways shows that it also has a potentially solid ERR.** The estimated ERR in this case is 21%, well above the discount rate of 12%, while the economic NPV is US\$177 million over a 20-year period. The BCR estimate is greater than one.

### PACKAGE #3: Improvement of storage infrastructure

**An important conclusion emerging from the background studies is that storage capacity in Ukraine is insufficient.** For example, the necessary storage capacity is at the level of 64.6 million tons (2013 estimate), however the capacity of the existing certified storages was only 52% contained within more than 1,200 elevators/grain storages with a total capacity of more than 41 million tons. Floor storage warehouses, with a low level of mechanization and automation, account for approximately 46% of the total grain storage capacity. The third package thus considers the investment in the improvement of existing elevators/grain storages and construction of new ones in order to improve storage operations and capacity.

**Table 8. Overview of the third investment package: storage infrastructure**

STORAGE INVESTMENTS		
<i>Activity</i>	<i>Amount</i>	<i>Public / Private</i>
Construction of new elevators/grain storages for a total capacity of newly constructed elevators of 6.4 million tons. Improvement of existing elevators in terms of loading and unloading facilities, weigh stations, testing, and drying facilities. The share of the flat/floor storages will be reduced from current 46% to 25% by 2022.	US\$1,500 million	Mostly private
Repair / construction of the roads leading to the upgraded and new elevators/grain storages.	No estimate	Public/private
Construction of new and expansion/improvement of the existing railway stations/terminals.	No estimate	Public/private
<b>Total</b>	<b>US\$1,500 million</b>	
ECONOMIC BENEFITS		ECONOMIC COSTS
Reduction of grain losses (1% losses in new elevators compared with 15% losses in flat/floor storages). Up to 0.6 million tons of grain will be saved every year thanks to these investments	Increase of costs on repair and maintenance of some parts of the roads due to increased volume of cargo transportation to the new and improved grain elevators.	
Economic and environmental benefits to increased energy efficiency for grain drying		
Improvement of the quality of stored grain as a result of application of improved technologies for drying and storing grain		

The preliminary estimates of the third investment package focused on storage result in an ERR of 24%, economic NPV of approximately US\$485 million and a positive BCR of 1.6.

**The three packages chosen for preliminary assessment all produce similar estimated economic rates of return - ranging from 21% to 24%, in all cases higher than the discount rate of 12%.** The economic NPV for all scenarios is positive and the BCR is well above one. It is important to note

that these are not mutually exclusive, but complementary packages and their simultaneous implementation would bring the best outcomes.

**Table 9. Summary of the three investment packages**

	Package #1 <b>Improvement of River Infrastructure</b>	Package #2 <b>Investment in Grain Hoppers</b>	Package #3 <b>Improvement of Storage Infrastructure</b>
Direct benefits	Shifting transportation from road/railways to river from 1.5 million tons per year to 7 million tons by 2022 would save resources and reduce costs	Shifting transportation from roads to railways from 3 million tons to 10 million tons by 2022 would save resources and reduce costs	Reduction of grain losses under storage (from the current 15% to 1%) in 6.4 million tons of new elevators. Up to 0.6 million tons of grain saved every year
<i>Base Case</i>			
Necessary investments (public/private)	US\$580 million <ul style="list-style-type: none"> <li>• rivers dredging</li> <li>• river grain terminals (private)</li> <li>• river tugboats and barges</li> <li>• public incentives: e.g., river tariff optimization, tax exemption</li> </ul>	US\$640 million <ul style="list-style-type: none"> <li>• grain hoppers</li> <li>• public incentives: e.g., tariff optimization, tax exemption</li> </ul>	US\$1,500 million <ul style="list-style-type: none"> <li>• grain elevators</li> <li>• public incentives: tax exemptions</li> </ul>
ERR	21%	22%	24%
ENPV	US\$241million	US\$177 million	US\$485 million
BCR	1.7	1.5	1.6

## CONCLUSIONS AND RECOMMENDATIONS

**The production and exporting of grains in Ukraine have made significant progress over the recent years.** Ukraine has become a leading global exporter of maize, barley, wheat, as well as sunflower seeds and oil. Ukraine is a major supplier to countries in the Middle East, North Africa and even Asia. So far, the negative impacts of the events of 2014 and the ongoing crisis have been limited and projections of future growth of grain exports remain high.

**Despite the overall positive headline achievements, the grain sector in Ukraine continues to suffer from inefficiencies along the supply chain.** As a result, Ukrainian grain producers receive a much lower share of the market price than their counterparts in the US, Canada or even Kazakhstan. Estimates of foregone revenue that grain producers have to cope with range from US\$600 million to US\$1,600 million per year. Diminished incomes on such a scale have important negative implications for investments in the sector and therefore its future performance and competitiveness.

**Logistics is an important cause of these inefficiencies.** There are several important drivers of high costs facing grain producers: (i) regulatory measures that increase transport costs; (ii) underutilization of river transport; (iii) poor management of rail transport; (iv) high share of road transport in the overall mix; and (v) sub-optimal storage management. These require a holistic response in order to preserve positive growth, stimulate investment and remove inefficiencies.

**In addition to present-day costs, the limited capacity of the transport and storage systems is projected to become an important bottleneck.** In fact, forecasts of growth in production and exports outline a future where Ukraine's transport and storage capacity will soon be inadequate to manage increased volumes of grain. The current storage capacity was sufficient to handle production and exports in the boom 2014 production, yet it was insufficient to enable farmers to align selling dates to best market prices. Similarly, rail infrastructure was able to process 2014 volumes, yet outdated grain hoppers will need to be substituted or rehabilitated to avoid shortages in the future.

**These challenges call for a comprehensive and balanced reform and investment agenda that will improve public infrastructure and remove barriers to investment.** Research points to five key areas that would improve grain logistics and put the sector on a sustainable path through a combination of investments and regulatory changes. The main goal of the proposed Action Plans of reforms and investment is to develop a multimodal transport infrastructure which does not focus only on railway and roads, but also taps the potential of river transportation and implements regulatory improvements.

## i.) GREATER USE OF RIVER TRANSPORT

**At present only 3% of exported grain is transported on rivers, yet rivers in Ukraine offer a formidable opportunity to transport bulk agriculture products reliably and at low cost.** Investments in river dredging, additional barges and tugboats, as well as in river terminals would contribute to gradually increasing the share of river transport. An overall policy that stimulate river transport requires at least two key regulatory changes. First, the winter navigation ban on Ukraine’s main inland waterway, Dnipro River, should be reviewed and made more flexible in order to reflect real climatic conditions – this would increase navigation opportunities during the key period for grain transport (November – March). Second, the regulatory obstacles on the entry of foreign vessels onto Ukraine’s inland waterways should be relaxed.

**Table 10. Suggested reforms for river transport and ports**

<b>SHORT-TERM REGULATORY IMPROVEMENTS</b>	
1.	<b>Finalize and adopt the Law on Inland Water Transport that is currently under discussion.</b> Such law could foresee the following: <ul style="list-style-type: none"> <li>(a) <b>Allow flexibility in the calendar of river operations</b> → base the river infrastructure closure in the winter on the actual risk of freezing, such as the number of days with temperatures below freezing thresholds, rather than rigidly implementing the current automatic 5-month ban. In addition, the possibility to utilize ice-breakers should be considered.</li> <li>(b) <b>Facilitate access of foreign vessels to Ukraine’s inland waterways</b> → facilitate long term, multi-entry permits for foreign vessels to enter river ports in Ukraine. Base port fees on tonnage, with tariffs to attract foreign sea-river vessels.</li> <li>(c) <b>Reduce the tariffs for pilotage, lock passing, and the opening of moveable bridges</b> → Current high tariffs create disincentives to river transportation and ultimately reduce the revenue of the public enterprise <i>Ukrvodshliakh</i>. Consider fixed schedules for the opening of moveable bridges.</li> </ul>
2.	<b>Review the process of setting sea port fees</b> → At present the port fees in Ukraine appear unjustifiably high – higher than comparable fees in the EU and the US. The fees in Ukraine should be set by a market-based, transparent and non-discriminatory process.
<b>SHORT-TERM INFRASTRUCTURE/CAPITAL INVESTMENTS</b>	
3.	<b>Improve navigation conditions on the Dnipro River</b> → deepen specific spots where river bed is currently too shallow to allow passage of river-sea vessels and barges at full load. Private companies have expressed their readiness to invest and the Ministry of Infrastructure should proactively look at possibilities to set up Private-Public Partnerships in this area.
4.	<b>Expand capacity of port railway stations and improve access to road transport</b> → such investments could increase the amount of trains and trucks accepted at ports and reduce turnaround times (e.g., Odessa-Port station, Chornomorska station of the Yuzhniy port, Mykolaiv-Vantazhniy station of the Mykolaiv sea port, and Zhovtneva station of the Nika Tera sea grain terminal close to Mykolaiv port)
<b>LONG-TERM REGULATORY IMPROVEMENTS</b>	

5. <b>Consider the liberalization of port management</b> → international examples show that the liberalization of port management results in important efficiency gains and lowering of costs, even if the political economy of change is challenging.
<b>LONG-TERM INFRASTRUCTURE/CAPITAL INVESTMENTS</b>
6. <b>Develop outdated river infrastructure</b> → large investments are required to modernize the outdated river infrastructure. The role of public and private sector should be clarified.
7. <b>Expand sea ports capacity to increase cargo flow</b> → port projects with total additional loading capacity of 28.3 million tons are estimated to cost between US\$1.5 and US\$1.7 billion. Authorization of projects by Ministry of infrastructure and other regulatory bodies are mandatory and time consuming.
8. <b>Expand river fleet</b> → this investment should be carried out by the private sector once proper conditions have been established.

## ii.) REMOVING REGULATORY INEFFICIENCIES IN RAIL TRANSPORT AND INCREASING ITS CAPACITY

**Railways are currently the most widely used means of grain transport and improving their management would result in considerable savings.** Three measures are key. First, the access to grain hoppers owned by the largest provider, the state-owned Ukrainian Railways Administration (*Ukrzaliznytsia* or UZ) needs to be ensured on equal terms – at present, certain intermediaries have preferential access due to favoritism and alleged unofficial payments. Second, the railway tariffs should be set through a market-based, transparent and non-discriminatory process to stimulate private investments in grain hoppers. Finally, the aging stock of hoppers requires rehabilitation or substitution to cope with increased volumes of grain exports.

**Table 11: Suggested reforms for rail transport**

<b>SHORT-TERM REGULATORY IMPROVEMENTS</b>
1. <b>Ensure market-based, transparent and non-discriminatory railway tariffs</b> → at present the economic logic behind higher tariffs for the use of private grain hoppers is unclear. Transparency is essential to stimulate further private sector investment in grain hoppers. The new draft railway law currently under consideration requires non-discriminatory access to railway infrastructure and facilities.
2. <b>Introduce seasonal tariffs for grain shipment</b> → given the seasonality of grain transport, seasonal differentiation of tariffs will create incentives for a more evenly distributed use of the infrastructure and for investments in storage.
3. <b>Improve the transparency for grain hoppers allocation</b> → such change would allow increasing the number of freight forwarders and thus increase competition.
4. <b>Improve rail scheduling and notification systems into silos, stations, and ports</b> → this could reduce train queueing, increase of train throughput, and decrease of downtimes.
5. <b>Use a reliable trace and tracking system</b> → this will reduce delays and increase train throughput.
<b>SHORT-TERM INFRASTRUCTURE/CAPITAL INVESTMENTS</b>

6. <b>If the replacement of the grain hoppers at the end of the service life is impossible due to budget constraints, extend its economic life to maximum possible</b> → the normal economic life of a grain hopper is 30 years, the current average age in Ukraine is 27. If full replacement is not possible, a major overhaul (rehabilitation) is essential and needs to be urgently budgeted to avoid shortages during 2014-2019.
<b>LONG-TERM REGULATORY IMPROVEMENTS</b>
7. <b>Develop and implement a railways modernization plan</b> → this would cover rail transport in general, not only grain transport.
<b>LONG-TERM INFRASTRUCTURE/CAPITAL INVESTMENTS</b>
8. <b>Expand railway grain hoppers fleet</b> → this investment should be carried out by the private sector once proper conditions have been created.

### iii.) IMPROVING ROAD ASSET MANAGEMENT AND INVESTING IN ACCESS ROADS TO PORTS

Road transport is an essential element of grain logistics, as it provides the necessary flexibility and carrying capacity. However, its excessive use (and abuse) leads to important external costs: road damage, pollution and decrease in traffic safety and flow. A key challenge for the future of grain logistics is therefore to achieve a sustainable balance between the various modes of transport in favor of less expensive and more efficient transport mode like the river. In this respect, enforcing stricter axle load controls an essential element. However stricter enforcement of existing regulations by itself will negatively affect grain producers and traders, who would have less access to road transport as a flexible mechanism. Such action should be implemented simultaneously with other measures, the combination of which would lead to a structural change toward more transport by more efficient and less expensive railways and river. In addition, targeted investments in access roads to ports deserve attention, as these would improve traffic conditions around ports, especially in congested urban areas.

**Table 12. Suggested reforms for road transport**

<b>SHORT-TERM REGULATORY IMPROVEMENTS</b>
1. <b>Enforce axle load control, including automatic weighing stations (weigh-in-motion) to reduce human flexibility and reduce the risk of corruption</b> → the free use of roads, as opposed to paid railway/river transport, represents a public subsidy to road transport, the least efficient and least environmentally friendly means of transport. Yet, tolerance of overloaded trucks represents an even more distorting public subsidy, as the repair of damaged roads is shouldered by the public purse. A stricter enforcement of axle load control, including with the use of automatic weighing stations to reduce human flexibility, could also contribute to the reduction of corruption risks. <b>If axle load enforcement is not feasible, consider setting up a system for legal payment for limited truck</b>

<p><b>overload</b> → this is not ideal, yet it may be pragmatically preferable to a system with very limited enforcement, which favors corruption.</p> <p>2. <b>Encourage private sector investments to adopt improved truck scheduling and notification for storage and ports.</b></p>
<b>SHORT-TERM INFRASTRUCTURE/CAPITAL INVESTMENTS</b>
<p>3. <b>Identify and improve access roads/parking facilities around ports</b> → some are currently in poor condition or traverse urban centers thus creating traffic issues, which contribute to cost and time inefficiencies.</p>
<b>LONG-TERM REGULATORY IMPROVEMENTS</b>
<p>4. <b>Consider introducing a system of toll roads</b> → to reduce distorting subsidies to road transport.</p> <p>5. <b>Improve the Road Asset Management System (RAMS)</b> → in order to maintain the road network in appropriate condition and improve maintenance (this may require small investments for the creation of RAMS unit and procurement of software and hardware).</p> <p>6. <b>Create incentives for the private sector to invest in higher capacity trucks</b> → the use of larger trucks (such as B-doubles and B-triples in Canada and Australia) has less impact on the road per ton of product transported.</p>
<b>LONG-TERM INFRASTRUCTURE/CAPITAL INVESTMENTS</b>
<p>7. <b>Support local governments' program for funding local, secondary roads critical in the grain supply chain</b> → this would improve road freight efficiency.</p>

#### iv.) INCREASING STORAGE VOLUME AND OPERATIONAL PERFORMANCE

**The current storage infrastructure in Ukraine is technologically outdated and its capacity insufficient.** Old drying, loading/unloading, weighing, as well as testing equipment is energy-intensive and time-consuming, resulting in higher storage-related costs. The example of the loading/unloading equipment is telling: while it can currently take up to 10 days to load a full train (54 grain hoppers), modern storage facilities and equipment can complete the same task within a single day. Investments in storage capacity would thus lead to three further main improvements: (a) they would increase the efficiency of grain hoppers and trucks; (b) they would allow grain producers to better time their sales; and (b) they would reduce post-harvest losses thus making more grain available.

**Table 13. Suggested reform for storage infrastructure**

<b>SHORT-TERM REGULATORY IMPROVEMENTS</b>
<p>1. <b>Establish regular surveys to monitor storing capacity and quality</b> → the collected information would provide basic information to inform the policymaking process.</p>

SHORT-TERM INFRASTRUCTURE/CAPITAL INVESTMENTS
2. <b>Support private sector investments in grain storage</b> → grain storages requires significant investment to be modernized, including replacement of floor storage, improving energy efficiency of grain drying, loading/unloading and testing equipment
LONG-TERM REGULATORY IMPROVEMENTS
3. <b>Consider privatizing or liquidating the State Food and Grain Corporation and the Agrarian Fund</b> → given the lack of clear public role, and the stained image of corrupt institutions, the liquidation or privatization of these institutions would allow redirecting public investments in areas where the role of the public sector is clearer.

#### v.) IMPROVING THE OVERALL REGULATORY ENVIRONMENT AND ADMINISTRATIVE PERFORMANCE

In addition to sectoral reforms and investment, overall regulatory environment and administrative performance require attention. Above all, interventions in this area should focus on policy coordination, better governance, transparency and simplification.

**Table 14. Suggested reforms for regulatory environment and administrative performance**

SHORT-TERM REGULATORY/INSTITUTIONAL IMPROVEMENTS
1. <b>Create a National Grain Logistics Council (NGLC)</b> → the NGLC would be composed of representatives of the Ministries and key stakeholders responsible for planning the National Grain Logistics Strategy, setting its targets and overseeing its implementation. The NGLC would be set up as a partnership between the private and public sector, providing leadership in the industry, advising Government, and promoting improvements. The role of the NGLC would be strategic in nature, to propose the Strategy based on users' and Government's input collected from across the country, as well as to review Grain Harvest Management Schemes and consider continuous improvements in grain supply chain efficiencies. The NGLC could report to the Transport and Agriculture Commissions of the Parliament and would not fall under the authority of any specific ministry.
2. <b>Prepare and implement the Grain Harvest Management Scheme</b> → the scheme would assist industry in complying with limit regulations in the transportation of grain off farms into receiving silos. This would lead to increased transparency, as well as to reduced corruption risks.
3. <b>Set up clear and fast procedures for the issuing of required documents</b> → this measure should cover quarantine documentation, veterinary certificates, GM-content certificate and other documents related to exporting grain. This would lead to reduction in time losses, as well as corruption risks.
4. <b>Improve documents management</b> → the system of document management within and between institutions involved in grain exporting should be improved, so as to decrease waiting time.
5. <b>Ensure key agencies (certification, laboratories and customs) are working 24/7 during the peak season of grain exports (September-January)</b>
6. <b>Assess the needs in certain grain logistics professions</b> → to improve labor market information and to facilitate the matching of skills and needs, as well as to define professional standards and training/certificate programs for the identified professions.

**Tentative investment packages simulated for the purpose of this report indicate solid economic rates of return ranging between 21% and 24% for the largest investments.** If the regulatory environment will provide the right incentives, most of these investments will attract private sector participants. Rather than investing directly (as in the case of the State Food and Grain Corporation) the public sector should focus on removing the barriers to investment and look at possibilities to form Public-Private Partnerships.<sup>25</sup>

**Above all, any set of measures needs to take into account the complexities of grain transport and promote inter-modality.** Isolated measures, such as a stricter enforcement of axle-load restriction, could lead to an additional increase in costs to grain producers, while not necessarily improving logistics or best protect public goods. Similarly, simply lowering tariffs for rail infrastructure use might not achieve as much as differentiated tariffs that would account for seasonality. In fact, lower tariffs in early autumn and higher tariffs during the peak grain transport demand time in winter could provide incentives to invest in storage and thus enable better timing of sales.

**Some of the recommendations in the report are supported by comprehensive research, while others (e.g., railway tariffs structure, port fees and customs) would merit further detailed analysis and should only serve as indications of policy options available.** At present, the imperative is to recognize the challenges facing grain logistics in Ukraine and agree on a comprehensive agenda of reform and investment that would address them. The World Bank Group stands ready to assist the Government of Ukraine in this endeavor.

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<sup>25</sup> In some cases, the private sector in Ukraine is already investing. Private companies such as Nibulon and *Hermes-Trading* are investing in river terminals and barges. In the past two years, a variety of private companies has purchased almost 1,400 grain hoppers (*MTK, Ukrtransleasing, TH Zapadny, Estate Global, Krukiv RCP, Cargill*, etc.). Several private companies are investing in modern storage facilities. However, the pace of these investments is not sufficient to counter the aging infrastructure and the increasing needs indicated by production and export forecasts.