



WORLD BANK GROUP

UKRAINE: UKRZALIZNYTSIA (UZ) MODERNIZATION STRATEGY:

Summary Report: Using Market Opening to
Catalyze Railway Reforms

June 25, 2019

Acknowledgments

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Preface

This Summary Report assembles and distills the main findings and recommendations of five separate Policy Notes that originated in a request from Ukraine's Ministry of Infrastructure (MoI) and state-owned railway company, JSC Ukrzaliznytsia (UZ) to the World Bank to help address specific topics concerning Ukraine's railway sector. The topics were:

1. **Railway market opening for cargo services:** progress in meeting the rail commitments in the EU-Ukraine Association Agreement, reorganization of UZ, Ukraine's readiness for, and implications of market opening, pre-requisites to avoid leaving UZ in an unfavorable situation.
2. **Loss-making long-distance passenger services:** service costing, institutional and financial options for providing sustainable transport passenger services for long distance travel.
3. **Selected Cargo Business Issues:** specific matters on which Bank advice has been sought including cargo tariffs, customer service and perceptions, and operating efficiency.
4. **Debt management:** options for UZ to restructure its debt and reach a financially stable situation.
5. **Infrastructure asset management and prioritization of investment.** Asset management strategy and life-cycle costing in the renewal and reconstruction of UZ's railway infrastructure network.

The EU-Ukraine Association Agreement of 2014 commits the parties to cooperate and seek to harmonize policy, legislation and regulation across a broad range of areas, including in the railway sector. The Policy Notes are all broadly aimed at either helping MoI to identify supportive policy and institutional actions, or addressing specific commercial challenges faced by UZ. However, as topic notes, they do not constitute a comprehensive railway sector appraisal nor an exhaustive treatment of all the issues confronting the sector.

Acronyms

CURRENCY EQUIVALENTS

Exchange Rate (Feb 2019)

Currency Unit: Ukrainian Hryvnia (UAH)

USD 1 = UAH 26.9

ACRONYMS

AMS	Asset Management System	Mol	Ministry of Infrastructure
AMCU	Antimonopoly Committee of Ukraine	NPV	Net present Value
CAPEX	Capital expenditure	OBB	Austrian National Railways
CoM	Cabinet of Ministers	OPEX	Operating Expenditure
CSM	Common Safety Methods	pkm	Passenger-km
EBIT	Earnings before Interest and Tax	PSO	Public Service Obligation, potentially comprising service PSOs (obligation to operate non-commercial services) and network PSOs (obligation to operate non-commercial lines)
EBITDA	Earnings before interest, taxes, depreciation, and amortization	SAR	State Agency for Railways (to be established)
EBRD	European Bank for Reconstruction and Development	SMS	Safety Management System
EIB	European Investment Bank	SB	Supervisory Board
ERA	European Rail Agency	TAC	Track access charges (charges levied for use of railway infrastructure)
EU	European Union	TOC	Train operating company ('Carrier' in Ukrainian Law)
GoU	Government of Ukraine	TSI	Technical standards for interoperability
gtkm	Gross tonne-km	UAH	Ukrainian Hryvnia
HDS	Heavy Duty Sleeper	USD	United States Dollar
IM	Railway Infrastructure Manager	USP	Under Sleeper Pad
LCC	Life Cycle Costing		
MAIC	Multi-annual Infrastructure Contract, (to part-fund the net costs of uneconomic lines kept open by government on social grounds, also known as network PSOs)		
MoF	Ministry of Finance		

1. Context

1.1 Introduction

In 2014, and as part of a reform to the railway sector in Ukraine, Ukrzaliznytsia (UZ) was transformed into a joint stock company (JSC) with the State, represented by the Cabinet of Ministers, as the sole shareholder. The 6 regional units of the railways (that made up UZ prior to the transformation) were merged into one legal entity along with 80 support enterprises including medical, educational and other support units. Thereafter, UZ reorganized into 34 branches, including 6 regional, 28 functional and 2 representative offices. UZ envisions the separation of its operations into four lines of business: infrastructure, cargo, passenger, and maintenance. The organizational restructuring is expected to continue to bring UZ more in line with the EU *acquis*.

Ukrzaliznytsia has recently developed the company's strategy for 2019-2023. The company's mission as stated in the strategy is to create a sustainable future for its business, economy and Ukrainian society by providing high-quality, safe and competitive transportation services. The strategy envisions UZ as a leader of transport and logistics, as an effective national carrier of freight and passengers and a leading socially-responsible company.

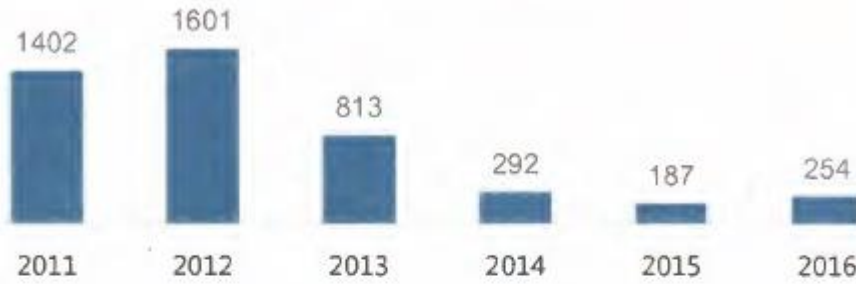
To achieve its goals, UZ has embarked on several initiatives to enhance revenues, reduce costs, reduce the wear and tear of its rolling stock and reorganize the company. Notable among the achievements are the establishment of an affiliate passenger company, launching a procurement system reform which will make Ukrzaliznytsia the first company with a certified procurement system in Ukraine, a 15 percent increase in cargo rates towards the liberalization of cargo rates and a significant increase in transparency providing public access to data on the company. UZ has also targeted critical investments--locomotive and wagon renewal and electrification of a major route. A draft railway law consistent with the EU *acquis* has been prepared but has not been passed by parliament yet. UZ continues to work on modernizing the company to increase its efficiency and financial sustainability.

1.2 Main challenges facing UZ—business as usual is no longer an option

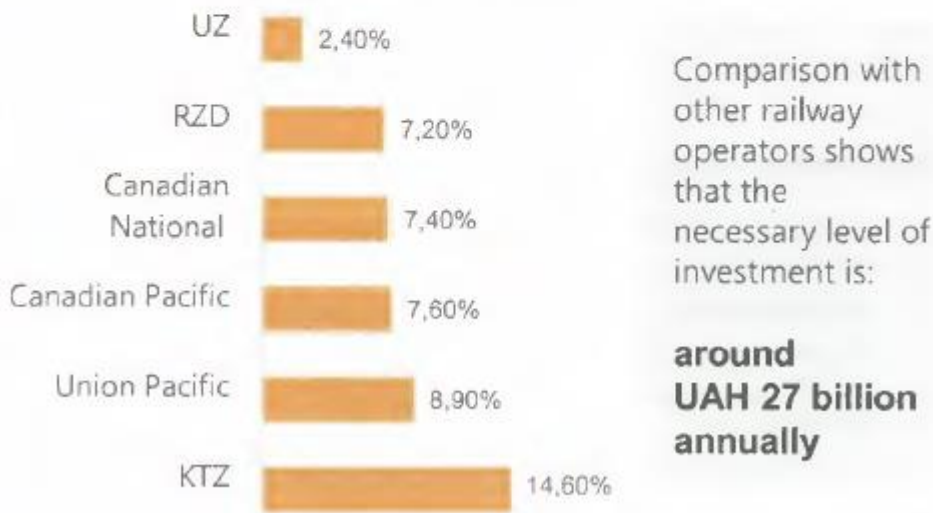
Ukrzaliznytsia's financial situation is tenuous. Between 2013 and 2016, UZ had a negative financial bottom line. Cumulative losses between 2014 and 2016 were about US\$ 2.4 billion.¹ While indeed UZ showed a net profit of about US\$ 1.4 million in 2017 as a result of several actions it took during the year (most importantly increasing freight charges by 15 percent), the current situation is not sustainable particularly when one considers the significant underinvestment in the railway sector. Half of the current rolling stock was purchased in the 1980s and urgently needs replacement. About a quarter of the track is overdue for a major overhaul; the useful life of about 80 percent of the machinery has expired; and locomotives and wagons are over 90 percent worn.

¹ The losses for 2014, 2015 and 2016 were respectively Ukrainian hryvnia (UAH) 16.8 billion, UAH 15.4 billion and UAH 7.3 billion (based on the audited consolidated financial statements).

Factual level of UZ capex, USD million



Comparison with the level of capital investments of other railway operators*



Comparison with other railway operators shows that the necessary level of investment is:

around UAH 27 billion annually

* investments to assets ratio, %

Source: UZ

Rail freight services cover their operating costs and create a surplus. However, passenger services generate large losses. Financial losses resulting from passenger services (excluding debt servicing) totaled US\$ 580 million in 2016 and 2017 alone. About 60 percent of the passenger losses were from suburban (regional) passenger services. The practice of cross subsidizing passenger services is becoming exceedingly difficult after the drop in freight throughput following the conflict with Russia. Moreover, this practice taxes shippers and reduces business competitiveness and is not permitted under the EU *acquis*.

UZ’s debt as of the end of December 31st, 2017 was estimated at about UAH 33.5 billion (USD 1.3 billion). About 70 percent of this debt is denominated in US dollars. Other than US\$ 185 million lent by EIB, EBRD and the Korea Exim Bank, the US denominated debt currently carries an effective interest rate slightly over 10 percent and local currency debt carries an effective interest rate of about 20 percent. UZ struggled to make a US\$ 150 million in debt repayment on the US\$ 500 million Eurobond in March 2019. Other debt repayments due in 2019 are significantly above US\$ 150 million. UZ embarked on an effort to issue a US\$ 500 million

Eurobond to help meet debt obligations and refinance expensive debt but this is unlikely to materialize in the near future given the prices and how the financial markets perceive Ukraine at present.² The equivalent dollar value of short-term loans is almost equal to the value of longer-term loans. This is clearly an unsustainable situation as a significant proportion of any additional debt would be used to repay maturing debt obligations and would hence not be used to help in addressing the large underinvestment in the railways.

The short maturities, unfavorable credit rating and high spreads resulting in very high interest rates, as well as increasingly limited access to international financial markets, have all created tensions in raising new financing to meet the debt service payments and refinancing maturing bonds. Section 3 of this Note and Policy Note 4 provide more details on UZ's financial situation.

The lack of government support for the railway is a critical issue. Governments in the EU typically support passenger services through a public service obligation, and infrastructure through multi-annual investment contracts. However, the government would like to see progress in the reforms before committing resources. Currently, UZ receives no budgetary allocations for the railways.

While the tenuous financial situation of Ukrzaliznytsia is severely impacted by the current stock of debt, the lack of government financial support and lack of consistent indexation of freight tariffs, it is reasonable to argue that there are investment and operational inefficiencies and lack of full transparency, despite recent improvements, that also contribute in a major way to the problem and also need to be addressed.

It is therefore of the utmost importance that UZ develop a financial sustainability plan that would address, among other issues, the short-term liquidity problems and historical debts. The elements of such a plan are presented in Section 2.

1.3 Market opening as an anchor for the reforms

The modernization of UZ to meet its objectives as specified in its 2019-2023 strategy and to increase efficiency and achieve financial sustainability requires coordinated efforts in several key areas: Rationalization of the network, labor optimization, addressing chronic underinvestment in infrastructure and traction, addressing its critical liquidity problem, managing its debt, managing non-profitable passenger lines, and increasing the competitiveness of cargo operations. While these objectives do not all directly relate to opening the market for freight to competition, the Association Agreement that the Government of Ukraine (GoU) signed in 2014 committing it to market opening in 2022 provides an opportunity to seriously embark and accelerate the reforms. As many of these reforms go beyond the realm of UZ or MoI and require decisions by the Ministry of Finance (MoF), the Ministry of Economic Development and Trade, the Cabinet of Ministers and local governments among others, GoU's commitment to the market opening helps in bringing all the stakeholders together in a concerted effort.

This point is particularly important as far as MoF is concerned. While UZ cannot continue to operate without financial support from the government whether the market is opened, and the sector follows the relevant EU *acquis* or not, there will be significant fiscal implications for the government, at least initially, once the practice of cross subsidization is discontinued, and the market for cargo is opened to competition. This is discussed in the following section on market opening.

² Last November, Naftogaz postponed indefinitely its Eurobond issue "because of volatile market conditions and elevated funding levels." The company was planning to issue 5-year Eurobonds for USD 0.5 – 1.0 bln. It was reported that the initial pricing of the bonds was at the 10.9% level.

This summary note is organized with the market opening as the anchor for catalyzing and achieving the modernization of UZ and putting it in a strong position to compete with other railways once the market is opened. And while many of the regulatory and institutional actions will depend on the pending railway law, UZ and MoI can continue and in some cases start preparations to be ready once the law is passed.

2. Market opening of rail cargo services—an anchor for railway reforms

2.1 Background

The draft Law on Railway Transport of Ukraine (the ‘new Railway Law’) is currently awaiting passage by parliament. The Law, among other aims, is intended to align with commitments contained in the EU-Ukraine Association Agreement 2014.

The Agreement commits the parties to cooperate and seek to harmonize policy, legislation and regulation across a broad range of areas. In its railway sector, Ukraine undertakes to approximate its legislation to specified EU legislation (the ‘rail *acquis*’) within stipulated timeframes, generally by 2022.

The new Railway Law is effectively an ‘enabling law’. It sets out the broad aims of the law, the roles and responsibilities of the key governance agencies and broad criteria for executing those functions. This confers flexibility but also means that much of the substantive work of drafting implementing regulations, building or strengthening the governance institutions and developing the administrative and regulatory processes need to proceed separately.

The focus of this Section is the ‘market opening’ provisions of the new Railway Law (and of the Association Agreement) particularly as this relates to cargo transport and how it impacts UZ. That is, the arrangements allowing cargo train operating companies, whether public or private, to provide transport services on Ukraine’s rail network on a fair and equal (competitively neutral) basis.

2.2 Key elements of market opening

Market opening on a fair and equal basis requires far-reaching changes in the institutional structure of the rail sector in Ukraine, in the organisation of UZ, and in the market for railway services. These changes include:

- i. **Introduction of management independence.** The corporatization of UZ in October 2015 was a critical first step. A Supervisory Board was established in 2015 but did not have any independent members. In 2018 the SB was reformed with seven members, four of which are independent. But UZ cannot yet be said to be managerially independent because, among other constraints, there is quite heavy regulation of commodity tariffs and UZ management is required to internally cross-subsidize many activities.
- ii. **Improvement of the financial situation of state railway enterprises.** The above factors also contribute to the fact that the company’s financial situation is currently not sufficient to meet all its historic debt obligations and, at the same time, sustain its capital assets. The company has serious liquidity constraints as explained earlier.
- iii. **Separation between infrastructure management and transport operations.** Infrastructure management and transport operations are not yet independently managed and there is not yet a financial accounting separation between infrastructure and transport operations.
- iv. **Compensation for public service obligations (PSOs).** The principle of PSOs, an essential precondition for both financial stability and a competitively-neutral market opening, is contained in the draft new Railway Law. UZ is currently in the process of defining and estimating the costs of its PSOs but is not yet in a position to submit a substantiated claim.

- v. **Licensing of railway undertakings.** MoI has already drafted licensing documentation and conditions for rail undertakings wishing to participate in an open market: their implementation must wait until the enactment of the new Railway Law and the establishment of the State Agency for Railways (SAR) which is intended to be the key regulatory agency.
- vi. **Infrastructure access regime.** Five of the main structural elements of the rail *acquis* relating to the infrastructure access regime are: allocation of infrastructure capacity; infrastructure access charges; safety certification; the network statement; and an infrastructure contract with government. The current status is summarised below. Most elements cannot be formally implemented until the draft new Railway Law is enacted, although the preparatory work can be done.

Elements of Infrastructure access regime	Progress/comments
Capacity allocation framework	<ul style="list-style-type: none"> • In progress. MoI is developing a draft infrastructure allocation framework for discussion with UZ and the approval of CoM. The Framework will need the oversight and approval of SAR, that can only be established when new Railway Law is enacted.
Infrastructure charges framework	<ul style="list-style-type: none"> • In progress. MoI is developing a draft infrastructure access charges framework for discussion with UZ and the approval of CoM. The Framework will need the oversight and approval of National Commission for Regulation of Transport (NCRT) when the new Railway Law is enacted.
Safety Certification	<ul style="list-style-type: none"> • In progress. UZ is liaising with the European Railway Agency (ERA) and is preparing and will progressively introduce Common Safety Methods (CSM) and Safety Management Systems (SMS). SAR will take over safety regulation role on its formation, following enactment of new Railway law.
Network Statement	<ul style="list-style-type: none"> • Not yet started. UZ has not yet created an independent Infrastructure Manager whose responsibility would include the Network Statement (it would also require inputs on capacity allocation and charges frameworks from MoI)
Multi-annual infrastructure contract	<ul style="list-style-type: none"> • Not yet started. Related in large part to the possible public funding the non-commercial parts of the network, an infrastructure contract between the UZ infrastructure Manager and GoU is likely to be a significant element of a broader PSO framework. It also impacts the Network Statement.

2.3 Benefits and risks of market opening

The planned opening of the railway market provides positive opportunities for Ukraine, but also creates serious threats if it is not well planned and implemented. Policies of contestability and private sector participation in rail cargo transport have typically been successful in improving industry performance where they have been adopted.

Rail market opening will over time provide more choice of cargo services, attract new participants, generate investments in traction, rollingstock and terminals to an industry where the assets are old and outdated. New participants will also bring new ideas about customer-focus, operating efficiency and service innovation. Market opening may help the railway sector attract some traffic currently using road transport, which would then deliver external community benefits in road accident savings, lower environment impact and fewer greenhouse gas emissions.

The most immediate benefit is that the expectation of market opening gives UZ the incentive and impetus to improve its own efficiency and performance. UZ faces fundamental structural problems: an investment backlog, deteriorating assets, and low market perceptions of its operating and service performance. It is not

sustainable in the long-run without reform, and freight market opening is an opportunity to tackle the problems in a fundamental way across all of UZ's activities, not just cargo transport.

Although the EU model of railway organization is not the only structural option that could have been adopted by Ukraine, there seems little doubt that the impending contestability of use of national railway infrastructure is acting as a positive catalyst for internal reforms in UZ; and at the policy level, the need to adopt a formal PSO framework will crystalize for government the real costs of operating passenger services previously concealed by cross-subsidies from freight, and the costs of operating non-commercial lines, currently supported by traffic on the core network. Such transparency will hopefully underpin a more critical scrutiny of how to improve social value for money in the rail sector policy-making.

In terms of risks, market opening poses a formidable threat to UZ cargo operations. International experience is that rail cargo markets are readily contestable. Ukraine's heavy, concentrated rail flows of bulk commodities are likely to attract significant competition and exert downward pressure on cargo tariffs for higher tariff classes. Most of the traffic carried by new participants will probably be abstracted from UZ. New commercial carriers will naturally target the more attractive segments of UZ's traffic where profitability is highest. It is likely that the company will lose market share and exert downward pressure on the tariff revenue yield on the traffic it retains. Third-party carriers wishing to enter the market will also look to UZ to recruit competent and experienced operating staff.

Given UZ's current financial situation is already very tight, UZ's overall financial situation could deteriorate, and cargo earnings would certainly no longer be able to support other parts of railway business. A new railway sector funding framework incorporating compensation for socially important loss-making passenger services and lines is therefore a pre-condition of successful market opening.

2.4 Status of preparations for market opening

Mol and UZ are both fully aware that the challenge for Ukraine is to manage market opening in such a way as to maximize the opportunities and mitigate the threats.

With limited technical resources, a small team is working within Mol, reporting to the Cabinet of Ministers (CoM) on meeting the provisions of the Association Agreement. It has strengthened the new draft Railway Law and has drafted a methodology for infrastructure access charges. UZ has assembled plans for further separating infrastructure activities and accounts from transport operations and is progressing with the costing of passenger services to assist in defining PSO services. The actions both entities are taking in their respective spheres are positive and headed in the right direction.

But there is a long way to go: the new Railway Law is not yet enacted; the key regulatory body for the railway sector (SAR) is therefore not yet formed; existing entities with future regulatory responsibilities (such as the National Commission for Regulation of Transport (NCRT) and the Antimonopoly Committee of Ukraine (AMCU)) have not yet determined how they will discharge their responsibilities in the new railway market; the entities of UZ that will provide infrastructure and transport services are not yet independently managed businesses; PSO arrangements have not been determined either for loss-making social passenger services (service PSOs) or for loss-making parts of the network (network PSOs).

It is crucial to enact the new Railway Law (some suggested amendments are recommended in Section 2.6 and in Note 1) to sanction the establishment of the new institutional and regulatory framework and give impetus and urgency to the preparation process. However, the new Law is unlikely to be in place until final quarter, 2019, at the earliest. Even then, achieving the apparatus of an open market, is not the same as being strategically ready for it.

2.5 Strategic readiness for market opening

When 2022 arrives, it would be a considerable achievement for Ukraine to be able to ‘tick the boxes’ to demonstrate that legal and regulatory instruments are by then in place to ‘approximate’ to the various elements of the EU rail *acquis*. However, it will be an even more important matter for Ukraine’s railway sector, both public governance and public enterprises, to be fit and ready to make market opening a success.

To be strategically ready for market opening, Ukraine must strive to attain three of the main pre-conditions for success:

- i. A strong, commercially focused UZ Cargo carrier capable of competing in an open market;
- ii. A sustainable funding framework for the railways sector as a whole; and
- iii. Effective public institutions to administer policy and regulate the industry.

For each of these three imperatives, Figure 2.1 lists some suggested fast-tracking actions that would help accelerate Ukraine’s strategic readiness for market opening.

Figure 2.1: Actions which could accelerate readiness for market opening.

1. A strong UZ Cargo carrier	2. Sustainable industry funding framework	3. Effective governance institutions
<p>a. Amend draft Law to strengthen UZ's commercial freedoms in the cargo market.</p> <p>b. Fast-track the creation of a UZ Cargo and Logistics Company.</p>	<p>a. Adopt provisional infrastructure access charges for UZ's own business lines.</p> <p>b. Determine provisional cost of PSOs for loss-making passenger services and net costs of retaining non-commercial branch lines (network PSOs).</p>	<p>a. Prepare the operating mandate and organisation blueprint for the SAR.</p> <p>b. Create a 'shadow' PSO contracting unit within Mol.</p> <p>c. Develop a Toolkit for local suburban contracting units.</p>

2.6 Commercially-structured UZ Cargo carrier

Nothing is more important to the success of Ukraine’s future railway market than to attain improved performance of UZ. Ukraine has huge human and material resources tied up in UZ and it will dominate the market for many years to come. It is difficult to see how the future railway framework can be successful if UZ does not successfully adapt to it. This is true for all parts of UZ but is especially important for the cargo business. Three key action areas should be considered.

- (a) **Legally strengthen UZ’s commercial freedoms.** As it is currently drafted, the new Railway Law will restrict the commercial freedom of UZ as a cargo carrier relative to private carriers. Because of its ‘dominant market position’ at opening, it will face special tariff restrictions and common carrier

obligations, even though its markets will suddenly be contestable. Regulation of infrastructure access tariffs is necessary, reflecting the 'natural monopoly' inherent in railway infrastructure. But an open and contestable railway carrier market for cargo makes such special restrictions on cargo tariffs charged to cargo consigners unnecessary. Customers who are not content with UZ Cargo company's services or tariffs can run their own trains, seek alternative supply from third-party operators, or negotiate with UZ Cargo entity for an alternative price/product mix to meet its needs. Cargo transport is a fast-moving and fast-changing market. A UZ Cargo carrier should have no less tariff and service flexibility than its competitors. It is recommended that the draft Law be amended (as outlined in the Policy Note on Market Opening). In the period after enactment of the new Railway Law and before market opening, the existing UZ tariff regulations (other than for services of social importance) should also be relaxed in many segments to give UZ time to adopt more market-based pricing structures prior to facing carrier competition.

- (b) **Accelerate creation of UZ Cargo Company.** There is a strong case for establishing UZ Cargo Company as soon as practicable. This would: (a) make the management more clearly responsible and accountable for their use of resources and business performance than under a divisional structure, and (b) bolster the 'independence' of the 'Infrastructure Manager' from transport operations in accordance with the Association Agreement. The most successful rail cargo operators globally are nearly all companies, a form of commercial organization that has stood the test of time and circumstance. UZ has strong and positive plans for its cargo and logistics business. Only when UZ Cargo is established as a company, with its own management focused on serving and retaining and winning cargo business, its own traction and rolling stock,³ skilled personnel, commercial freedom, and ability to reinvest its profits in service-enhancing assets, will it be able to compete successfully. Section 5 of this note provides some key elements for proposed cargo strategy for UZ. These are presented in more detail in Policy Note 3. In addition, while labor optimization (discussed below under sustainable funding), is an issue for UZ as a whole, there is more urgency to reduce the labor force for the cargo company that after market opening will be almost immediately facing strong competition.

2.7 Sustainable funding framework

Early implementation of a sustainable funding framework for UZ itself is essential. The interrelated financial parameters of infrastructure access charges and public service obligation (PSO) payments need to be put in place under the existing market structure prior to extending to a new market structure. There are two sequential, but interrelated actions required ahead of market opening.

- (a) **Implement the infrastructure access tariffs for UZ's own businesses.** Before market opening, Mol needs to determine an infrastructure charging framework that UZ can apply to its own passenger and cargo carriers, but which can be extended to new entrants in due course. Ukraine's national budgetary constraints, relatively high traffic volumes, and the existence of capacity constraints on many main lines suggest that Ukraine's targets for infrastructure cost recovery should be set at the higher end of European experience, including charging a fair share of infrastructure costs to passenger services. The wide variety in commodity classes, and large differences in traffic density on different routes, suggests a case for differentiation in charges, and a surcharge for train paths on

³ The Bank team fully agrees with UZ's plan not to establish a separate traction business segment but instead to allocate the necessary traction and rolling stock assets to the two main transport business segments of cargo transport & logistics and passenger transport who will 'own', operate and manage these vital assets.

congested routes. Conversely, on those lines that have very low traffic levels, but are kept open and funded by government direction, zero mark-ups above marginal costs would make sense.

- (b) **Accelerate the implementation of UZ PSO contracts.** Compensation requirements for social services can only be estimated after infrastructure cost allocation and infrastructure access charges have been determined. It is important to put the PSO passenger service contracts and an infrastructure contract for non-economic passenger lines, in place as soon as possible after the enactment of the new Railway Law and before market opening. While MoI drives the policy, it is UZ that must provide a substantiated claim for compensation. The Policy Notes identify the various forms of compensation that may be involved for service PSOs for *operating losses*, *debt obligations* and relevant *future investments*. In addition, PSOs should be adopted for those non-commercial low-density lines in the network which, after comprehensive review the GoU decides to retain. Annex A shows that around 45 percent of the railway network (8,000 km) could not earn enough in TAC revenue to fund the costs of its own infrastructure operation and maintenance. This compensation could form part of an Infrastructure Contract between the GoU and the UZ Infrastructure Manager. In practice, if GoU wishes to retain low density branch lines it would be most straightforward and more transparent to fund them directly through an MAIC as a network PSO. However, before doing so it is recommended that the GoU undertake a detailed analysis of each of the lines that constitute the approximate 8,000 km of potentially uneconomic lines to determine if they have wider social and economic value that justifies retention and subsidy, and if the government can prioritize/afford such a subsidy. Policy Note 1 presents the factors that need to be considered in assessing whether a line should be kept open or closed. Note 1 on Market Opening also identifies a competitively-neutral option for phased transition to the new funding framework if Ukraine and local authorities are not able to fund the full level of PSO compensation before market opening. Section 4 summarizes the financial performance of long-distance passenger lines and the extent to which they cover operating and capital costs. This is covered in more detail in Policy Note 2 on managing loss-making mainline passenger services. The ongoing work by the European Investment Bank (EIB) on managing loss-making suburban passenger services will enable UZ to develop a more complete picture on the compensation for the different lines. GoU may also consider replacing certain suburban passenger services by good quality bus services which have usually been shown to be far more cost effective than rail services in low patronage situations.

2.8 Additional actions critical for UZ's financial sustainability

The two actions mentioned above for developing a sustainable funding framework are directly-related to market opening. There are however other actions necessary to enhance the financial sustainability of UZ, and while not related to the market opening, are of critical importance: These are addressed below.

- (a) **Labor optimization.** High labor cost is a typical problem for railway companies transitioning from state control to commercial orientation. There are many functions in which labor requirements have declined substantially over the last few decades. These include mechanized track maintenance, automatic and centralized signaling, communications and IT technology, containerization, unit and block train operating strategies, automatic ticket machines and electronic bookings and closure of low traffic density branch lines and very small stations. As a result, a modern efficient railway operation needs far fewer staff numbers than were needed in the past to handle a given level of traffic. This has led to major reductions in labor levels in most railways internationally: for example, in Eastern Europe and Central Asia region alone, railway employment reduced by more than 2 million people over the last thirty years. Today, labor costs typically account for about 25% - 35% of

operating costs in well run railway companies. In Ukraine these are currently around 50% of operating costs. The reduction in the labor cost would significantly reduce operating costs and enhance the sustainability of UZ. Labor right-sizing has political and social implications and needs to be carried out in a socially responsible manner. Annex B presents the impacts of overstaffing and different ways for labor restructuring, starting with natural attrition, early retirement, voluntary separation and finally involuntary separation. In the case of UZ, it could start with allocating to the Cargo Company only such employee numbers that it needs while retaining surplus labor in UZ pending a comprehensive and properly funded labor retrenchment program. Labor optimization will require close planning with approval by GoU. In line with labor reduction, Section 5 (and Policy Note 3) present several ways for increasing the efficiency of the company.

- (b) **Managing UZ's debt—short-term solutions and long-term sustainability.** Section 3 of this note (and Policy Note 4) show the untenable financial situation of UZ with total debt of about US\$ 1.3 billion and half of the company's debt being short term loans. This clearly points to the need to not only develop a plan for the long-term financial sustainability of the company but also to address the unbalanced capital structure of UZ. The sale of surplus assets could help in retiring some of the company's debt. However, this is unlikely to be sufficient. Refinancing on better terms which is likely to require support from the Ministry of Finance should be considered and is likely to be subject to commitment and commencement of important reforms.
- (c) **Prioritization of investment.** With a large proportion of assets requiring replacement and renewal and with limited financial resources for investment, prioritization is even more critical. Section 6 (and Policy Note 5) present a modern methodology for prioritizing infrastructure investment based on life-cycle approach.
- (d) **Revenue enhancement.** In addition to measures for reducing cost and increasing efficiency, UZ should conduct a market demand study to identify new market opportunities. Section 4 (and Policy Note 2) provide some ideas from enhancing revenues and reducing losses from long-distance passenger trains. UZ's 2019-2023 strategy provides some projections and scenarios for cargo traffic for the main commodities. A market study could explore other opportunities for both passengers and cargo. The 2017 agreement in principle between Ukraine and the European Commission (EC) on extending the Trans European Transportation Network (TEN-T) to Ukraine would help Ukraine better integrate into the European Union (EU) and increase freight flows. The Mediterranean Corridor, one of the TEN-T's nine corridors, would pass through Ukraine connecting the country via Hungary and Croatia/Slovenia along the Mediterranean Sea all the way to Spain. In addition, the Rhine-Danube Corridor would also go through Ukraine; and the Baltic-Adriatic Corridor and the North Sea-Baltic Corridor pass close to Ukraine (in Poland). These connections are expected to provide opportunities for new freight and passenger traffic for UZ. The market study should also consider multimodal transport and the opportunities that they can provide for UZ. UZ can also explore providing certain services catering to people of different ages and different gender in passenger trains.

A time bound plan needs to be developed to address the short-term liquidity problems and long-term financial sustainability of UZ. These go well beyond the sustainable funding framework actions associated with market opening that are intended for a stable set of operations where the collective sources of financing available would cover operating and capital costs in a sustainable manner.

2.8 Strong governance institutions

The third area where strategic readiness could be accelerated is in facilitating the creation of key institutions and processes of government administration and management. Strategic readiness could be accelerated by facilitating the early planning and development of 'shadow' institutions and processes of government (and local government) administration and management ahead of their formal creation by the new Law. Preparatory actions will put Ukraine in a stronger position to create effective institutions in a timely manner prior to market opening.

- (a) **Design an institutional blueprint for the SAR.** The State Agency for Railways will be the key entity for the regulation of the railway sector in an open market. MoI should consider commissioning the preparation of SAR's operating mandate and organizational blueprint. This could include the following operational elements: a statement of regulatory objectives; scope of regulatory functions; accountability framework; information and data requirements; organization structure; administrative processes; consultative processes; a human-resources plan; and budget projections. If work on the mandate were initiated early, it could be possible to ensure completion of the mandate within the same timeframe as enactment of the new Railway Law. Having such a blueprint ready would help jump-start the new organization and accelerate regulatory readiness for market opening.
- (b) **Create a 'shadow' PSO contracting unit.** Under the new Railway Law, MoI will exercise this function. It is crucial to a sustainable funding framework and to competitive neutrality. But it is also an important component of GoU's wider transport and mobility policies. To get started, the function could be vested in an experienced senior official to act as a focal point for negotiations with UZ and discussions with Ministry of Finance. By establishing it as a separate unit from those working on infrastructure access charges it will help avoid conflicts of interest between the social passenger services unit (which may wish to minimize contract prices paid for social services) and the infrastructure access group (which must seek the most technically robust allocation of infrastructure costs to passenger sectors, even if this increases the requirement for PSO compensation).
- (c) **Toolkit for local government management and funding of suburban rail contracts.** Compensation for operating suburban services is likely to be the single biggest element of PSO payments and therefore one of the most important funding streams to ensure financial stability of the sector. Under the new Railway Law this funding responsibility will devolve to local executive bodies or local authorities. It is probable that many local bodies do not have the experience to readily assume this responsibility, so it is important to help them prepare. It is suggested that MoI consider commissioning the preparation of a *Suburban Railways Contracting Toolkit*. Possible content is identified in the Policy Note and it would be informed by the results of the current EIB sponsored investigations in two pilot regions. Supportive institutional measures could include MoI/UZ convening a contact group of senior transport officials in local authorities to facilitate consultations and planning for the new rail market conditions, provide technical training and support, and promulgation of best practices between local authorities.

2.9 Timeline for implementation of recommendations

The target year for market opening contained in the EU-Ukraine Association Agreement is 2022. If it were assumed that the new law would come into effect by about mid-2020, this would require implementation by

mid-2021 under the timetable contained in the Law itself (Chapter XI). Either way, that is a tall order, and emphasizes the importance of getting preparatory work started early, even before the Law is enacted.

A suggested fast-track timetable for implementing recommendations phased over the two and half years remaining until 2022 is shown in Figure 2.2. Figure 2.2 indicates broadly (in six-month time blocks) how the recommendations of the Bank contained in this Policy Note could be phased over the two and half years remaining until 2022. The aim would be to try to make major preparatory progress with setting UZ’s track access charges, measuring PSOs and designing the State Agency for Rail in the remainder of 2019, with a view to being in a position to implement them in a full year 2021 prior to market opening in 2022 and to have UZ restructured into freight (and passenger) companies by then, separated from infrastructure.

Figure 2.2: Possible fast-track timeline to implement critical measures before market opening

Main Tasks	Fast-track timeline				Market Opening	
	2019	2020	2021	2022		
1a. Amend draft Law to give UZ a level playing field		Delete or time-limit dominant carrier clauses				
1b. Create UZ Cargo & Logistics Company			Determine coy. assets, employees, organigram, opening accounts and provisional business plan and budget	1st year of company		
2a. implement internal UZ Track Access Charges		Determine provisional TAC for use by UZ	1 st year of UZ internal access charges	Determine final TAC for all operators		
2b. Assess and implement service and network PSOs		Assess required PSO payments	Negotiate PSO policy and payments with MoF (joint UZ/MoI activity)	1st year of PSOs		
3a. Prepare mandate and blueprint for State Agency for Railways (SAR)		SAR scoping, organisational and regulatory process study		SAR set up		1 st full year of SAR operation
3b. Create “shadow” PSO contracting Unit within MoI			Shadow unit to negotiate with UZ and MoF on PSOs	Permanent PSO contract specification and performance monitoring unit		
3c. ‘Toolkit’ and training for local authorities			Create contact group between MoI and local authorities and commission Toolkit and training for LA’s to take on legal and technical responsibilities for suburban services (Joint MoI/local authority activity)			

MoI lead activity
 UZ lead activity

Resource availability is clearly a major challenge. Mol has limited administrative resources for some of these tasks and would need to find ways of supplementing their existing implementation team, already stretched by the many tasks they are undertaking. UZ has large numbers of people, but possibly not enough with the kinds of skills required. In both cases external support and human resources would be helpful and possible essential.

The Bank team's view is that the two-and-half years timetable is attainable if there is sufficient commitment to it, and if there are sufficient skilled people deployed to implement and manage change of this magnitude. If it is not possible to attain a restructured UZ, proper treatment of PSO's, and an effective State Regulatory Agency by 2021, it may be in the interests of the railway sector and of Ukraine to consider delaying full market opening for a short period rather than to implement it prematurely.

3. Railway debt management

3.1 The Issue

While sections 3-5 dealt respectively with UZ's main business activities, passengers, cargo and infrastructure, this Section focuses on the current debt situation of UZ. This debt is associated with past capital investment in all segments of UZ's activities. The section analyses the available audited financial statements in the January 1, 2014 –June 30, 2018 period to discuss risks and concerns regarding the financial viability of the UZ going forward given the near-critical liquidity situation and widespread solvency concerns in the financial markets.

3.2 The creation of public JSC UKRZALIZNYTSIA

The public railway company JSC Ukrzaliznytsia (UZ) was created as a public Joint Stock Company through reorganization of public service railway organizations and institutions subordinated to and controlled by the business group State Administration of Railway Transport (SART) "Ukrzaliznytsia" (the SART Group). JSC UZ was registered on October 21, 2015 and effectively started operation on December 1, 2015. All assets and liabilities of entities previously controlled by the SART Group were transferred to new joint stock company.⁴

Despite significant legal and organizational change, UZ management believed that the reorganization did not result in any significant change in the substance of economic activities, nor qualitative and quantitative characteristics of assets and liabilities.⁵ Hence, the financial performance of the new company has been evaluated through consolidated financial statements (generated on the basis of 'pooling of interest method'), independently audited and publicly disclosed.

3.3 Financial statements of JSC UKRZALIZNYTSIA

Based on audited annual consolidated financial statements for years 2015-2017, and unaudited interim consolidated financial statements for the first six months of 2018, the Bank team compiled summary tables of the financial position of the company (balance sheet – Table 3.1); and comprehensive income (profit and loss statement – Table 3.2).

Table 3.1 indicates a huge discontinuity in the financial position of the UZ due to external shocks. The first shock came from a sizeable 50 percent depreciation of the exchange rate, from UAH 15.6 per one USD at the end of 2014, to UAH 23.4 per one USD at the end of 2015. This created massive foreign exchange losses (USD 1,197 million – Table 3.2) which explain 89.7 percent of the accumulated deficit (USD 1,335 million) carried forward to 2015.

The second shock was even bigger and came from the revaluation of UZ fixed assets (Property, Plant and Equipment – PPE) in the amount of USD 8,507 million. The application of Ukrainian accounting rules, which did not comply with international standards (IFRS), increased the value of non-current (fixed) assets by 97.8 percent in USD terms (and 196.6 percent in UAH terms). The revaluation increase was distributed unevenly across key elements of PPE. The value of land (which was previously not valued at all) was increased by USD 1,951 million; buildings by USD 2,123; infrastructure by USD 2,899; locomotives by USD 245 million; and

⁴ In addition, some health care institutions were merged into JSC UZ. Corporate rights of seven railway JSC owned by the State were also included in the charter capital of the new JSC UZ.

⁵ Based on Ernst & Young JSC UZ Audit report for 2015.

railway cars by USD 896 million. To balance the books, net equity in dollar terms was increased from USD 1,780 million to USD 9,326 million, i.e. by 424 percent or more than 5.2 times.

As a result of biases introduced by these adjustments, standard solvency and debt ratios that reference asset and equity values exhibit a large degree of instability between 2014 and 2015, and then stabilize at different and significantly lower levels (from 3 times lower for Debt/Asset ratio to 6 times lower for Debt/Equity ratio).

Table 3.1: JSC UZ – Financial Position (Balance sheet), 2014-2018*

	2014	2015	2016	2017	In mill US \$ 2018*
ASSETS					
Non-Current Assets	4,302	11,141	9,548	9,057	9,496
<i>Of which: Revaluation of PPE**</i>	-	8,507	-	-	-
Current assets	421	557	599	559	453
<i>Of which: Cash</i>	131	209	244	189	59
TOTAL ASSETS	4,723	11,698	10,146	9,616	9,950
EQUITY					
Capital	1,195	10,661	9,486	9,047	9,496
Acc. deficit/ret. earnings	585	(1,335)	(1,470)	(1,382)	(1,434)
NET EQUITY	1,780	9,326	8,016	7,665	8,061
LIABILITIES					
Non-Current Liabilities	606	1,028	1,021	1,090	905
<i>Of which: MLT Loans</i>	367	905	906	823	627
Current Liabilities	2,336	1,343	1,110	862	984
<i>Of which: ShT Loans</i>	1,626	889	634	396	550
TOTAL LIABILITIES	2,943	2,371	2,131	1,952	1,888
TOTAL EQUITY and LIABILITIES	4,723	11,698	10,146	9,616	9,950
*) First six months.					
***) PPE = Property, plant and equipment					
<i>Source: UZ publicly disclosed data converted at NBU official end of period exchange rate.</i>					

Regarding revenue dynamics presented in Table 3.2, there was a sizeable 33 percent decline of equivalent dollar earnings in 2015 following a large UAH depreciation. The structure of revenues remained fairly stable with cargo contributing slightly over 80 percent, and passenger transport about 10 percent. Operating expenses declined even more with weaker local currency mainly due to lower wages and other operating costs. Combined energy costs (electricity and fuel) retained a stable 22-23 percent share of operating expenses. There was an expected large increase in depreciation charges in 2016 following the revaluation of assets in 2015, as already discussed. Because of that, EBITDA is much more stable over the years than the operating profit (EBIT).

It should be stressed that both EBIT and EBITDA have been positive during the entire 2014-2018 period. Overall company losses are caused entirely by large interest payments and other financial costs, as well as foreign exchange losses which exceeded USD 1.8 billion in 2014-2015 and USD 2 billion during the 2014-2017 period.

Table 3.2 JSC UZ – Comprehensive Income Statement, 2014-2018*

	2014	2015	2016	2017	2017*	In mill US \$ 2018*
					Jan-June	
Total revenues	4,156	2,745	2,600	2,780	1,316	1,497
Cargo	3,303	2,242	2,127	2,260	1,082	1,226
Passenger	442	274	263	275	127	140
Other	411	230	211	245	108	132
Operating expenses	3,886	2,481	2,528	2,579	1,274	1,493
Staff costs	1,912	1,023	1,003	1,202	558	748
Electricity	436	297	305	296	148	168
Fuel	415	268	230	275	131	165
Other operating costs	649	572	291	255	150	151
Depreciation	473	321	700	551	287	260
Operating profit	270	264	72	201	42	4
EBITDA	743	586	772	752	329	264
Finance income	4	14	14	21	10	5
Finance cost	(311)	(234)	(188)	(143)	(75)	(69)
<i>Of which: Interest paid</i>	(253)	(183)	(158)	(129)	(65)	(55)
ForEx losses	(1,197)	(635)	(177)	(49)	46	87
Profit/Loss before income tax	(1,234)	(591)	(278)	29	23	28
Income tax	(64)	(175)	(8)	(25)	(18)	(10)
PROFIT/LOSS after tax	(1,298)	(766)	(286)	4	5	18
Revaluation surplus / loss	3	9,090	(4)	(7)	-	-
Total Comprehensive Income	(1,295)	8,323	(290)	(3)	5	18
Memo: Financing gap						
Net Cash flow from financing **	(73.51)	(210.81)	(259.83)	(181.21)	(92.33)	(31.52)
*) First six months.						
**) Proceeds from minus repayments of loans, bonds and borrowings.						
Source: UZ publicly disclosed data converted at NBU official period average exchange rate.						

3.4 Liquidity, solvency and debt indicators

As detailed in Table 3.3 below, UZ has chronic liquidity problems. Current ratio has been consistently improving over the past four years but, at 0.65 in 2017 and 0.46 during the first half of 2018, it still lags markedly behind the industry standard (0.8), and even more behind the desired norm (1.0). Cash ratio has been improving during the 2015-2017 period but has deteriorated in 2018.

Solvency indicators, both Debt/Equity and Debt/Asset ratios, are nominally very good (around 0.25 and 0.20 respectively). For the most part this reflects the bias introduced by a massive USD 8.5 billion accounting revaluation of PPE in 2015 which does not necessarily reflect realistic market value of fixed assets.

Regarding the term structure of loans, during the 2015-2017 period, UZ was successful in embarking on a desirable trend of increasing the share of long-term loans and decreasing the share and the dollar equivalent amount of short-term loans. This trend has been reversed in 2018 as the equivalent dollar value of short-term loans increased and almost equaled the value of longer-term loans.

Short maturities, unfavorable credit rating and high spreads (over 900 basis points), resulting in very high interest rates, as well as increasingly limited access to international financial markets, have all created tensions in raising new financing to meet the debt service payments and refinancing maturing bonds. UZ is facing significant difficulties in refinancing its maturing short-term loans and corporate bonds both in domestic and international markets. The absence of (institutional and guarantee) support from the Ministry of Finance has made things much more difficult.

Table 3.3 JSC UZ – Select Liquidity, Solvency and Debt Indicators, 2014-2018*

	<i>Reference</i>	2014	2015	2016	2017	2018*
LIQUIDITY RATIOS						
Current Ratio ¹	0.80	0.18	0.41	0.54	0.65	0.46
Cash Ratio ²	0.22	0.06	0.16	0.22	0.22	0.06
SOLVENCY and DEBT RATIOS						
Debt to Equity Ratio ³	0.58	1.65	0.25	0.27	0.25	0.23
Debt to Asset Ratio ⁴	0.24	0.62	0.20	0.21	0.20	0.19
Interest Coverage Ratio EBIT ⁵		1.07	1.45	0.45	1.55	0.07
Interest Coverage Ratio EBITDA ⁶		2.94	3.21	4.87	5.82	4.81
<i>Memo:</i>						
Total Loans to Equity		1.12	0.19	0.19	0.16	0.15
MLT Loans to Equity	0.58	0.21	0.10	0.11	0.11	0.08
ShT Loans to Equity		0.91	0.10	0.08	0.05	0.07
Total Loans to Assets		0.42	0.15	0.15	0.13	0.12
MLT Loans to Assets	0.24	0.08	0.08	0.09	0.09	0.06
ShT Loans to Assets		0.34	0.08	0.06	0.04	0.06
Average interest rate (AIR) ^{7,8}		12.7%	10.2%	10.3%	10.6%	9.3%
*) First six months.						
<i>Source: Staff calculations based UZ publicly disclosed data converted at NBU official ER.</i>						
1) Current Assets / Current Liabilities						
2) Cash and marketable securities / Current Liabilities						
3) Total Liabilities / Equity						
4) Total Liabilities / Total Assets						
5) Operating Income EBIT / Interest payments						
6) Operating Income EBITDA / Interest payments						
7) Interest payments / Total Loans						
8) AIR for 2018 is calculated assuming equal interest payments in H1 and H2.						

3.5 Liquidity as a binding constraint

UZ obviously has liquidity problems, both in terms of securing sufficient current assets to meet current (short-term) liabilities and generating enough free cash to meet its imminent payment obligations and investment needs. Under normal circumstances a solvent corporation with low indebtedness, good management and solid business model should not have any problems raising additional financing against its net equity in excess of USD 9 billion equivalent. This is not the case with UZ due to the unclear position of the state (the owner) vis-à-vis the status of the company. There may also be insufficient confidence of the recent asset revaluation exercise based on pure accounting rules.

In the presence of substantial country risk, unclear quality of corporate governance, and uncertainty of commitment to legal and organizational reform of the railway, a tight liquidity situation becomes an effectively binding constraint. Paradoxically, good solvency indicators and the present low level of indebtedness (long-term loans to equity of only 8 percent) do not support the 'benefit of doubt' argument but rather exacerbate concerns about overemployment, weak governance, inefficient use of resources, unreasonable public and political expectations regarding PSO and subsidized cargo tariffs.

3.6 Need for a new comprehensive debt and asset management strategy

Presently, UZ is faced with a lending premium of close to 1100 basis points (about 950 on the count of country risk and additional 150 for the corporate risk). The key objective of a successful debt management strategy is to focus on lowering those risk premia in the medium run by strengthening the quality and trust of UZ corporate governance, commitment to market opening and comprehensive corporate restructuring.

Concurrently, UZ must make an effort to better manage its ample assets with current book value of close to USD 10 billion. According to some estimates, almost half of all assets contribute only ten percent of UZ revenue. There are strong indications that some rail segments can be shut down and replaced with bus service in line with PSO obligations. This would enable significant cost savings.

3.7 Next steps – Action plan

To overcome existing constraints in raising liquidity and investment financing in domestic and international markets, UZ should, first, commit to a clear corporate restructuring strategy.

Second, UZ must make a decisive move to conduct a detailed asset valuation exercise carried out by reputable asset evaluators. This exercise must be launched as soon as possible to arrive at reliable financial statements.

Third, based on the results of asset valuation, UZ should seek Government consent to sell (privatize) or leverage select assets not related to core business (such as buildings, urban land, etc.) to raise cash or marketable securities that would improve its liquidity position and enable normal operation.

Fourth, UZ should seek support in raising substantial investment resources at reasonable (low) cost necessary to carry out the adopted modernization strategy and reach sustainable levels of business operation in the medium-to-longer run. Potential partners are the Government of Ukraine, domestic and foreign business partners and investors (through bonds issued in domestic and international financial markets), as well as international financial institutions.

Any sustainable solution going forward, hinges on permitting UZ's cargo and passenger businesses to operate more commercially and with greater management autonomy in an open market, together with deep organizational and management restructuring programs discussed in other policy notes. Given the ownership

structure, political and social importance of UZ, and the legal status of the company, this cannot be done without full ownership and support of the government (including the Ministry of Finance).

Additionally, given the size of the company and present institutional and governance risks, successful restructuring and changed perception of domestic and international financial markets will critically depend on the credibility of the proposed program.

4. Long-distance passenger service PSOs

4.1 The issue

Under the new Railway Law, UZ would be entitled to compensation from the national budget for long-distance passenger PSO's. As explained in Section 1, Public Service Obligations (PSOs) means 'obligations which the transport undertaking in question, if it were considering its own commercial interests, would not assume or would not assume to the same extent or under the same conditions'.

Ukraine runs a wide range of passenger services. They form two main groups, regional/suburban (called *prymiski* or *prigorodne*) and long-distance. The World Bank developed a methodology in 2015 for costing the services which could be used as the basis for a PSO payment from the local or central government and used this as the basis for analyzing the regional services within Lviv Oblast. This work is now being further developed by consultants working with UZ under the auspices of The European Investment Bank (EIB).

This section is concerned with long-distance services. Within this group there are both conventional loco-hauled services and express InterCity services using multiple-units. The express services are considered by UZ to cover their attributable costs and this note concentrates on the conventional loco-hauled services. Some of these recover their costs from fare revenue and some do not, with one class of fare (*Platzkart*) regulated by the Government (GoU). Currently losses are covered by internal cross-subsidy within UZ, but this will become progressively more difficult with market opening. This section focusses on testing whether, as suggested by UZ, compensation for the regulated *Platzkart* fares is a valid and practical approach to defining PSOs in the long-distance market.

In addition, it is not reasonable to expect that even if *Platzkart* services make financial losses, GoU should simply pick up the bill to compensate those losses. GoU would wish to be sure that UZ has first considered all options for making *Platzkart* services as cost-efficient as possible. This section proposes an approach to costing passenger railway services in general, and *Platzkart* services in particular, to assess financial performance, and identifies ways in which UZ might consider reducing operating costs to reduce the budget cost of the obligation to provide *Platzkart* services as a lower than market fare.

4.2 Basic Service Characteristics

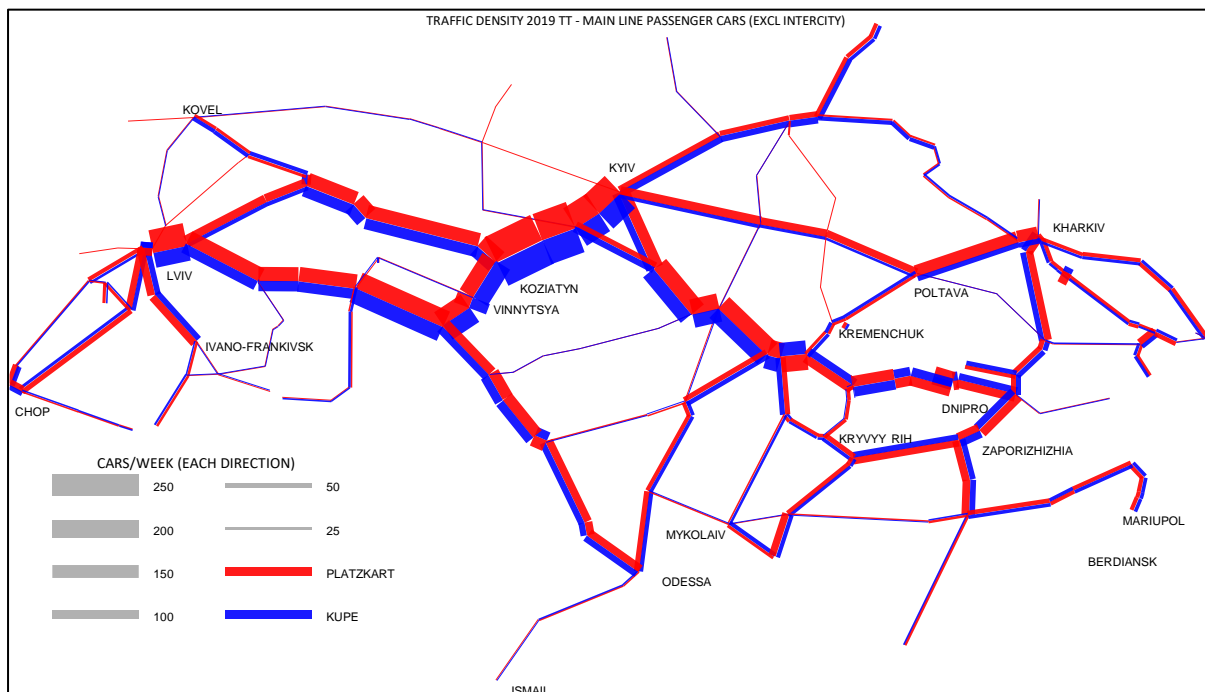
Table 4.1 summarizes the basic characteristics of the main types of long-distance services operated by the Passenger Company (i.e. excluding the Regional Trains and Day trains). Sleeping carriages have the least number of berths per carriage and *Platzkart* has the most.

Table 4.1 Summary characteristics of long-distance Passenger Services 2018

	Sleeping	Kupe	Platzkart	Total
Number of services	-	-	-	110
Train-km p.a. (million)	-	-	-	53
Carriage-km (million)	1	365	419	785
Passengers (million)	0.9	12.2	21.4	34.5
Passenger-km (million)	608	8061	11453	20123
Revenue (UAH million)	730	5723	3436	9889
Average distance (km)	647	659	536	582
Yield (UAH/pkm)	1.20	0.71	0.30	0.49

UZ has a wide range of detailed passenger service data available (e.g. static and dynamic occupancies by carriage type by service) and the data used in this report has drawn on datasets covering passengers, revenue and operating statistics in routine use within UZ. A sample of 94 trains was selected for analysis, covering a wide range of routes and range from 41 km (on the UZ network) to 1657 km (the full sample is described in provided in Policy Note 2). An average train in the sample of 94 consisted of seven Kupe carriages and five Platzkart carriages, although there are a significant number which are effectively all one or the other. The average distance is 784 km, taking over 13 hours. The average commercial (end-to-end) speed is relatively low at 58 km/hr, although this is often not an important consideration for passengers travelling overnight. In addition, many services, especially on low-frequency routes, make many intermediate stops. Figure 4.1 shows the sections of the network covered by these services.

Figure 4.1 Network coverage of sampled services



Because of the electronic ticketing system installed by UZ, demand (passenger numbers) and revenue can be directly attributed to individual services. However, as is the case in almost all large railways, it is impractical to record more than a few cost items directly to each individual service in the general ledger (financial accounting) system. These costs have therefore to be estimated by management accounting methods.

3.2 Passenger Service Costing methodology

Few railways automatically record the cost of individual train services through their general ledger system. However, most railways record the cost, to a greater or lesser degree, of each of the main technical functions that create services, and then use broadly similar approaches to deriving the cost of the passenger sector as a whole and of individual services. This process consists of estimating a set of unit costs (i.e. cost per unit of output) for a set of outputs associated with passenger services (e.g. locomotive-km, car-kilometer and so on) and then applying them to the resources consumed in creating a particular service or set of services.

Table 4.2 shows a functional classification of passenger service costs that is in general use in railways worldwide. Most of these cost types can be categorized in one of two ways:

- i. whether they are directly variable with the volume of train operations or are fixed (at least until changes are made overall organizational scale or capacity);
- ii. whether they are associated with train operations (sometimes called 'above-rail' costs) or with infrastructure maintenance and operations (sometimes called 'below-rail' costs).

Table 4.2 Functional Cost Categories and Basis of Allocation to Services

Cost category	Basis of cost allocation
Variable costs	
Above-rail:	
Fuel and energy	Gross tonne-km
Train crew (driver and assistant)	Train-hours
On-train crew (conductors, attendants)	Crew-hours (or weighted train-hours)
Passenger handling and station operations	Passenger
Catering	Passenger-km
Rollingstock maintenance and servicing	Vehicle-km (with vehicle-hour component)
Rollingstock renewal capital	Vehicle-hour
Below-rail:	
Traffic-related track maintenance	Gross tonne-km
Train planning	Train-km
Infrastructure renewal capital (traffic-related)	Gross tonne-km
Fixed costs	
Below-rail:	
Traffic-unrelated track maintenance	Gross tonne-km
Structures maintenance	Gross tonne-km
Overhead line equipment maintenance	Gross tonne-km (electric-hauled)
Signals and communications maintenance	Train-km
Signaling operations, train dispatching and control	Train-km
Infrastructure renewal capital (time-related)	Gross tonne-km
Administrative overheads	Percent mark-up
Non-renewable infrastructure capital	Omitted

Policy Note 2 describes the methodology of service costing and derivation of unit operating costs of UZ passenger services in more detail.

4.3 Financial performance of long-distance passenger services

Two important financial thresholds help establish the financial viability of rail passenger services:

- i. Is the revenue earned by the service greater than the above-rail operating costs (excluding capital)? If so, it is worth continuing to operate the service as it has a positive cash flow, as long as there is not a better use for the rollingstock used in the service

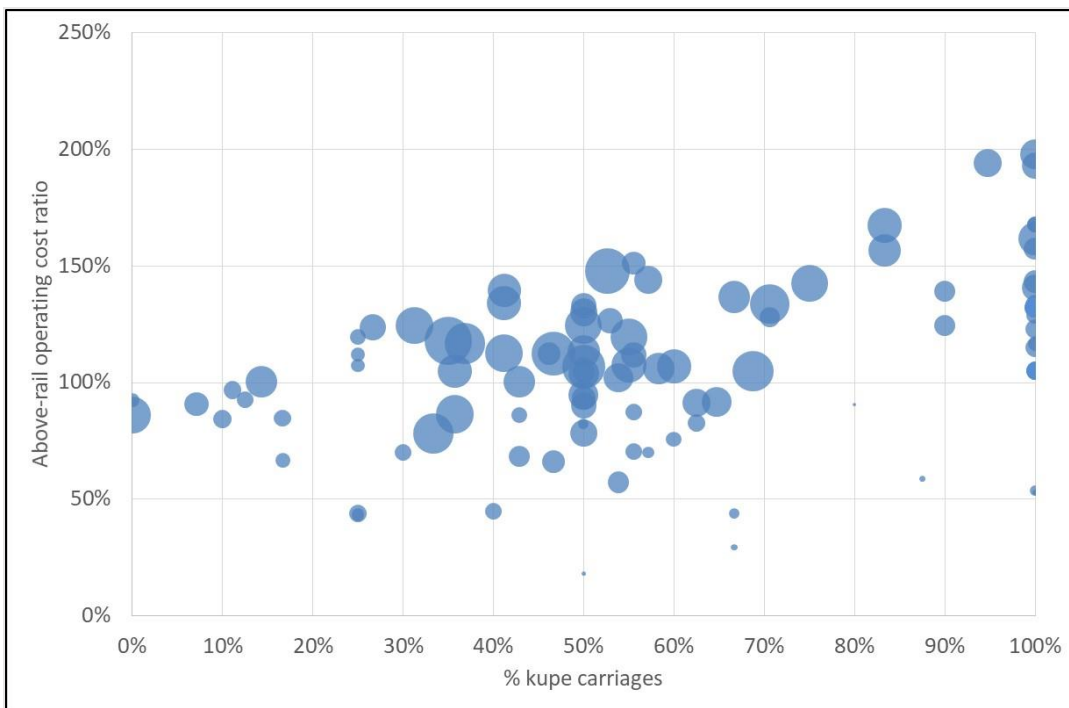
- ii. Is the revenue earned by the service greater than the above-rail operating costs (including capital)? If so, it is worth reinvesting in the rollingstock for that service when it becomes life-expired.

Both thresholds assume that there are other users of the infrastructure over which the service operates (a reasonable assumption in the case of mainline passenger services in UZ). If not, then either the service needs to generate sufficient financial surplus to cover the cost of the infrastructure or there needs to be external financial support to achieve this.

4.3.1 Overall Service Viability

Figure 4.2 addresses the first threshold above and shows the distribution of the above-rail operating cost ratio for the sampled 94 services as a function of the proportion of Kupe carriages in each service. In both Figure 4.2 and 4.3, the size of the bubbles indicates the passenger-km on the service. Of the 94 services analyzed, 57 had a ratio greater than 1 and were thus earning more on each trip than it was costing to operate them. Almost all services for which Kupe cars were over 70 per cent of the train composition were over 100 percent, but none of those with under 20 percent Kupe cars were. When above-rail capital costs (locomotives and carriages) are included, only 20 out of the 94 services had a ratio greater than 1 and were thus earning enough to fund replacement rollingstock as it became due (Figure 4.3). Only services with 60 percent or more of kupe carriages are passing this test and even then, it is by no means guaranteed.

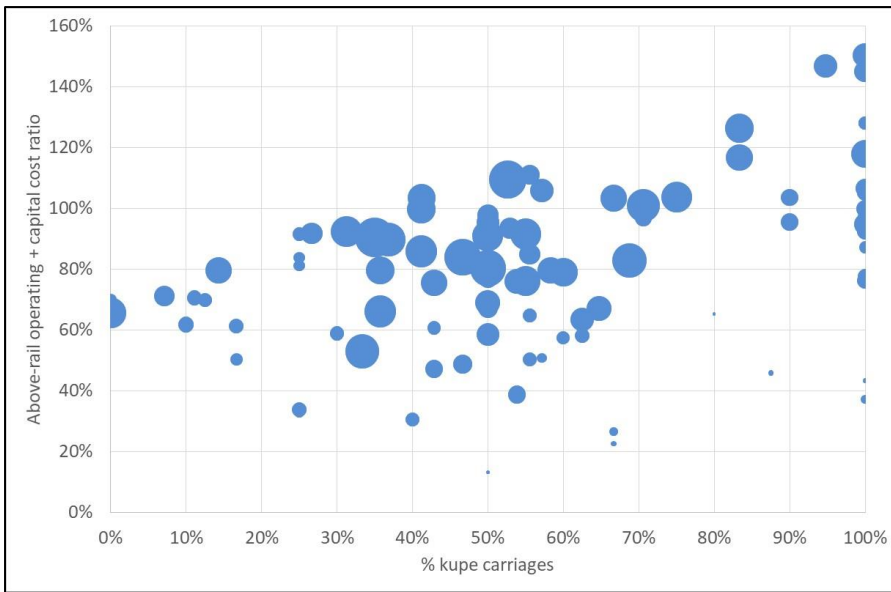
Figure 4.2 Above-rail operating cost ratio and proportion of kupe carriages in a train



An even smaller number of the sample would be able to contribute significantly to the cost of infrastructure. If the track access charge for mainline passenger were set at UAH 30 per 000 gross tonne-km, only 9 out of the 94 services analyzed would be able to pay.

Given the revenue per passenger-km for a kupe passenger is more than twice what it is from a platzkart passenger, the mix of classes is clearly a critical element in determining the financial viability of a service.

Figure 4.3 Above-rail operating + capital cost ratio and proportion of kupe carriages in a train



4.3.2 Financial analysis by class

Figure 4.3 shows that almost all all-kupe train services are able to cover their reinvestment costs, while no all-platzkart train services are. Figures 4.4 and 4.5 show the cost per vehicle-km and per passenger-km.

Figure 4.4 Cost per vehicle-km of platzkart and kupe services in a train

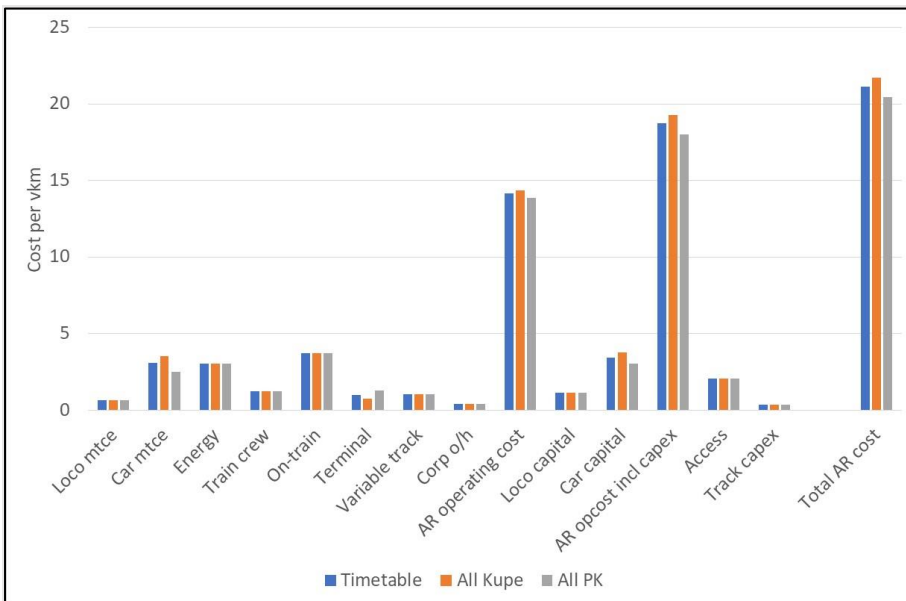
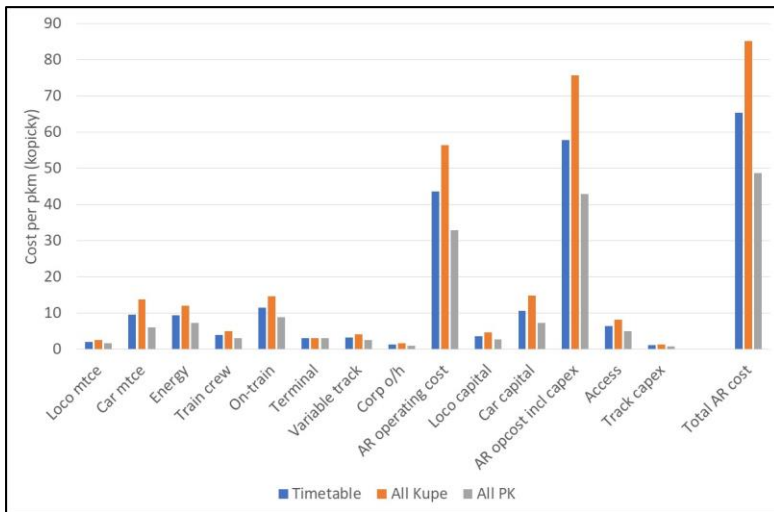


Figure 4.5 Cost per passenger-km of platzkart and kupe services

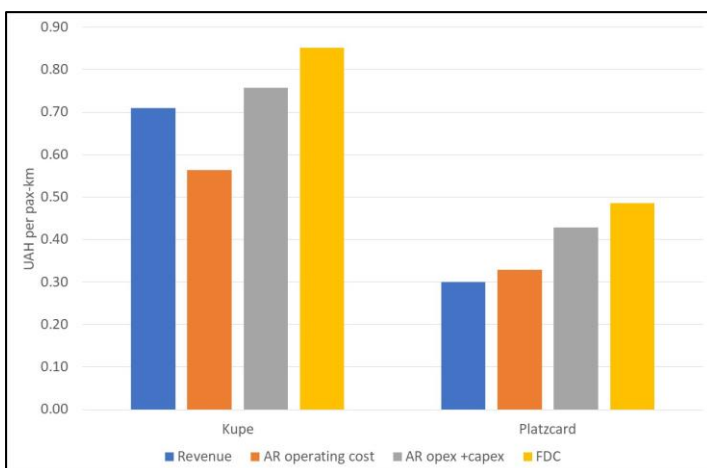


The cost of platzkart per vehicle-km is only slightly less than for kupe, because of the lower maintenance cost. Per passenger-km, however, the difference is more pronounced because of the higher occupancy rate for platzkart. Even so, however, this is not sufficient to generate comparable earnings per vehicle-km (Table 4.3) and platzkart will normally always fail to cover its full costs because of the lower regulated fares (Figure 4.6).

Table 4.3 Average revenue per vehicle-km

	Kupe	Platzkart
Average load (pkm/vkm)	26	41
Yield (UAH/pkm)	0.71	0.30
Revenue/pkm	19	12

Figure 4.6 Comparison of kupe and Platzkart revenue and operating cost⁶



⁶ FDC is fully distributed costs.

With UZ’s current cost structure, the cost of passenger trains is dominated by the carriage-related costs (on-board attendants, maintenance and capital) rather than those associated with the locomotive (Figure 4.7). Some of these are variable with time while some primarily vary with distance. About 75 percent of the total costs are associated with carriages, with costs also dividing approximately equally between passenger and freight. This indicates that, while improving travel times should have a noticeable effect on overall cost per passenger-km, varying the size of the train will have comparatively little effect if average occupancies remain unchanged.

Figure 4.7 Train and carriage-related costs

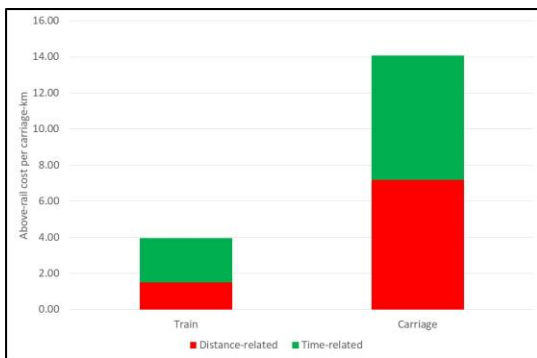


Figure 4.8 shows the variation of cost with speed for a 12-car Platzkart train. The blue columns show the distribution of the analysis sample by speed in terms of car-km per week. Doubling the commercial speed reduces the cost per vehicle-km by about 40 percent.

Figure 4.8 Cost variation by speed

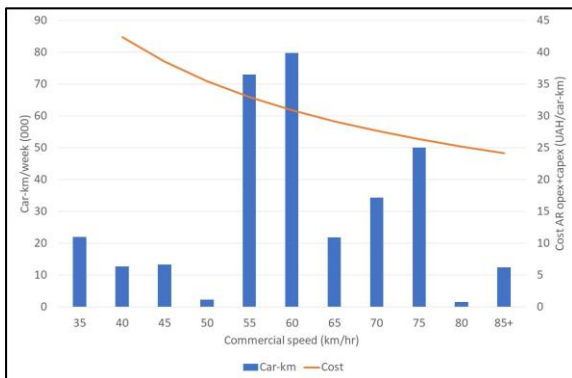
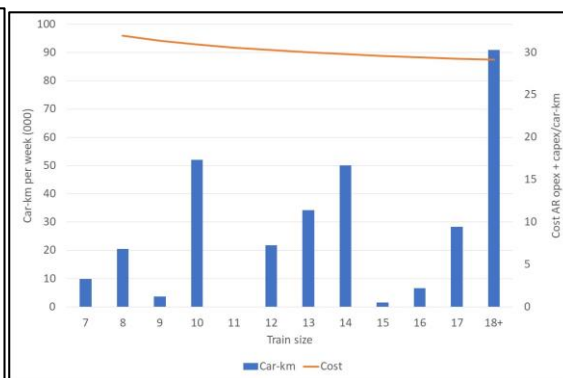


Figure 4.9 Cost variation by size of train



The variation in cost with the size of the train is much less marked (Figure 4.9). Doubling the size of the train reduces the cost per vehicle-km by only about 10 percent. Although train-related costs (which includes the locomotive) are relatively small, electric-hauled trains are cheaper than diesel-hauled ones by about 15 percent.

4.4 Policy options for Platzkart services

The normal response to improving the financial recovery of Platzkart services is simply to increase the fares. However, Platzkart fares in Ukraine are heavily regulated by the government for social reasons and that policy seems unlikely to change in the short and medium term. The main options available to UZ to improve the financial performance of the Platzkart service form three groups:

- i. **Reduce the unit cost of the inputs.** The inputs are the various activities necessary for operating trains (e.g. locomotive maintenance cost, vehicle maintenance and so on). However, while some reduction is attainable, the Bank team's conclusion is that any reduction from this source is likely to be modest in the long-term. There is little evidence that the unit costs in UZ are unduly high compared to those in other countries, based on experience of railways in Eastern Europe that the World Bank has worked on in recent years. Whilst unit costs can almost always be reduced by reviewing methods and procedures, in many cases the scope for reductions is not large and some costs should probably be increased rather than decreased to ensure adequate maintenance of assets.
- ii. **Reduce the volume of inputs required.** UZ is already reviewing the on-board train crew requirements which can reduce the total cost by 15-20 percent. Another option is to review the train composition to better align capacity with demand; this is particularly relevant where there are sections of heavy demand while other sections are relatively lightly loaded⁷.

The conclusion is that, even allowing for improvements, if GoU wishes UZ to continue to operate Platzkart services at the current low fare levels for social reasons, under the new Railway Law it will require budgetary compensation.

If this were to be done, there is a strong case to implement it on a simple contract basis, with the GoU receiving all Platzkart revenue and UZ being paid a standard rate per Platzkart vehicle-km provided, plus a commission for collecting fares on GoU behalf (a gross cost contract). Alternatively, a net-cost contract could be considered whereby the Government is paying the shortfall in cost.

⁷ Although the average occupancy (measured as the dynamic load factor: passenger-km/seat-km) for the analyzed services is 73 percent, this varies from 100 percent to 40 percent or less.

5 UZ Cargo Strategy

5.1 The Issue

The ‘market opening’ provisions of the new Railway Law will include arrangements allowing properly licensed cargo train operating companies, whether public or private, to provide transport services on Ukraine’s rail network on a fair and equal (competitively neutral) basis. UZ has already set out a wide-ranging reform program with its *Development strategy for 2019-2023* that includes a comprehensive strategy dealing with its vision and values, market analysis, objectives, reorganization into business segments, and positive actions to improve business performance.

In Section 1 the Bank Team argued for an accelerated creation of a UZ Cargo Company to implement the plans for cargo and logistics business. Only when UZ Cargo is established as a company, with its own management focused on serving and retaining and winning cargo business, its own traction and rollingstock, skilled personnel, commercial freedom, and ability to reinvest its profits in service-enhancing assets, will it be ready to compete successfully.

5.2 The need for change

Operational readiness for competition is primarily concerned with understanding which activities are adding to financial sustainability and which activities are wasteful. This will require a change in culture for the employees and the clients of UZ. An analysis of activities, identifying cost drivers and minimizing those costs, identifying revenue sources and maximizing revenue, will be required prior to market opening and beyond. The sort of analysis escribed for long-distance passenger services in Section 2 can be equally applied to cargo movements.

Competition should provide the incentive and opportunity to make changes to operations and practices that can achieve cost minimization and revenue maximization. The starting position is that UZ’s current operations are not efficient. The former organization structure involving six different railways has left behind unnecessary practices that hinder the efficiency of the new integrated organization, soon to be subject to competition. Old equipment and incompatible electrified areas have also generated inefficiencies.

Wagon utilization is very low. The average freight wagon is earning revenue, about 8-10 percent of its time. Generally, loaded wagons are stationary (not running) for approximately 30 percent of the time. Container wagons are loaded and stationary for approximately 75 percent of the time, more than half of that for loads of empty containers. Unless UZ earn revenue from storing empty containers on wagons, this time is lost money.

Poor wagon utilization is due in part to aged equipment and also because of a sub-optimal train operating strategy and customer terminal arrangements that lead to wagons being stationary for long periods. While reports indicate a shortage of rollingstock, the utilization of the current fleet is poor, with much rollingstock waiting for attention, either loading, unloading or in marshalling yards. Many current UZ clients use the UZ rollingstock for storage purposes. For example, approximately 200,000 tonnes of grain capacity is available in stationary wagons, half of which are loaded. And many containers remain on flat wagons while being stuffed and unstuffed, thus tying up valuable container wagon capacity.

Poor wagon utilization creates a heavy penalty in lost earnings, as well as time-based capital depreciation. It would be better to have fewer wagons in a fleet that would be better used. Certainly, fewer wagons than currently used would be required by an efficient cargo railway.

Many cost drivers are time-based such as depreciation and capital opportunity costs as well as some maintenance tasks, but revenue is almost entirely driven by volume and distance. This has led to an imbalance where there is little regard by customers or staff for the non-productive time of railway resources.

Separation of infrastructure and train operations, and competition in the latter market, will need to have far reaching effects on the way UZ conducts its operations. UZ's cargo transport managers will be subject to entirely new disciplines about when and how to operate their trains. They will not have unfettered track access and the access they do have will cost them money in track access charges. They will need to operate to a strict schedule of train pathing and optimize their use of infrastructure capacity.

Priority for access will be based on a non-discriminatory track access agreement the infrastructure company will have with all operators. UZ Cargo cannot expect to be given first choice of train paths in the working timetable. Nor will it be given automatic priority over other train operators when day-to-day instances of track congestion or other disturbances occur. The only infrastructure that UZ will have full control over will be small sidings and depots necessary for its own maintenance activities.

5.3 Maximizing opportunities in cargo services

UZ has an extensive customer relationship which can be used in the lead up to the open market by reinforcing good relations. Between now and 2022, when market opening is expected to begin, UZ has the opportunity to make changes to exploit its intricate detailed knowledge of the network and rail market, by reinforcing its strengths and addressing its weaknesses.

Road transport provides a door-to-door service but is costlier than a rail option. Unfortunately, rail transit times are far in excess of road transport and that time is more valuable for the client who is willing to pay the premium for faster delivery. Rail can address this threat by lowering transit time. This will not be achieved by increasing speed on the mainline but by reducing time in terminals and marshalling yards. This is achieved with block train operation.

Third party operators will especially target those parts of the market that can be handled by block trains, because it is the most efficient method of utilizing railway assets for cargo transport. New entrants will not use marshalling yards and will not stop to change locomotives. UZ Cargo therefore needs to reorganize its activities so that block train operations are adopted wherever possible. In non-bulk markets, where consignment sizes may be less than full trainloads, this will involve aggregating hitherto groups of wagons into larger blocks that have a single origin and destination.

Customers may need to reorganize their own activities to facilitate new train operating strategies and can be incentivized to do so through the costs savings available through more efficient train operations. The key 'enabler' of block trains is the reorganization and design of loading and unloading points so that they can handle block trains. Block train operation has been successful for grain transport because the grain industry has reorganized its loading patterns. Recent 2015-2018 initiatives in the grain industry to consolidate loading points and enjoy the economies of scale have been welcomed by UZ, enabling block train operation from many sites. This same model can apply in other markets depending on circumstances.

With increasing use of block trains, the need for large numbers of marshalling yards and time-consuming train re-marshalling activity will reduce. Train plans should try to minimize use of marshalling yards as these locations are a large cost base that add to transit time and often also to high variability in the transit time experienced by customers.

High variability of performance is not desirable by all cargo customers. For bulk commodity customers it means they must carry larger inventories in warehouses, stockpiles and silos etc. And it is particularly damaging to shippers and forwarders of higher value intermodal freight who base their marketing commitments to their own customers not on the best or average performance that the cargo transport provider can deliver, but on the performance level they can depend on. The higher the variation in railway transit time the more customers will penalize an already slower transit time than road haulage by padding the actual rail performance with 'buffer' time to allow for unreliability.

Marshalling yard land is valuable. With modern approaches to train and transit planning, marshalling yards and their land will become surplus. Some marshalling yards may be candidates for redevelopment since they contain large areas of land. In other countries these areas have often been converted to industrial zones, logistics centers or even housing.

Targeted investment in the container market could improve market share by using the existing terminal strengths provided by "Liski". Depending on the view of the regulatory agency to be established, the "Liski" terminals are likely to remain exclusively available for UZ container services because they are an integral part and owned by the UZ JSC. However, there are only five operational container terminals for the entire Ukrainian task and Liski only transports approximately 10% of the total container traffic on UZ. UZ must expand its Liski terminal asset base if it is to compete with new entrants, who will no doubt provide their own terminal facilities.

5.4 Increasing customer focus

Cargo shippers choose modes on the basis of many criteria, including physical capacity to carry, service characteristics, prices, and other more strategic factors (Table 5.1). For some customers and cargoes, the decision is an easy one: they want the lowest tariff; or the fastest possible delivery time; or the most reliable delivery schedule. However, in many markets the matter is more complex involving both long-term and short-term trade-offs between the various factors. UZ Cargo will need to develop much closer relationships with clients to understand their needs and preferences and to tailor services to that will make them preferred carrier over road transport or other rail companies.

Block train operation is the most efficient method to utilize railway resources for cargo transport, but it needs to be matched by sensible and responsible wagon load practices that take into account client needs. This balance of efficiency and service requires an in-depth understanding of the client needs, and discussions with the client with the aim of achieving a win-win where both the railway and the client modify their requirement and service respectively to achieve an efficient quality service.

Third party train operators will be reluctant to service smaller clients, who cannot fill a train, but this will provide an opportunity to UZ Cargo if it can rationalize the way it handles such traffic. UZ can provide a more personalized service for the small client, optimizing the service and cost by working with the client, adjusting the railway offering and adjusting the client logistics, to result in a win-win outcome.

This may be by way of amalgamation such as servicing the client every second day with a larger consignment than every day with a small consignment. Specialized wagons may also be required. Negotiated tariffs can incentivize customers to accept service strategies that enable UZ Cargo to handle wagon-load traffic more profitably.

Table 5.1 Freight customer mode choice criteria.

Criteria	Attributes	What the customer might ask?
Capacity	Infrastructure availability	Is the mode physically available on the route(s) required to meet my demand?
	Carrier capacity	Does it have sufficient capacity within the timescale of the haulage contract that I would like to sign?
Service	Reliability	Can I depend on this mode and what is the likely variability of performance?
	Service frequency	How well matched is the service schedule to my business needs, or those of my own customers?
	Delivery time	How long will it take to deliver the freight from origin to destination (door-to-door)?
	Risk of loss/damage	What is the likelihood of my freight being stolen or damaged; what will it cost to insure this using this mode?
	Availability of ancillary services	Does the freight transport provider offer me e.g. storage services, consignment tracking, insurance?
Tariff	Door-to-door price	What will I pay to deliver the freight from origin to destination (door-to-door) if I choose this mode?
	Price incentive structures	What price incentives does the company offer me to send more volume by this mode?
	Inventory cost	What will be the cost to me or my customers of inventory held in-transit?
Strategic	Option value	What is it worth to use this mode to make sure there remains competition between alternative suppliers?
	Relationship value	What is the long-term value of maintaining relationship with supplier instead of chopping and changing for short-term advantage?
	Corporate image	Will the mode help deliver a positive corporate image for me or the freight owner (e.g. safe/green)?

5.4 Improvements to service quality perception

Two elements drive the perception of quality. The actual performance itself and the myths and rumors that are circulated. Improving actual performance is best achieved by adopting targets and using data and communicating it to employees and clients to demonstrate performance. Targets of improvement should be openly shared and strategies to achieve those targets worked on by all parties.

Perception can be altered by providing data in an open and transparent way even if it indicates poor performance. Generating trust is a powerful way of improving perception.

5.5 Management of tariffs

For an interim period, prior to market opening, UZ will be required to maintain financial sustainability. Adjustment to tariffs are logically addressed by applying an index based on the changes to its input costs. This is a Production Price Index (PPI). This index is a base upon which other factors may be applied. Tariff adjustments should display the following attributes:

- i. The adjustments should be part of an overall agreement that includes base rates, conditions of carriage and service quality;
- ii. Adjustments should take account of the prevailing conditions of the general economy, client circumstances, railway financial circumstances and any other factor that may impact or be impacted by the adjustment;
- iii. Use of a Production Price Index is a rational base to make the adjustments because it reflects input costs and if there are any other factors that should be taken into account, such as large capital expansion or productivity improvements, the PPI can be modified with the addition or subtraction of a factor;
- iv. The adjustments should be applied either regularly or with as much notice as possible so that all stakeholders can make any commercial or operational changes in advance;
- v. With regular adjustments, the method of adjustment and the factors are conveyed to all parties for their comment and iteration, and the method of adjustment and the factors are applicable over a multi-year period. This makes the adjustments somewhat predictable within the bounds of the factors being used;
- vi. The overall trend in railways around the world is to regularize the adjustments so that there are no severe shocks to clients and to promote a stable operating environment that promotes investment.

After market opening, when UZ may have to compete with both road transport and third-party train operators, continual indexation may not always be in their best interests, as indexed tariffs may increase beyond the competitive rate. Although state-owned, UZ Cargo will be subject to market forces and will need to make decisions based on commercial competition criteria in order to be sustainable. It should have the freedom to price as it sees fit but needs to understand the forces at work including road truck competition and third-party train operating companies. Cargo tariff policy can no longer be just cost-based, it needs to reflect market and competitive factors. Under market pricing, indexation would remain applicable only by agreement between an operator and a shipper as part of a multi-year contract to carry.

6. Network infrastructure asset management

6.1 The issue

One of the main features on the new railway institutional framework will be the transformation of UZ's infrastructure management (assets, staff, responsibilities, activities and accounts) into an independent 'Infrastructure Manager' entity, consistent with responsibilities set out in the new Railway Law and aligned to commitments contained in the EU-Ukraine Association Agreement. This transformation will not of itself alter the physical challenges of asset condition and performance. But, as happens with all major institutional changes, it will provide an opportunity to examine and improve the way in which infrastructure managers perform their functions.

This section is focused on the concept of Infrastructure Asset Management (IAM) and the role of life-cycle costing, and how these concepts and processes could help the new Infrastructure Manager perform its responsibilities better.

6.2 Infrastructure life-cycle costing

The life-cycle cost (LCC) of track incorporates ballasted track component/element choices based on commonly used components, as well as alternative solutions involving innovations. Strategic life-cycle analysis is based on attaining a more favorable CAPEX-OPEX balance (i.e. leading to lower life-cycle operational cost profiles without excessive initial CAPEX increases) than the more usual choice of track components based on the minimization of CAPEX only. Designing a life-cycle costing methodology must reflect the specifics of railway infrastructure:

- i. The infrastructure of railways is very costly.
- ii. The service life of infrastructure assets is very long, 30 years and often more. Consequently, all costs over the entire service life must be considered.
- iii. Infrastructure is a precondition for train operating companies to earn revenues. However, these revenues cannot be directly linked to a specific type of track or track-work. Therefore, an economic evaluation of infrastructure must focus on cost comparisons of the alternatives.

LCC is a process whereby costs of various track alternatives are compared in order to identify the most sustainable and economical solution. On the cost side 'key ready' costs are used, a concept that includes trackwork costs, all logistic costs (e.g. transport of track materials), overhead costs, and also (due to the long service lives) the cost of capital (represented by an interest rate). Downstream costs for train operators due to track possessions or poor track quality, need also to be taken into account (e.g. costs of operational hindrances). These various costs occur at points of construction, maintenance and renewal. The scrap value or disposal cost for the previous asset needs to be included where significant. All these costs are assembled for every alternative based on the working cycles of the Standard Elements of infrastructure. Standard Elements deliver a time sequencing of costs from one re-investment to the next (and are discussed in more detail in Section 6.3).

In principle, there are different methodologies available for an economic evaluation of alternative options (Figure 6.1).

Figure 6.1 Methodologies for economic evaluations

STATIC	DYNAMIC
comparison of costs	net present value costs
comparison of profit	net present value
average profit	annuity ¹
productivity	internal rate of return
repayment period	repayment period

¹ annuity: annual average dynamic costs

Static methods of evaluation are inadequate because, within long service lives, the cost of capital must be included. Comparing the profit and the net present value cannot be used as there are no direct revenues. This is also true for the internal rate of return and the pay-back period. Therefore, the annuity method which takes into account cost of capital (measuring dynamic average annual costs) is the most appropriate method for comparing different options.

Costs will change over time. There are intrinsic uncertainties in estimating the total life cycle cost of long-lasting assets because of the high likelihood of unexpected changes related to, for example, component costs and maintenance productivity. Therefore, the central values that result from a study are a valuable aid to decision-making but are not sufficient. Sensitivity analyses must form an integral part of the economic evaluation. Sensitivity analyses will deliver different estimates of life cycle costs based on differing assumptions about future parameters. The ranking of the alternatives, and the stability of that ranking, are the most relevant indicators. If the ranking remains stable through the sensitivity test, the option that ranks first can be considered the best solution despite the future uncertainties.

In some cases, the methodology of calculating critical values can be helpful. In this case it is calculated how much a data set must differ, until the first and the second alternative show the same economic efficiency. Experience shows that in most cases the ranking remains stable because alternative values often affect the different alternatives in a similar way. However, if the sensitivity analyses show a frequent change of ranking between, for example, number one and ranking number two, then for decision-making purposes it is reasonable to treat these alternatives as probably having very similar economic efficiency.

6.3 The standard element approach

The Standard Element approach aims at describing track behavior over its entire service life, so service life must be identified as well as the maintenance demand. However, infrastructure elements such as “track” or “turnout” are not unique technologies: different track/turnout options have different costs and performance. So the track superstructure must be analyzed in detail. The condition of sub-soil and the dewatering (drainage) system also have a strong influence on superstructure behavior and performance, so these conditions must also be taken into account.

Railway infrastructure has an extremely long service life and there is a strong relationship between the initial construction quality, ongoing maintenance demand and total service life. Research into track behavior shows that investment determines the initial track quality but does not automatically deliver service life. It is maintenance that then transposes the *potential* service life offered by the investment into an *actual* service life.

Though general track behavior follows some rather simple general principles, analyzing the status of a given length of track is complicated, as track behavior is very sensitive to many boundary conditions, including:

- a. **Subsoil quality.** The subsoil forms the foundation of a track and thus has a major impact on the amount of maintenance needed. Subsoil with sufficient bearing capability needs least maintenance and delivers maximum service life.
- b. **The dewatering system.** A good subsoil will stay good only if a drainage system is properly installed and a maintained.
- c. **Traffic load and type of traffic (speed, axle load).** The transport load triggers maintenance need: the more and heavier the trains operated, the higher the maintenance demand and the shorter service life.
- d. **Ballast Quality.** Ballast is the most relevant component of track superstructure and its quality crucial.
- e. **Track Alignment (mainly the radii).** The alignment of track is a major aspect of track maintenance demand. A curved track needs a separate maintenance regime or simply more maintenance than a straight track section. Consequently, service life is shorter in curved track compared to a straight one.
- f. **Type of Superstructure (type of sleeper, rail profile and steel grade, status of rail pads and fasteners).** All track components influence track behavior. The rail profile defines the service life of rail in terms of fatigue resistance. Higher profiles are able to carry more gross tonnes before frequent rail breakages occur. The rail steel grade influences the wear resistance and the resistance against rail surface failures (mainly cracks). The sleeper type has a major impact on the load distribution towards the ballast bed: wooden sleepers deliver a slightly more elastic track and thus distribute the load on more sleepers. The main difference to concrete sleepers occurs on the sleeper-ballast-interface as ballast stones can penetrate the sleeper surface and generate a bigger load carrying area in this way. Concrete sleepers on the other hand are cheaper (influencing the investment cost of track) and reach longer service lives as they are not subject to natural wear. Additionally, for turnouts, the following parameters need to be taken into consideration:
 - **Geometry of turnout.** Maintenance demand of turnouts is influenced to a high degree by their geometry, meaning turnouts in straight sections, turnouts in curved sections without cant, turnouts in curved section with cant.
 - **Diverging radius.** The influence of diverging radii depends on the diverging speed. This is true except for the wear of the switch rail. However, the length of a turnout is defined by its diverging radius and thus the costs of investment and maintenance depend on this parameter.
 - **Type of frog.** The frog can either be fixed or movable, resulting in different investment costs and different maintenance demand. Furthermore, different materials are in use. Nowadays manganese frogs are a standard solution.
 - **Transport load.** The transport load of diverging trains influences maintenance demand and service life of switch rails.

Table 6.1 shows as example the range of different parameters taken into account in Austrian Railways for defining general asset management strategies for open track. (Speed is not shown in Table 5.1 because in Austria, speed and transport load go hand-in-hand. If this is not the case, speed forms an individual parameter).

Table 6.1 Parameters for Describing Open Track (Austria)

transport volume [gross-tonnes/day, track]	track [number]	rail profile []	rail steel grade []	sleeper []	radius [m]	rails []	subsoil condition []
> 70,000	1	60E1	R400HT	concrete	> 3,000 m	CWT	good
45,000 - 70,000	2	54E2	R350HT	concrete USP	1,000 m - 3,000 m	jointed	weak
30,000 - 45,000	2+2	49E1	R260	wooden	600 - 1,000 m		poor
15,000 - 30,000			R200		400 m - 600 m		bad
8,000 - 15,000					250 m - 400 m		
2,000 - 8,000					< 250 m		
< 2,000							

6.4 Identifying rail infrastructure backlog

Estimation of the technical backlog in infrastructure investment and maintenance can be approached in two ways:

- i. Based on the Standard Element approach, the Standard Elements for the entire network generate an average service life (depending on the values of the different elements). This provides a basis for calculating the average necessary renewal rate: by dividing network-length by this average service life. This rough estimate can be compared to the average annual renewals. If the actual is lower, especially over a long period, this means a constant, ongoing over-aging of the network.
- ii. The second option – that should be at least partly adopted – is to identify specific sections that are over-aged. Over-aged track faces either operational restrictions (speed restrictions and/or reduced axle-loads) or needs intensive, costly maintenance in order to delay track renewal.

At this stage, the first alternative is proposed for Ukraine because it allows for a fast overview of the track age distribution of the network. That includes not only identifying the backlog, but also the challenges of maintenance, and renewal needs in the upcoming years.

Detailed data was not available for this exercise. However, the length of rehabilitated tracks of 2,297 km in the last 5 years implies an average annual renewal rate of some 450 km/year. Excluding stations and sidings, there is a total of 27,000 track km. This annual rate constitutes about 1.7 percent of the network. **The average service life of track would need to be around 60 years for this to be adequate.** Such a long service life is wholly unattainable with today's track components and Ukraine's traffic load. The point is illustrated by considering two specific analyses.

A high-loaded section of the Ukrainian network analyzed by the Bank team (some 240,000 gross-tonnes/day on each track) would have a service life of about 15 years under Austrian conditions (sustainable maintenance assumed). A lower-loaded section analyzed (Odesa-Sort. – Chornomorska has some 50,000 gross-tonnes/day on each track) might have 40 years of service life, again with application of sustainable maintenance. However, the data provided indicate that even these service lives might not be reached due to the lower maintenance levels actually executed.

The estimation has also been carried out for that sub-set of lines having transport loads of at least 10,000 gross-tonnes per day, this give some 18,000 track-kilometers (less than half the total network track-km). Assuming the renewals of the last 5 years have been mostly allocated to these busier lines, their average

service life is estimated to be about 40 years. That seems still to be too high and indicates there is a backlog, but not a severely over-aged main network. Conversely, it means the rest of the network, the lower-density lines, must be already under operational pressure and are heavily over-aged implying either deteriorating quality or expensive renewal. This will be significant in any future Mol appraisal of what to do with low density lines (See Policy Note 1, Annex A).

In summary, preliminary analysis suggests 40 years average service life on higher loaded lines cannot be realized presently due to inadequate maintenance. For very high loaded sections, 15 years could be possible but would require comprehensive levelling-lining-tamping. For medium loaded lines some 30 years of service life is possible without major maintenance interventions but could be increased to 40 years if proper maintenance were to be executed. This first technical evaluation strongly indicates a backlog of re-investment which is currently increasing.

6.5 Possible future steps

Implementation of an LCC-based asset management system is a challenging task for infrastructure managers. International experience suggests it takes at least 18 months for an asset management system to reach the operational level necessary for strategic decision making. Starting the work requires an initial two days seminar on the main principles of the Standard Element approach and to win the commitment of a working group to ownership of the implementation process. The working group would need to meet at least every six weeks.

The first milestone of the working group would be a set of Standard Elements describing the present situation and its history of maintenance and service lives of track in the Ukrainian railway network. These Standard Elements need national and international verification as this forms the base line for all economical comparisons and thus for all derived strategies.

The second milestone is a set of alternative technical scenarios enabling the definition of a sustainable solution. This again is a task for the working group taking account of existing international experiences. Reaching this second milestone, the renewal demand as well as the maintenance demand for a sustainable network can be calculated. Comparing these figures with the existing situation (first milestone) allows identification of the current backlog and can form a base for budget discussions.

A workshop on economic evaluation techniques, provides the possibility for UZ to implement the Standard Element approach as a UZ decision tool for track asset management.

To establish comprehensive Life Cycle Management in which all decisions are taken that focus on a modern, sustainable railway system, requires:

- i. A set of Standard Elements needs to cover at least 80 to 90 per cent of the network.
- ii. The associated maintenance demands must be specified including small, reactive maintenance.
- iii. Track costs must be calculated and documented on a uniform basis including costs of material, machinery, staff, and overhead costs.
- iv. Speed restrictions (if existing) must be monitored by an approach that is feasible for the existing data.

These data requirements are discussed in detail in Policy Note 5 together with a description of how the data can be assembled to create working cycles for the whole service life for each section of track.

The local working cycles derived should always be cross-checked against expert knowledge. Various infrastructure managers internationally have already examined the Standard Element approach and verified their working cycles and service lives by live and frequent matching of executed maintenance and track renewal. (The type of local track ballast must be taken into account robustly, as it is crucial for the entire behavior of track).

If implemented well, the “Standard Elements” approach can support

- i. the identification of necessary maintenance and renewal budgets in order to guarantee a sustainable railway infrastructure ready to cope with future loadings – and thus also evaluate backlogs,
- ii. the identification of components to be used for different parts and lines in the network, and
- iii. if local data are added, decision making for single re-investment projects.

Annex A: Low-density rail lines requiring policy review

An understanding of the economics of Ukraine's railway network is essential to developing a policy position about the level and structure of PSO payments under the new Railway Law. The Bank team has undertaken preliminary analysis which indicate the nature and importance of the issue.

Under the EU rail *acquis*, and in accordance with the new Railway Law, an 'independent' UZ Infrastructure Management entity (probably a company) will 'sell' access to its network in return for track access charges (TAC). The actual 'market' to be opened in the first instance is therefore the market for train paths on the railway network.

What is the nature of the railway network for which the market will be opened? In broad terms, Ukraine's working rail network is nearly 20,000 km long, of which 10,000 km is electrified (with two different voltages) There is a wide range in the cargo utilisation of this network.

To provide a visual representation of utilisation, the Bank team plotted the flows on stylised network diagrams. Figure A1 shows the distribution of cargo flows by route measured by net tonnage of cargo. This shows that about 30 percent of the network carries 10 million tonnes of cargo per year or more: the most heavily-used sections carry up to 70 million net tonnes of cargo each year, an extremely high traffic level by European and world standards. The busiest parts of the network will almost certainly attract multiple new cargo rail companies to buy train paths from the UZ Infrastructure Management entity. Conversely, about 20 percent of the network carries fewer than 250,000 net tonnes annually, equivalent to perhaps 2-3 trains/week: these 'low-density' branch lines are a financial burden to many railways and in some countries have been gradually closed. Most are unlikely to be of much interest to new operators.

Figure A2 shows utilization of the network by long-distance passenger services, this time measures by carriage-km. It includes Platzkart and Kupe services. Mainline passenger train services (including intercity trains, not shown on Figure A2) use about 60 percent of the network. International experience is that the rail passenger market is substantially less contestable than rail cargo markets. When the network is opened there may be some demand from new operators for train paths to operate passenger services on the main lines but possibly only 1-2 operators on these main routes.

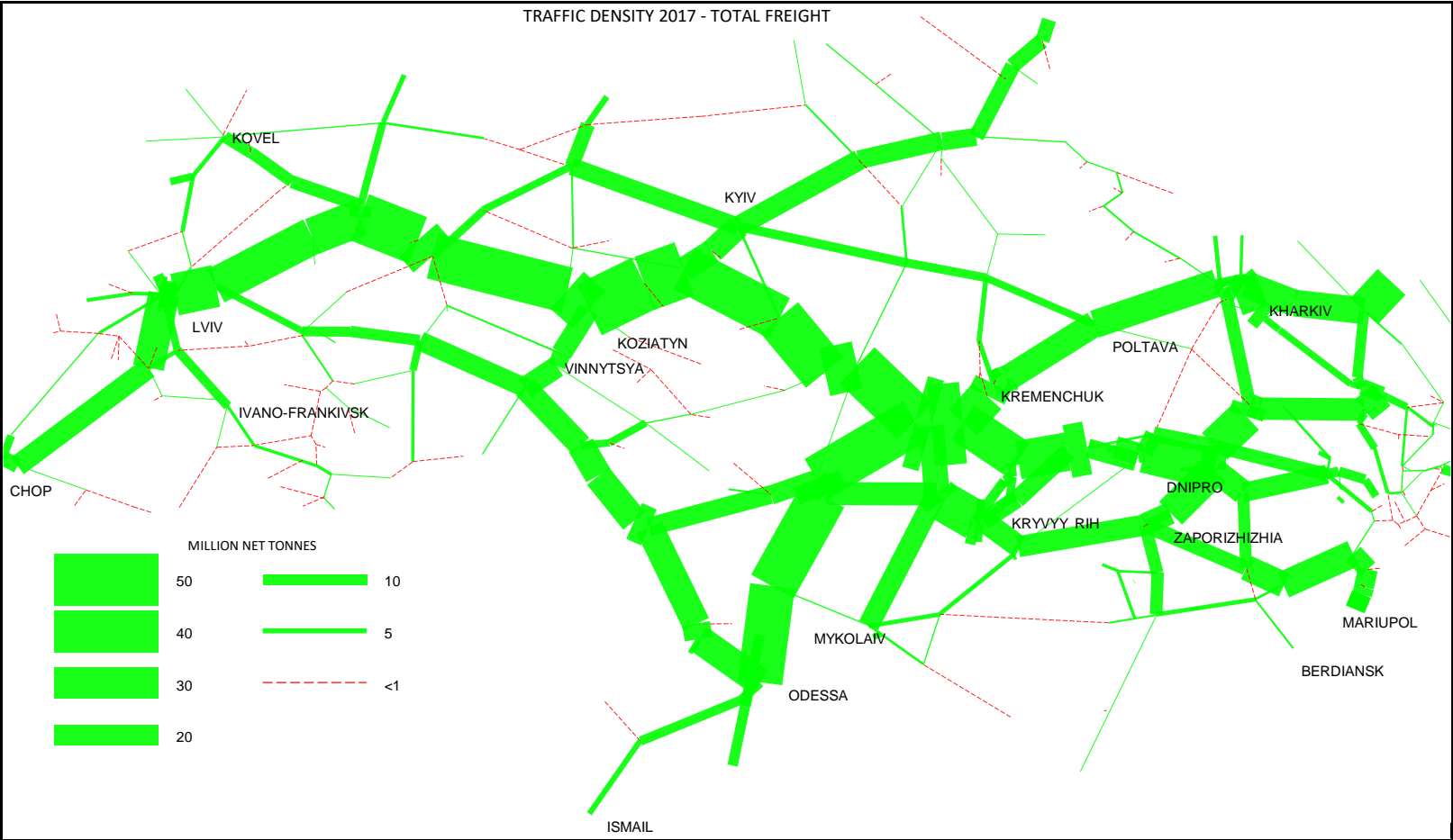
The Bank team then made estimates of which parts of the network might be financially viable when a market for train paths is created. That is, which parts of the network are capable of earning sufficient in revenue from TAC to pay for the costs of maintaining and operating railway infrastructure and which would not. For analytical purposes the analysis assumed a uniform TAC level across the whole system (i.e. the same charge per gross tonne-kilometer for anywhere on the system) and with charges set at full cost recovery levels for the system as a whole (which is at the highest end of EU experience). Figure A3 shows that on this basis, around 55 percent of the railway network could earn enough in TAC revenue to fund itself. The remainder, about 8,000 route-km, could not. If the low-density lines are retained it will require that their costs (a) be supported by TAC revenue from the main-lines, or (b) funded by multi-annual infrastructure contract (MAIC) payments from the GoU, or (c) funded by GoU through direct subsidies to passenger train services using them that are in turn paid to the Infrastructure Management entity to recover the full infrastructure costs of the lines they use.

In practice, if GoU wishes to retain low density branch lines it would be most straightforward and more transparent to fund them directly as a network PSO through an MAIC. However, before doing so it would make sense to undertake a detailed analysis of each of the lines that constitute the approximate 8,000 km of potentially uneconomic lines to determine if they have wider social and economic value that justifies retention and subsidy. Such a review would need to consider the following factors for each line:

- i. Could the line have any compelling long-term strategic importance (e.g. as a by-pass route for cargo on congested main lines)?
- ii. Does the main cargo or passenger flow on the line originate at the end, or only part way along the line, which might imply retaining a shorter section of line?
- iii. How well utilized are any passenger train services on the line and could service to these passengers be provided more economically at an equal or higher level of service by contracting with a road transport operator to provide good quality road bus services?
- iv. If the line is dominated by one industrial user (e.g. a grain shipper or a paper mill), would that industry be willing to take over the operation of the line, shunting its wagons to/from the main line for collection by regular cargo train services?
- v. Is there any other private company or group willing to take a long-term concession for operating it as a 'short-line' (the usual economic model applied to branch lines in the USA)?
- vi. Is there an Oblast government or other local government interested in keeping the line open either by financial support or taking over responsibility for the line?

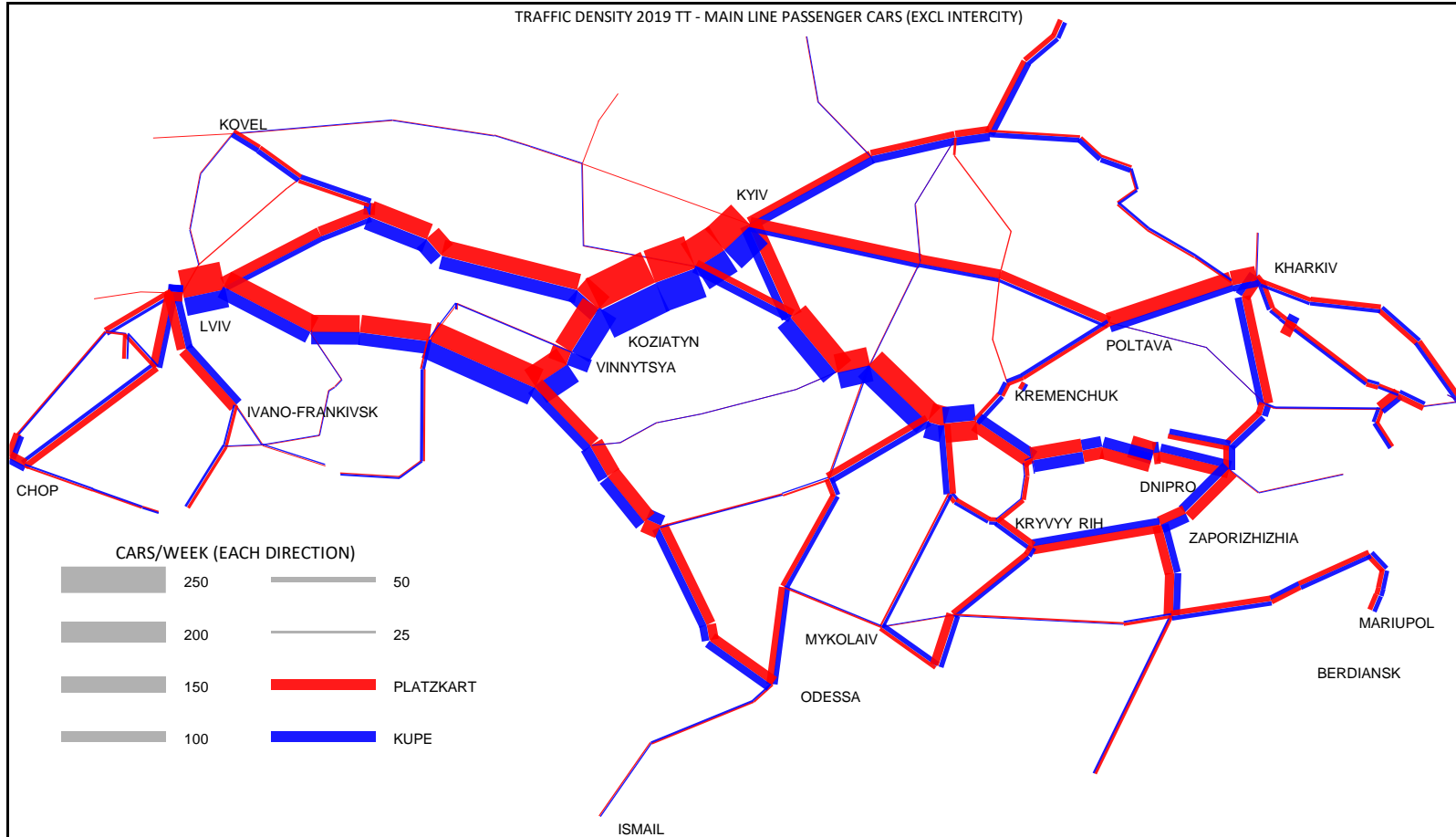
Importantly, it is not necessary to wait for the passing of the new Law for Mol/UZ to commence a joint review of low-density lines as an input to determine which should be retained. This is, a necessary input to quantifying the justified level of compensation for network PSOs (payable through a MAIC)

Figure A1: Utilization of Ukraine Railway Network: cargo tonnes



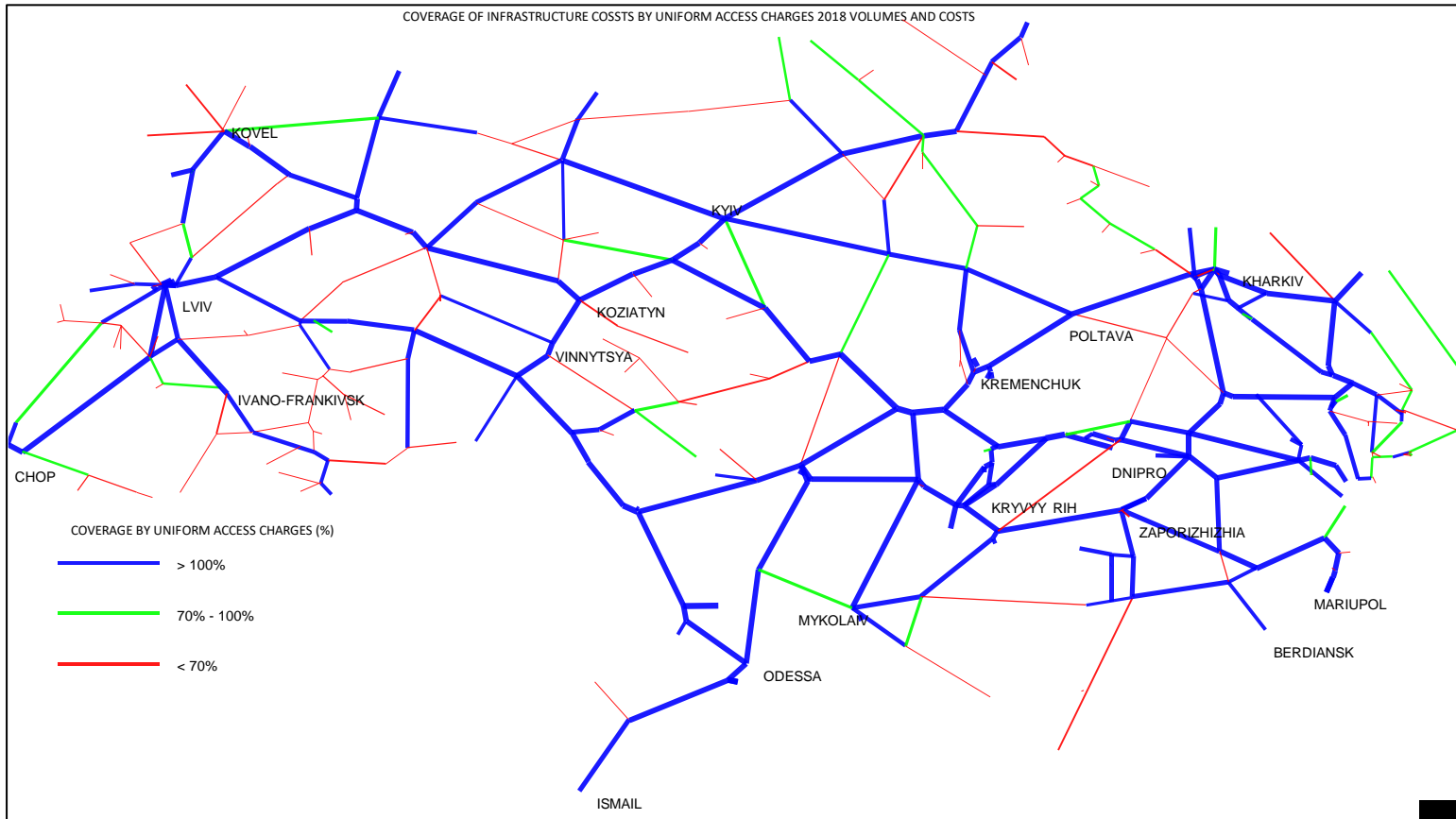
Source: UZ data and World Bank analysis

Figure A2: Utilization of Ukraine Railway Network: passenger trains



Source: UZ data and World Bank analysis

Figure A3: Potential coverage of UZ Infrastructure Management entity's line costs by TAC revenue



Source: UZ data and World Bank analysis

Annex B: Labor optimization

1 Trends in labor intensity in railways

Modern railway enterprises, whether state-owned or private, are less labor intensive than in the past. There are many functions in which labor requirements have declined substantially over the last few decades. Some examples are summarized in Table 1. As a result, a modern efficient railway operation needs far fewer staff numbers that were needed in the past to handle a given level of traffic. As a result, there have been major reductions in labor levels in most railways internationally: for example, in the World Bank's Eastern Europe and Central Asia region alone, railway employment reduced by more than 2 million people over the last thirty years.

Table 1: Impact of railway technologies and management approaches on employment levels

Trends	Impact on staff requirement
Mechanized track maintenance	Requires fewer and smaller maintenance gangs for track and other infrastructure.
Automatic and centralized signaling	Replaces large numbers of individually staffed signal-boxes.
Communications and IT technology	Enables more functions to be managed centrally with lesser need for distribution of functions among regional divisions.
Containerization of freight	Underpins mechanization of freight handling and reduces need for loading, unloading and transshipment staff.
Unit and block train operating strategies	Cuts out need for many small sidings and stations and intermediate marshalling yards, reducing staff requirement.
New locomotive and wagon technologies	Need more sophisticated maintenance resources but with fewer people working in fewer depots and workshops.
Better loco utilization, bigger trains	Requires fewer crews and smaller crew sizes required per train and per traffic unit.
Automated freight customer billing systems	Cuts out the need for large numbers of freight accounting clerks at stations and sidings.
Automatic ticket machines and electronic bookings	Fewer manual ticket selling staff needed
Competitive outsourcing of non-core competences	Reduces in-house staff and their overhead requirements while cutting costs through competitive procurement strategies
Closure of low traffic density branch lines and very small stations	The development of modern road transport means the small volumes of traffic can be carried at better service for lower cost by road transport

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2 Impacts of overstaffing

Retaining excessive numbers of employees damages the railway industry. Overstaffing adds to railway costs and reduces competitiveness⁸. In the context of market opening, UZ may confidently anticipate that any new carriers using the railway network will employ only the number of staff they need. They will not inherit any of UZ's traditional employment levels, work practices or employment norms. Those working for private carriers are likely to be paid more but be more productive in terms of revenue earnings per employee. UZ's Cargo & Logistics operator will be at a considerable disadvantage if it is unable to pursue a similar HR strategy

Overstaffing also usually leads to insufficient investment in improving and developing human resources. The most effective skills mix of an efficient modern railway is much richer than in the past. Overstaffed railways invariably lack either incentives or corporate culture to deepen and widen individual employee skills. The future of railways is with a smaller, more professionalized staff, with wider skills, higher productivity and with much higher value-added per employee. Chronic overstaffing can only stand in the way of that evolution.

The proportion of labor costs in UZ appear to be significantly higher than many other railways despite a relatively high average output in terms of traffic units/employee compared to many other European railways. With investment, more efficient work practices and employee upskilling, it is likely that UZ could make a substantial contribution to reducing costs and increasing railway competitiveness.

Labor union resistance to changes threatening to their members is understandable. It is reasonable that those who pay the short-term price of change should look to share some of its benefits in generous severance packages. Many railways have found that when they can demonstrate that a labor restructuring program is fair, and the workers are confident that it will be funded effectively, many railway employees have been very willing to take up a 'redundancy package' and seek more productive employment elsewhere.

3 Methods of labor restructuring

The main alternative approaches to labor restructuring are shown in Table 2. The methods shown are not mutually exclusive. Many labor restructuring programs internationally have contained a mix of the different elements⁹.

However, whatever approaches are used, the returns on funding a reduction in surplus railway staff is invariably high. The reason is straightforward. Surplus railway staff are a substantial cost for a that does not add to the economic output of the company (the same amount of traffic would be carried if the surplus staff were not employed). Therefore, if staff are paid an average of, for example, one year's wages to leave the railway, the investment in labor restructuring also pays back in about one year. After that the benefits continue each year as the costs are saved. The return on investment in labor

⁸ World Bank Railway Reform Toolkit:

<https://olc.worldbank.org/content/railway-reform-toolkit-improving-rail-sector-performance>

⁹ World Bank and PPIAF: Toolkit on Labor Issues in Infrastructure Reform

<https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/LaborToolkit/Toolkit/index.html>

restructuring is therefore typically very high and gained much earlier than for physical investment. Indeed, because labor restructuring increases labor productivity, labor restructuring typically also improves returns from asset investments as it reduces their average annual operating costs.

Table 2: Main alternatives for restructuring railway labor force.

Approach	Advantages	Disadvantages
Natural attrition	<ul style="list-style-type: none"> ➤ Normally less politically controversial. 	<ul style="list-style-type: none"> ➤ Usually too slow to transform efficiency or finances. ➤ Undesirable increase in average age of workforce.
Early retirement	<ul style="list-style-type: none"> ➤ Reduces immediate railway working expenses. ➤ May be the most acceptable option for workers or unions. ➤ Shifts part of financing burden to pension funding. 	<ul style="list-style-type: none"> ➤ Produces uncertain longer-term financial costs for pension funding. ➤ May lead to loss of the most skilled or experienced workers if early retirement lowers the retirement age. ➤ Options may be limited by the terms of pension rules.
Voluntary redundancy	<ul style="list-style-type: none"> ➤ Relatively simple to negotiate and implement as a 'one-time' payment and often politically more acceptable. ➤ Makes a clean break with employees so long as there are 'revolving-door' restrictions. ➤ As a bilateral contract with employees it may avoid legislative actions or mandatory collective bargaining obligations relating to compulsory redundancy. 	<ul style="list-style-type: none"> ➤ Often requires a substantial 'up-front' investment, especially because these plans tend to be generous to attract enough applicants. ➤ Requires that care be given to the rules and processing of applications; generous plans can lead to a rapid exodus of the best workers.
Compulsory redundancy	<ul style="list-style-type: none"> ➤ Makes a clean break with employees so long as there are 'revolving-door' restrictions. ➤ Is likely to be the lowest-cost option if only the statutory minimum payment is made to workers. ➤ Produces few adverse selection problems; workers will be selected for compulsory redundancy by HR management based on railway needs. 	<ul style="list-style-type: none"> ➤ Is usually the most politically difficult to implement requiring lengthy consultation/negotiation with government and Unions. ➤ Needs strict rules and process is it is to be fair and transparent process. ➤ May require compliance with complex Union agreements or statutory processes.
Outplacement	<ul style="list-style-type: none"> ➤ Probably more politically acceptable as railway takes responsibility for ensuring workers retain jobs in non-core rail enterprises. ➤ Some new separate businesses established by railways may be capable of competing and winning contracts outside the railway sector. 	<ul style="list-style-type: none"> ➤ May tie railway into continuing to contract with ex-railway businesses even if not best value for money. ➤ Railway may be required to provide financial support or guarantees to new companies to keep them in business, to detriment of core railway needs.