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FINANCING MODEL CROSS-BORDER RAIL TRANSPORT

D.T2.2.1 Financing and procurement of rail vehicles for regional passenger transport

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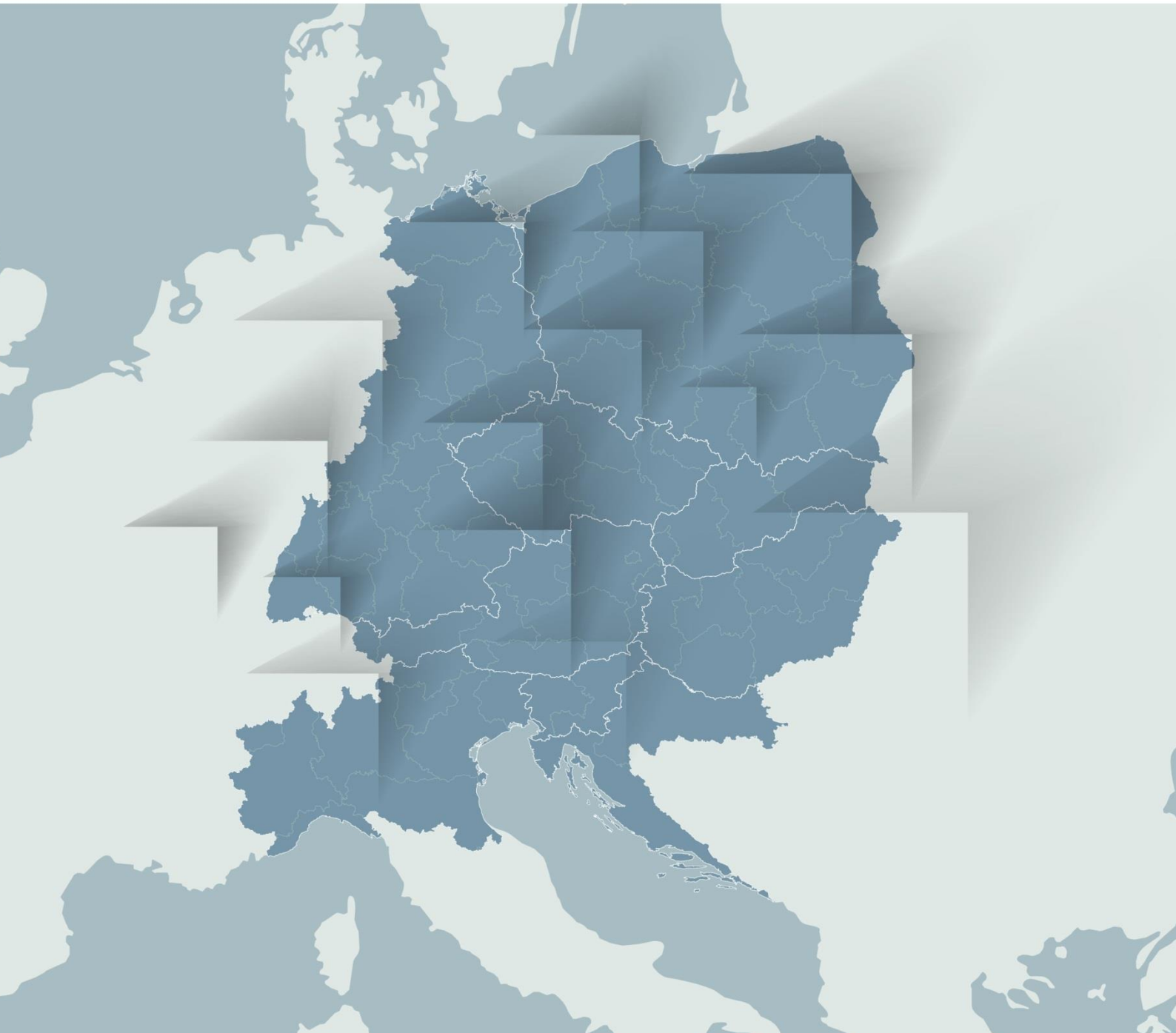

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A. THE SAXON PART

1. The objective of the investigation

The procurement and financing of rolling stock, whether freight or passenger, is a major challenge for railway undertakings. The purchase of a commuter railcar costs several million euros, depending on the configuration and type of vehicle. An electric locomotive with an ETCS module and the option of cross-border operation costs between €4 million and €4.5 million, depending on the form of the contract and the procurement volume.

In regional rail passenger transport (German abbreviation: SPNV: Schienenpersonennahverkehr), there has been a change in vehicle procurement that is still progressing. Innovative, tailor-made procurement models ensure more competition and cost-effective procurement. In the cross-border regional rail passenger transport between Germany and Poland examined here, it should be considered that there is currently no electrically powered multiple unit concepts on the vehicle market that is equipped with both the German and Polish train security and power systems. The available or used electric multiple units are usually authorized either in Germany or in Poland. The procurement costs amount to approx. € 5 to 6 million per vehicle (e.g. five-part multiple unit). For multi-system vehicles, the procurement costs are estimated to be between 30 and 50 % higher.

The aim of the study is first of all to show the general procurement models as well as their advantages and disadvantages, in particular concerning the possibility of purchasing a rolling stock for cross-border traffic between Germany and Poland. Based on the general procurement possibilities and forms of financing, a rough guideline for the cross-border procurement of rail vehicles in regional rail passenger transport will be developed.

The reason for the study is the complete line electrification between Dresden and Wroclaw, which is expected to be available from the beginning of the 2030s, and the resulting possibilities for transfer-free regional and long-distance passenger transport on this route.

2. Methodical procedure

The basis for the multinational procurement and financing model is formed by the prevailing framework conditions for the financing and awarding of transport services in regional passenger transport in Germany and Poland. The differences and similarities in connection with the financing and procurement of rolling stock in Germany and Poland will be worked out in a first step. At the same time, existing studies on vehicle procurement models and financing options for vehicles will be evaluated. Subsequently, models from practice are presented and analysed.

The preparation of a general guideline for cross-border vehicle procurement, which considers the financing possibilities, will be based on the results of the previous working points.

3. Financing of Regional Rail Passenger Transport in Germany and Poland

3.1. Financing Regional Rail Passenger Transport Germany

The current financing structure for regional passenger transport in Germany is highly complex. Various financing instruments are available, with four main financing pillars emerging. In addition to regionalisation funds under the Regionalisation Act, the Regional Rail Passenger Transport is financed by subsidies from the Municipal Transport Financing Act (Gemeindeverkehrsfinanzierungsgesetz) or the Unbundling Act (Entflechtungsgesetz), funds from the Federal Railway Expansion Act (Bundesschienenwegeausbaugesetz, BSAG), the Service and Financing Agreement (Leistungs- und Finanzierungsvereinbarung) and by fare revenues.

A major cost factor for the railway undertaking (RU) is the financing of the rolling stock. Depending on the type of vehicle and the service provided, the capital costs for the vehicles are between 15 % and 20 % of the total cost of providing a train kilometre.[1]

In Germany, regional (local) and long-distance transport can be easily distinguished based on the continuing implementations. The difference does not only result from the definition of local transport, which in the majority of cases refers to a travel distance of up to 50 km but also from the organisational separation. Local public transport is under the responsibility of the federal states or their relevant organisations, which order the operational services from RUs. As a rule, transport services must be put out to tender throughout Europe, depending on the transport volume. Competition has become the norm for Regional Rail Passenger Transport awards.[2] The award periods in Germany are usually 10-15 years, which is partly due to the necessary procurement in connection with capital costs. In case of the connection between Dresden and Wroclaw, there have not been any long-distance services in the strict sense for some time. Instead, a cross-border regional express connection was maintained in various constellations between 2008 and 2018, which came to a provisional end with the start of electric train operation on the Polish side. The regional express service is thus an exception and was achieved with great effort on the German and Polish sides and in the absence of comparable long-distance services. On the other hand, the Regional Express has led to a high quality of development of the two border regions. In the long term, however, regular, transfer-free long-distance transport connections in the corridor described are desirable and necessary for reasons of attractiveness, among others. Long-distance transport connections are generally operated on a commercial basis. The electrification and the closing of the gap between Dresden – Görlitz – Zgorzelec is an essential basis for an economical long-distance rail passenger transport.

The state railways Deutsche Bahn (DB) has been losing more and more market share in regional rail passenger transport since the opening of the market due to increased competition. In recent years, the majority of regional rail passenger transport services were awarded to competitors of DB Regio. The chart Figure 1 shows the share of bidders in completed rail passenger awards in 2016. To continue to ensure competition in rail passenger invitations to tender, public authorities have developed various financing models so that procurement does not have to be carried out by the RU. The models are explained in Chapter 0.

[1] Transport Economy and Logistics Centre (Zentrum Transportwirtschaft und Logistik): Ausschreibungswettbewerb im europäischen SPNV – Was kann Österreich aus den Erfahrungen von Ausschreibungen in Europa lernen?, Wien, 2013

[2] See also: Marx, Westen: Ausschreibung von innovativen Modellen im Naheverkehr, Eisenbahningenieur, März 2019

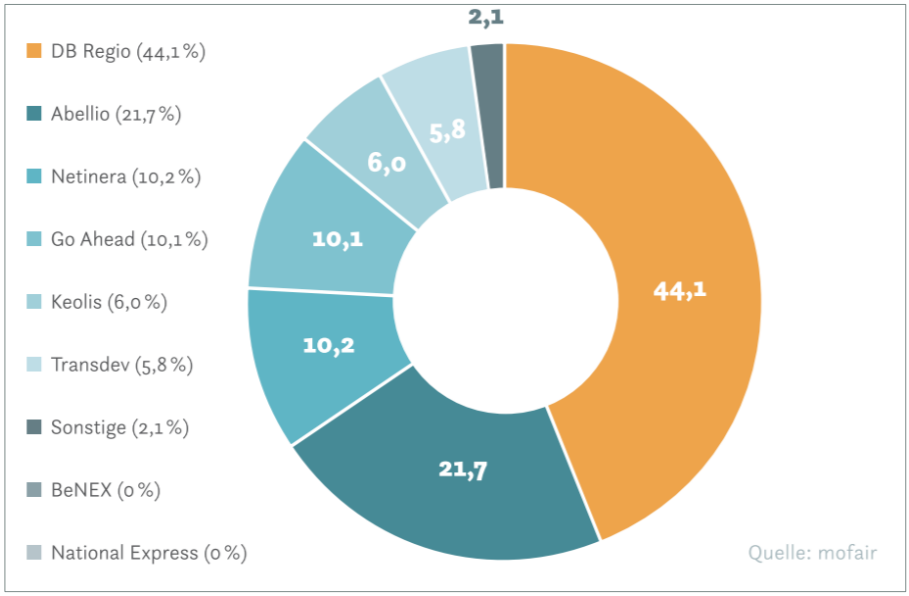

Figure 1: Proportion of bidders awarding rail passenger services 2016[3]

3.2. Financing Regional Rail Passenger Transport Poland

The financing and awarding of rail transport contracts in Poland are very different from that in Germany.

The Polish administrative districts are responsible for awarding and financing regional transport contracts. In this sense, the local governments contribute financial resources to the financing of rail passenger services. Since the end of 2008/beginning of 2009, 16 Polish administrative districts have been owners of the respective railway companies and rolling stock.[4] While in Germany regional transport services are tendered and awarded based on secured financing through long-term contracts (e.g. 10 to 15 years), in Poland, due to the uncertain financing, only transport contracts with short terms of 3-5 years are common.

In Poland, there is hardly any competition in regional passenger transport.[5] As mentioned above, the public railway undertakings are owned by the regional authorities, which means that regional vehicle pools can often be used, which has a positive impact on costs.

In long-distance rail passenger transport, too, certain services are ordered by the state through the central infrastructure resort of the Ministry of Transport.

[3] Mofair

[4] Lars Neumann, Céline Pinto: Strategische Perspektiven der Arbeitnehmer im europäischen Personenverkehr

[5] Senate Department for Economics, Technology and Research Berlin (Senatsverwaltung für Wirtschaft, Technologie und Forschung Berlin): Entwicklungen im grenzüberschreitenden Eisenbahnverkehr zwischen Deutschland und Polen, Berlin, 2014

4. Overview models for vehicle procurement

4.1. General models for vehicle procurement

The vehicle procurement strategy and vehicle financing is an important strategic decision for rail transport companies. In 2010, the operators in Germany still owned around 89 % of the railcars in the regional passenger rail network. In the past, the procurement of rolling stock and financing was left to the railway undertakings through tendering procedures. This approach is advantageous if standard vehicles are used and the capacity required for the individual lines can be estimated well in the long term.

In the meantime, more and more vehicles are provided by leasing companies or by public authorities or the federal states, which opens up new perspectives for all involved. This chapter describes the general models for vehicle procurement.

As explained above, in comparison to Poland, the rail vehicles used in Germany are not explicitly owned by the railway undertaking (or by banks or leasing companies depending on the financing model). Not all vehicle provision models are explained in this study due to a large number of models. Concerning a possible joint vehicle procurement between Germany and Poland, the most important supply models are presented in this specific context. These are:

- Provision of vehicles by the rail vehicle industry
- Procurement of vehicles by railway undertakings
- Procurement of vehicles by the regional authorities
- Foundation of a joint German-Polish vehicle pool
- Procurement of vehicles by third parties

In the case of vehicle provision by the manufacturer or the rail vehicle industry, the manufacturer of the rail vehicles is contractually obliged to produce, supply, rent and maintain the rail vehicles. To keep the risk as low as possible, the manufacturer usually founds his own company based on the above-mentioned requirements.[6] In return, the contracting authority undertakes to use the vehicles during the rental period so that the rental costs can be reliably covered. It is also advantageous for the manufacturer if the rental contract generally corresponds to the life of the vehicles to reduce the residual value risk.

In the ideal case, the public transport authority leases the vehicles to various railway undertakings (RUs) over their entire service life to ensure that the vehicles are used to their full capacity. [6] RUs shall then be contractually obliged to have the repair carried out by the corresponding companies of the manufacturer subsidiary.[6] The RU can also directly access the model “vehicle provision by the manufacturer”.

Another form of provision is the provision of vehicles by an RU. In this case, the RU procures the vehicles itself and is therefore also their owner. The acquisition is made through equity or financing with the involvement of third parties. It also has to take care of the maintenance of the vehicles.[6] The possibilities of financing will be discussed in more detail in the next chapter.

A further possibility is the provision of vehicles by the public authority or by the state. Here, the public authority or the state establishes its own company, which acquires and manages rail vehicles itself. When tendering routes for RUs it will be ensured that the use of vehicles is stipulated contractually to be from the contracting authority’s pool. The maintenance can also be taken over by contracting authority’s relevant organisation.

[6] ETC Transport Consultants GmbH: Machbarkeitsstudie für ein förderfähiges Modell zur nachhaltigen und betreiberneutralen Fahrzeugbereitstellung, Februar 2018

Alternatively, the RU can procure the vehicles and pass them on to the contracting authority immediately after receipt. This makes use of the RU's expertise, which may not be available to the responsible body.[6]

In particular, it has been shown that the number of bidders in procedures involving the provision of vehicles by the public authorities or the use of financial assistance is higher on average than in procedures without such bids by the public authorities.

The Landesnahverkehrsgesellschaft Niedersachsen mbH (LNVG) can be cited here as an example. While an average of 1.7 bidders submitted bids in procedures without a vehicle pool between 2012 and 2014, the average number of bidders in procedures with a vehicle pool was 3.8.[7]

The objectives of the RUs (participation in tenders, economic efficiency, key figures) and the objectives of the authorities (competition, low bid prices, appropriate risk distribution, high performance/quality, etc.) can be achieved with the help of public authority models.[8]

Also, there is the possibility that the public authorities may **set up** a **joint vehicle pool**. The vehicle pool company then procures the necessary rail vehicles and takes care of the necessary financial resources. The contracting authority, in turn, issues invitations to tender in which the RUs can win contracts to operate routes. Here it is contractually agreed that the RU which provides the transport services must rent the vehicles available in the vehicle pool.[6] addition, the RU must take care of the maintenance of the rolling stock and the contracting entity must ensure that the maintenance is carried out comprehensively and with sufficient care. [6] The procedure gives the public authority a better control or overview of the vehicles, as these are not the property of the RU, but belong to the public authority's vehicle pool. [6] With this construction it is also possible that the vehicles will be purchased by the RU and later resold to the public transport authority. A prerequisite for a common vehicle pool, however, is that the terms of the transport contracts of the participating service providers can be harmonised and that both sides have the will to cooperate.

The creation of a joint vehicle pool has some important advantages. This means that the vehicles can be ordered by the vehicle pool company before the routes are awarded, which in turn prevents the RU from not having any vehicles to operate the route after winning the tender. Also, rationalisation benefits can be achieved and passenger gains can be achieved as new, larger vehicles can be procured. Also, savings can be achieved since the vehicles for the vehicle pool can be purchased in larger numbers than would be possible for a single RU. Also, a vehicle pool can ensure equal opportunities among the individual RUs. From a financial point of view, a pool of vehicles will facilitate interest payments, since there will be no interest on capital if regionalisation funds can cover the financing completely.[9]

In regards to the establishment of a German-Polish vehicle pool, there are further requirements and complexities. The following essential points must be clarified in advance:

- Clarification of the use and procurement of the vehicles
- Clarification of the modalities for vehicle registration with railway authorities (EBA/UTK)
- Clarification of the award procedure

Another conceivable method of vehicle procurement or provision is procurement by third parties. Here there is first the possibility of the direct procurement of the vehicles by a third party. In the process, the public authorities launch an invitation to tender in which they look for a company to provide the vehicles.[6] After winning the tender, this vehicle provision company shall be obliged to procure rail vehicles following the specifications of the responsible body. Also, the company must take care of the financial means to

[7] Federal Office for Goods Transport (Bundesamt für Güterverkehr): Marktreport SPNV, 2015/2016

[8] Transdev: SPNV-Fahrzeugfinanzierung, 11.Deutscher Nahverkehrstag Köln

[9] https://www.lnvg.de/spnv/fahrzeuge-fahrzeugpool/fahrzeugpool, called on 10.05.2019

purchase the vehicles.[6] If the public transport authority6 found a vehicle supply company, it is up to the public transport authority to determine by invitation to tender that an RU can provide transport services on the tendered routes.[6] The tender stipulates that the RU must rent the vehicles from the vehicle procurement company and ensure that the vehicles are properly maintained.[6] The vehicle supply company monitors the maintenance, as it has a special interest in ensuring that the vehicles remain in good condition.[6]

A second option for vehicle procurement by third parties is vehicle procurement by the contracting authority with subsequent contract transfer to a third party. In this case, the responsible authorities first search for a vehicle supply company by tender, which is to take over the financing and leasing of the vehicles.[6] In addition to this, a tendering procedure is carried out by the responsible body in which a rail vehicle manufacturer is sought who can manufacture the required rail vehicles. Once such a manufacturer has been found, the public authority concludes a sales contract for the rail vehicles. This purchase contract is then transferred to the vehicle supply company.[6]

The invitation to tender for the provision of transport services stipulates that tenderers must hire vehicles from the vehicle supply company and are obliged to maintain the vehicles.

4.2. Financing possibilities

4.2.1. General information

In addition to the procurement of vehicles through equity or revenue reserves (if available), various financing models exist on the market. Depending on the financing model, the value of the vehicle serving as collateral (asset) and the creditworthiness of the rail transport company or the investors play a different role in the financing conditions. The different financing models do not influence the value of the vehicle but on the risk distribution between the financier and the railway company[10]. In general, a distinction must be made between the following financing models:[10]

- Capital market financing
- Loan financing without collateral on vehicles/corporate financing with high credit rating
- Loan financing, with real security on vehicles/classic object financing with the high significance of real security
- Finance leases and synthetic operating leases
- Real Operate Lease/Rental

Capital market financing is an instrument for financially strong and larger transport companies operating throughout Europe, as well as larger leasing companies. Financing takes place, for example, by issuing bonds. These bonds are then purchased by several investors, spreading the financing risk and using the money obtained by issuing the bonds of a company for financing purposes. Through capital market financing, financing terms of up to 20 years can be achieved (common duration mainly before the 2008 economic crisis).[10] Another possibility is the financing of vehicles at favourable conditions with EUROFIMA[11] or the European Investment Bank.

It is also possible to issue promissory notes. The borrower hands over this promissory note to the lender and receives a certain sum in return. The lender, in turn, then passes on part or all of the loan to other

[10] Allianz pro Schiene: Umweltbezogene Risikobewertung bei der Finanzierung von Schienenfahrzeugen, Berlin 2009

[11] European Company for the Financing of Railroad Rolling Stock (www.eurofima.org)

credit institutions to minimise his risk[12]. Promissory notes are usually only issued for large sums and have a long maturity.[13]

Loan financing without collateral requires a relatively high proportion of the customer's equity. Thus, the financing costs are correspondingly high. The loan is repaid from the customer's cash flow. The borrowing costs are thus determined based on the borrower's cash flow. However, the latter may contribute collateral to the loan that is not the property to be financed (land, office buildings, etc.). This can reduce credit costs. In general, the maturities of such loans are quite short (one to five years), as the lender bears a relatively high risk[10]. Interest expenses are comparatively very high.

In the case of loan financing with real security, the object to be financed also serves as security for the lender. The vehicle, which is to be both financed and used as security, is appraised before the loan is granted. The economic and technical lifetime plays an important role here, as this also affects the term of the loan. In general, it can be said that the credit period is about half the life of the vehicle.[10] The service life of rail passenger vehicles is generally 30 years and more.

The level of financing costs depends on how universally usable the financed vehicle is. The better its universal applicability or the robustness of the vehicle, the lower the financing costs, since the probability of a bad investment is minimized. It is important, however, that the borrower deposits the vehicles as collateral, but still has unrestricted access to his vehicles.

Ideally, the borrower will set up a separate company for this type of credit, which will be used as the owner of the vehicles. This has the advantage for the borrower that in the event of insolvency of the customer, the lender can only access the property of the company and cannot intervene in the company itself. On the other hand, the risk is more calculable for the bank, as it can only expect the vehicles as a risk and not the customer's operating business.

With finance leases, the residual value risk lies with the lessee and not with the lessor. Also, the lessor has a comprehensive right of recourse against the lessee. Depending on whether the lessee is the owner of the vehicle and the basic rental period is between 40% and 90% of the depreciation period, he does not have to balance the vehicle.

In the case of finance leases, the residual value risk of the vehicle lies with the lessee, who must also account for the vehicles in accordance with International Financial Reporting Standards (IFRS). As long as the non-cancellable basic rental period is between 40% and 90% of the depreciation period (depreciation period according to official tables) and the lessee is the beneficial owner, the vehicle does not have to be accounted for by the lessee in Germany in accordance with the provisions of the German Commercial Code (HGB).[10]
The lessee can transfer the entire risk to the lessor if a correspondingly high final rental payment has been agreed. The amount of this final payment is determined by the lessor. This form of leasing is called synthetic operating leasing. In both cases, the term of the lease is between 5 and 12 years.[10]

In the case of so-called real operate leasing, the lessor assumes the residual value risk[14]and the reuse risk in addition to his lessor risk so that the lessee does not have to carry the vehicle in his balance sheet. Operate leasing is the classic form of financing in the competitive market of rail passenger service.[15] The advantage of such a real Operate Leasing is that the lessor takes care of many formalities, such as concluding the purchase contract for vehicles so that the lessee can concentrate on his core business.[16]

[12] http://www.wirtschaftslexikon.co/d/schuldscheindarlehen/schuldscheindarlehen.htm , called on 07.05.2019

[13] http://www.wirtschaftslexikon.co/d/schuldscheindarlehen/schuldscheindarlehen.htm , called on 07.05.2019

[14] EI-Eisenbahningenieur (Thomas Schmidt): Operating Lease: Ein Finanzierungsmodell für Fahrzeuge im SPNV, November 2015

[15] Transdev: SPNV-Fahrzeugfinanzierung, 11.Deutscher Nahverkehrstag Köln

[16] EI-Eisenbahningenieur (Thomas Schmidt): Operating Lease: Ein Finanzierungsmodell für Fahrzeuge im SPNV, November 2015

Stringent tests exist to qualify as operating leases under IFRS. The lease term may cover only a relatively small portion of the economic life of the leased asset and the lessee does not have the option to purchase the leased asset at the end of the lease term at fair value. The shorter the lease term, the more expensive the rent usually becomes, because the lessor's residual value risk and the administrative expense are higher than with longer terms.

Also, the lessee cannot purchase the vehicle for its current value after the leasing contract expires[10]. The lessee no longer has any risk as the lessor assumes this. As a consequence, such a form of leasing is relatively expensive, as the lessor has the risk paid for and the leasing term is relatively short. In practice, the lease term is between one and five years for locomotives and between seven and 15 years for rail passenger vehicles.[10] Due to the residual value risks, the spread of operating leases is considered to be rather low.

4.2.2. Mixed forms of financing with support from public authorities

In addition to the forms of procurement and financing already mentioned, mixed forms of financing are becoming increasingly modern with the support of the public authorities. Examples of this are:

- Debt service guarantee
- Assumption of the interest rate risk by the responsible body
- Re-use / Re-registration Guarantee
- BW/VRR Model
- Extension of the duration of the transport contract to 22.5 years

The debt service guarantee is increasingly used for the individual vehicle provision methods, in particular for vehicle provision by independent third parties and vehicle procurement by public authorities with contract transfer.[17]

In this case, the task holder guarantees the lender timely payments of the debt service, i.e. the interest or loan repayment.[18] This debt service guarantee can be offered with a tender for the routes. In the [19]case of such a debt service guarantee, the RU must transfer the vehicles to a separate company, so that if the RU becomes insolvent, the vehicles do not become part of the insolvency estate.[18] In a crisis, the responsible body can take over the property company or enter into the rental or leasing agreement. If a claim is made, the customer's fee shall be reduced by the guarantee amount paid. Within the framework of the debt service guarantee, various arrangements are possible.

When assuming the interest rate risk, the executing agency assumes the risk of the interest rate change over the period from submission of the offer to the conclusion of the financing agreements. [18] Thus, the RU does not have to fear a loss if the interest rate develops in such a way that it would harm the financing contract concluded by the RU with third parties.

In the case of a reuse guarantee, the public authority takes over the RU's vehicles as soon as the RU's leasing contract expires.[18] The public authority shall pay the residual value for the vehicles and make the ve-

[17] ETC Transport Consultants GmbH: Machbarkeitsstudie für ein förderfähiges Modell zur nachhaltigen und betreiberneutralen
Fahrzeugbereitstellung, Februar 2018

[18] VDV/BAGSPNV Vehicle Issues Working Group (Arbeitsgruppe Fahrzeugfragen): Finanzierungsinstrumente im Besteller Markt, März 2015

hicles available for a new tender and then hand them over to the tender winner.[20]Alternatively, the awarding authority may group the vehicles in a separate vehicle pool and make the vehicles available to the winner of the tender. The sale of vehicles is also an option.[18]

In the case of a re-registration guarantee, the contracting authority shall ensure that new vehicles which are part of the same tender in the case of a call for tenders shall again be part of the call for tenders in the case of subsequent calls for tenders.[21] Only legal changes can lead to the fact that this guarantee cannot be given.[18]

[20] BAGSPNV: Übersicht Finanzierungsmöglichkeiten Auftraggeber, 2013

[21] BAGSPNV: Übersicht Finanzierungsmöglichkeiten Auftraggeber, 2013

5. Practical examples of vehicle procurement and financing

5.1. Procurement at country level / public authority

To support the transport companies at the beginning of the market opening and the competitive award, some public authorities decided to purchase the vehicles themselves and make them available to the operator. The measures aimed to keep the barriers to market entry for railway undertakings as low as possible and thus to promote competition.

There is a continuing and growing conflict between an increasing number and complexity of the networks to be allocated on the one hand and the associated limited number of bidders and the limiting investment resources on the other. As a result, the public authorities are increasingly called upon to make the market more attractive for bidders, so that the public authorities themselves increasingly assume risks. There's a risk shift. Vehicle pools currently exist in Lower Saxony and Hesse and, more recently, in Berlin. Also, the VVR model and the BW model are another form of vehicle procurement and financing.

With the VRR model (named after the Verkehrsverbund Rhein-Ruhr), the option is offered within the framework of a "classic" invitation to tender (transport service is put out to tender, procurement of the vehicles is the RU's task) that the responsible body or a national company subsequently acquires the vehicles from the RU and leases them back to it. The EVU thereby receives the financing conditions of the national company. The latter in turn obtain favourable financing conditions by the fact that the Land guarantees debt service to the financing bank. If the contract is awarded to a bidder who draws this option, a vehicle pool is created for the follow-up tender, since the public authority/the national company acquires ownership of the vehicles and provides them in a follow-up contract (usually after 15 years).

The debt service guarantee is also offered - as in the VRR model - within the framework of a "classic" invitation to tender. The public authorities offer to guarantee the loan repayment for vehicle financing for 24 years (or the depreciation period of the vehicles). If the contract is awarded to a bidder who exercises this option, the bidder must bring along a leasing company for insolvency reasons, which enters into the purchase and financing contract.[22]

The chart Figure 2 illustrates the Baden-Württemberg model. Under this model, the state of Baden-Württemberg has established a company, the Landesanstalt Schienenfahrzeuge Baden-Württemberg (SFBW), which concludes all necessary contacts with the rail transport companies. The RUs conclude a vehicle delivery contract with the manufacturer of the rail vehicles, whereby they configure the vehicles according to the specifications of the SFBW. Although the RU buys the rail vehicles itself, the SFBW buys the vehicles back from the RU immediately after the contract is concluded, whereby the vehicle supply contract becomes the property of the SFBW. Immediately afterwards, SFBW leases the rail vehicles back to the RU, similar to the VRR model.

The SFBW remains the owner of the vehicles and the RU must take care of the proper maintenance, which in turn is controlled by the SFBW. The tender for the routes will be carried out by the State of Baden-Württemberg itself.[23] The SFBW finances the RU through the direct purchase of the required vehicles. The SFBW itself takes out loans for this purpose, whereby the Land of Baden-Württemberg provides the lender with a debt service guarantee. This has the advantage for the RU that the more favourable conditions of the federal state can be used for the loans.[24]

[22] State of Baden-Württemberg: Modelle zur Fahrzeugfinanzierung

[23] State Institute for Railway Vehicles Baden-Württemberg (Landesanstalt Schienenfahrzeuge Baden-Württemberg)

[24] State Institute for Railway Vehicles Baden-Württemberg (Landesanstalt Schienenfahrzeuge Baden-Württemberg)

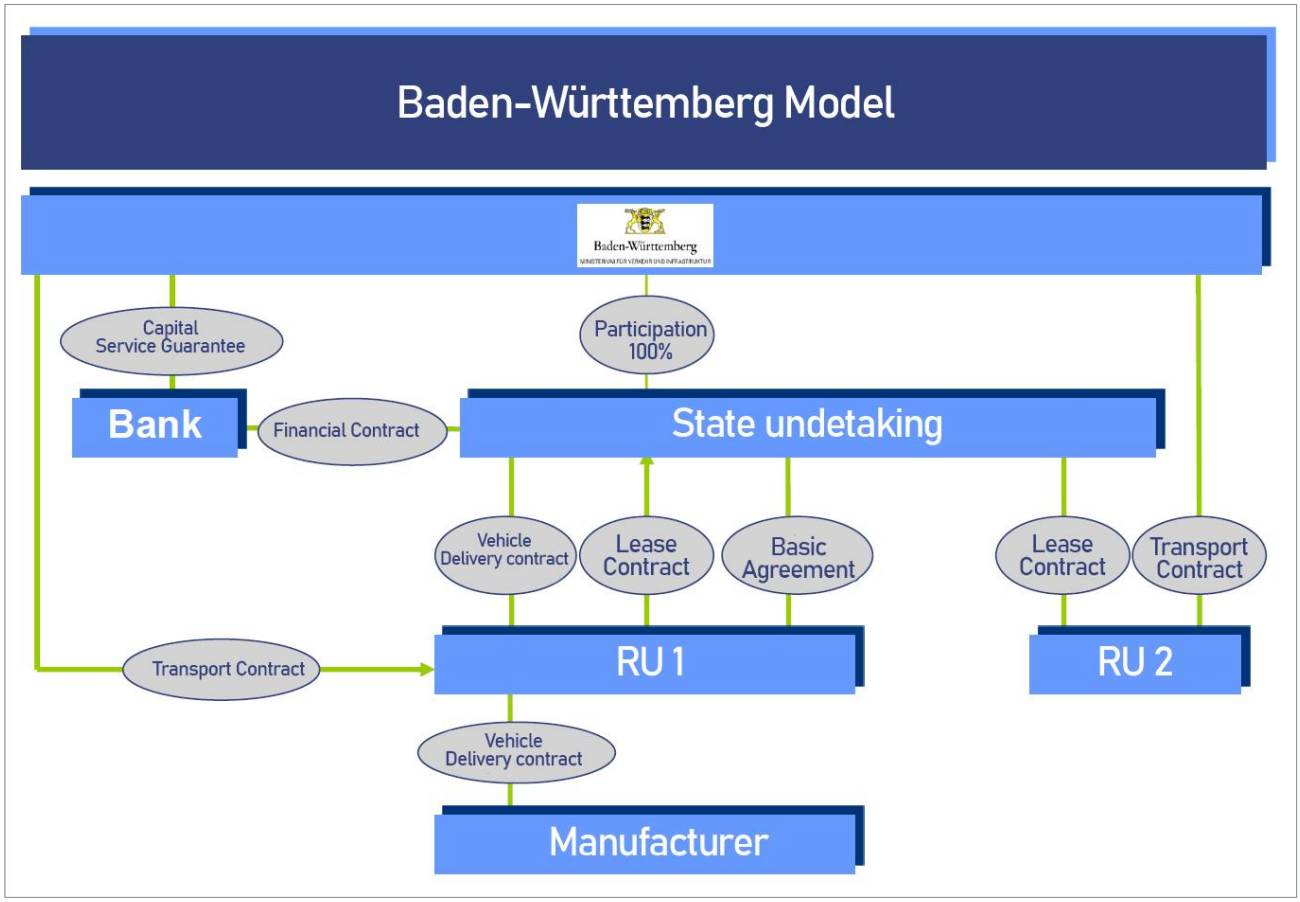

Figure 2: Principle of the BW model[25]

A state-owned company responsible for rail vehicles has also been set up in Lower Saxony, namely Landesnahverkehrsgesellschaft Niedersachsen (LNVG). In contrast to the BW model, trains are procured by the LNVG before the lines are tendered to RUs. Thus, LNVG buys the trains independently according to its requirements. This offers the LNVG and the future operators the opportunity to compensate for the long delivery time of the trains so that rail operations can commence quickly after the tender has been awarded. Also, LNVG can realise volume discounts on vehicle purchases if it procures vehicle material for several routes at the same time. An RU could not obtain these volume discounts for a single route. LNVG can also finance the vehicles from regionalisation funds, which eliminates capital costs.[26]

5.2. Procurement by transport companies

Until the financial crisis, with a few exceptions, the responsibility for procurement and financing lay with the railway undertaking. Due to the growing lot sizes in the allocation of networks, which increases the required number of vehicles, reinforced by high-interest rates for self-financing of the vehicles by rail transport companies and high risk when the transport contract expires without a follow-up agreement, new models for vehicle financing have arisen in recent years. This has already been explained in Chapter 5.1. Nevertheless, the RU still provides the vehicles for a large number of awards.

[25] Dr. Ute Jasper: Modelle der Fahrzeugfinanzierung

[26] Regional Transport Company of Lower Saxony mbH (Landesnahverkehrsgesellschaft Niedersachsen mbH): Fahrzeugpool

6. Summary and overview

The Table 1 shows the most important models for vehicle procurement, taking into account the procurement structure, vehicle financing and vehicle maintenance.

	Life cycle model	Transport authority pool	VRR model	Leasing	Property of the railway undertaking	Baden Wuerttemberg model	German-polish vehicle pool
Owner	Transport authority or third parties	Transport authority	Transport authority	Leasing company/ railway undertaking	Railway undertaking	Transport authority (country)	Various transport authorities
Responsible for the choice of vehicles	Transport authority	Transport authority	Railway undertaking	Railway undertaking/ leasing company	Railway undertaking	Railway undertaking	Transport authority
Procurement structure	Tender by transport authority	Tender by transport authority	Railway undertaking sells vehicles after choosing them to the transport authority, the transport authority leases them back to the railway undertaking	In responsibility of the leasing company	In responsibility of the railway undertaking	Railway undertaking sells vehicles after choosing them to the transport authority, the transport authority rents them back to the railway undertaking	Transport authority purchases the vehicles, the railway undertaking then rents them
Vehicle financing	Municipal loan (if owned by transport authority)	Municipal loans or regionalisation funds	Municipal loans (if possible)	By the leasing company	Railway undertaking	Transport authority takes out a loan, gets a capital service guarantee from the country	Financing by transport authority by regionalisation funds
Vehicle maintenance	Tendered by the transport authority in combination with the provision of the vehicles	Tendered by the transport authority in combination with the provision of the vehicles	Carried out by the railway undertaking under control of an asset manager	Carried out by the railway undertaking under control of an asset manager	Carried out by the Railway undertaking	Carried out by the railway undertaking under control of the transport authority	Carried out by the railway undertaking under control of the transport authority
Model types	Alternative vehicle financing depending on the owner	Vehicle pool belongs to the country	Maintenance by third parties (manufacturer)	Finance leasing (accounting with the lessee/ railway unertaking)	Model adjustments freely selectable by the railway undertaking		Purchase of vehicles by the railway undertaking, sale to the transport authority, transport authority rents the vehicles back to the railway undertaking

Table 1: Overview of vehicle procurement models[27]

[27] Updated table on the basis of BSL Transportation Consultants: Marktreport SPNV, 2013

7. Conclusions for the use of multi-system multiple units between Saxony and Lower Silesia

7.1. Framework

The general conditions for the procurement and use of multi-system multiple unit trains between Saxony and Lower Silesia are, among others, influenced by the following factors:

- Date of commissioning the electrified roadway Dresden – Görlitz – border D / PL
- The validity period of the transport contract in the East Saxony network
- Vehicle inventory and procurement on the Polish side
- Organizational/institutional framework for coordinating/ordering cross-border regional rail services, inter alia, by harmonising the transport contracts

These influencing factors and their interactions are explained below.

7.1.1. Route electrification Dresden – Görlitz – border D / PL

The project is registered in the Federal Transport Infrastructure Plan but is not considered as a pressing need. To put the necessary processes in operation, the Free State of Saxony commissioned DB Netz AG with the preliminary planning and they finance it completely. Although the further planning steps have not yet been secured to be financed, there is a clear hint for implementing the infrastructure project in the context of the compensation for the coal phase-out in the Lusatian district: This project is contained in the list of railway projects in the draft for the Structural Strengthening Law for Coal Regions[28] which has been passed by the German Cabinet on August 28, 2019. The parliamentary procedure is currently ongoing. The law is expected to be adopted in the course of 2020.

According to DB Netz, the preliminary planning is currently in the technical review. The completion should take place after the implementation of the Regional Planning Procedure by the end of 2020. A separate planning section was created for the electrification between the state border and Görlitz train station. This is a prerequisite for relocating the place of interchanging the local rail transport for cross-border connections from Zgorcelec to Görlitz. Görlitz station will also be the station for changing the electricity systems. In the final state, train journeys with the respective power systems can start or end here and multi-system vehicles can pass through the station.

Provided that the design and approval planning is continued in 2020 and then a subsequent project approval procedure for this section is passed, the construction can begin in 2025 and possibly be completed in 2026/2027. According to the current state of planning, completion of the route between the Görlitz and Dresden-Neustadt stations is possible by the end of 2029.

7.1.2. The validity period of the transport contract in the East Saxony network

The four public transport authorities, i.e. the Zweckverband Verkehrsverbund Oberlausitz-Niederschlesien (ZVON), the Zweckverband Verkehrsverbund Oberelbe (ZVOE), the Liberec Region and the Ústi nad Labem Region have awarded the services in the Eastern Saxony network to “Die Länderbahn GmbH” from Decem-

[28] Draft of a law on structural strengthening of coal regions, Federal Ministry for Economic Affairs and Energy (BMWI), 2019 (see https://www.bmwi.de/Redaktion/DE/Downloads/E/entwurf-eines-strukturstaerkungsgesetzes-kohleregionen.pdf?__blob=publicationFile&v=12)

ber 15, 2019. The contract has a validity period of 12 years (until the end of 2031) and includes the provision of the following local rail services:

- RE 2 Dresden – Zittau – Liberec
- RB 61 Dresden – Ebersbach – Zittau
- L7 Liberec – Zittau – Varnsdorf – Seifhennersdorf
- RE 1 Dresden – Bautzen – Görlitz
- RB 60 Dresden – Bischofswerda – Bautzen – Görlitz

To establish a connection in the direction of Wroclaw, 10 pairs of trains are extended to Zgorzelec. Diesel multiple units of the types Desiro (Siemens) and Regio-Shuttle (Stadler) are used.

7.1.3. Vehicle inventory and procurement on the Polish side

The Lower Silesian Voivodeship founded the RU Koleje Dol-nośląskie (KD) in 2007 to provide the rail passenger services. KD provides transport services with its vehicles and has been carrying out a comprehensive procurement program since 2012, which is supported by the Polish ERDF program. This also includes the 31WE series electric multiple units, which were purchased from the manufacturer NEWAG Nowy Sącz and have been used since of the electrification for the 2018 timetable change between Wroclaw and Weglinec has been completed. Since the timetable change in 2019, this line has been extended to Zgorcelec where there is a connection to regional traffic from Saxony (see chapter 7.1.2).

The multiple units are licensed for a maximum speed of 160 km/h. There are eight connections between Wroclaw and Zgorcelec every day; the fastest in the "Sprinter Kaczawa" with 1 hour and 28 minutes. According to the manufacturer, it is not possible to retrofit trains with batteries to run cross-border connections.

In 2020, the KD will procure 5 five-part electric multiple units, which come into operation also on the Wroclaw-Zgorcelec route[29]. Given the lack of a time perspective for the continuation of the route electrification on the German side to Dresden until the end of 2019, all-electric multiple units that have been procured so far have been exclusively equipped with the Polish power and train security system.

7.1.4. Organizational framework

Before the schedule change in 2018, contractual agreements on the use of vehicles had to be made for the direct connections without change between Wroclaw and Dresden. This primarily concerned ordering transport services with German diesel multiple units which are licensed in Poland. Since these are used vehicles, they only had to be rented. The rental was secured by a corresponding transport contract for three years. The same vehicles currently run to Zgorzelec.

Under the current conditions - i.e. with a change in Zgorcelec - the schedules between the authorities ZVON and KD / UMWD primarily have to be coordinated in a way that the connections for ten daily train pairs are guaranteed. This can also be assumed in the same way for the state from the commissioning of the section between the state border and Görlitz station if the electric KD multiple units run with the Polish electricity system there.

[29] https://www.eurailpress.de/nachrichten/fahrzeuge-komponenten/detail/news/koleje-dolnoslaskie-nur-newag-bietet-dialmode-triebzuege-an.html

The question of ordering vehicles with multi-system equipment or cross-border transport services without change for regional traffic between Wroclaw and Dresden will be relevant at the end of the 2020s when the electrified route section to Dresden is going to be commissioned. According to the current status, this coincides approximately with the expiry of the existing transport contract in the Eastern Saxony network in 2031. To be able to use the future infrastructural possibilities for direct connections without change with attractive travel times, a detailed perspective for the procurement of multi-system multiple units must be shown at an early stage and coordinated across borders. Given the complexity of the topic, it is advisable to create an institutional framework that can either be used for direct procurement - e.g. in the form of a separate vehicle pool - or accompanies the procurement professionally and thus creates the basis for contractual agreements.

7.2. Conclusions

The organizational form to be selected should consider the general conditions described above. This concerns, in particular, the way that awarding or creating transport services on the Saxon and Lower Silesian side – which differ significantly – has been practised until now. While it is almost certain that in the Lower Silesian Voivodeship the KD will be the service provider with its vehicles, the public authorities in Eastern Saxony are publicly tendering the traffic performance. So far, the contracted RU has also provided the vehicles to be used. In the future, however, it would be also possible that the East Saxon clients - similar to e.g. the Verkehrsverbund Mittelsachsen (VMS) in 2014 - procure vehicles for a future transport contract and make them available to the authorized RU. The intersection between the Polish and German constellation remains the vehicle fleet that will be used across borders on electrified routes in the future. This means that a vehicle pool could be created, which is procured either by the German or Polish partner or by both together. In this context, "procurement" means a contractual relationship with a company that provides the vehicles in one of the variants described in chapter 7.2 (i.e. purchase, leasing, etc.). Given the significant additional costs for the dual-system vehicles, it is necessary in this specific case to clarify, among other things, how many vehicles are to be procured and how these are to be integrated operationally into the vehicle fleets on both sides of the border. The multi-system vehicle fleet should therefore be dimensioned in such a way that it primarily serves the regional development of the border region of Saxony-Lower Silesia and does not render superfluous the justified demand for connecting this border region to high-quality long-distance transport.

Comparable considerations in other German-Polish border regions show that it is already foreseeable that finding a suitable variant is not a selective decision, but rather a more complex coordination process that considers several actors and the legal and financial framework. For this purpose, it makes sense to unite the relevant actors (regional authorities, regional rail authorities) in an institutional, cross-border form of cooperation that:

- leads this coordination process,
- supports professionally the establishment of the preferred variant for vehicle provision and
- coordinates in the long-term cross-border vehicle use.

For the cross-border cooperation of public institutions, European law has established the legal form of European Grouping of Territorial Cooperation (EGTC). EGTCs aim to facilitate and promote cross-border, transnational and interregional cooperation between their members.

The EGTC is therefore a platform that supports cooperation. At the same time, such a network serves as a planning and decision-making aid. The topics dealt with by the EGTC are diverse. In the field of local public transport, for example, timetable design, route routing or type or mobility offer play a role. On the other hand, it must be clarified which requirements must be placed on the vehicles that are to travel the routes in future. It is also important to examine the extent to which the station infrastructure needs to be

adapted (Example: platform height). The basic structure of an EGTC also helps here, as the agreements appear to be less complicated and more binding due to a clearly defined circle of participants. As a result, agreements can usually be reached much more quickly. In cross-border traffic, in particular, an EGTC offers the advantage that transfer times between the trains of the companies participating in the network can be optimised by jointly drawing up timetables.

A further advantage of the EGTC is the joint elaboration of the bases for vehicle procurement if vehicle procurement is necessary (depending on the procurement or financing model, RUs can be found using invitations to tender, which contribute their vehicle material to the operation of the route). In addition to the aforementioned specifications, the basic principles also include drawing up together the invitation to tender for the vehicle procurement. The procurement coordinated within the EGTC avoids problems such as incompatibility between the vehicles of different companies since a vehicle is procured from the outset which is used by all transport authorities and can operate on the various routes based on the technical equipment defined. The EGTC can also be used for marketing purposes, for example by operating a common website. On the one hand, it can be shown in this way how closely the associations cooperate. On the other hand, a customer-friendly approach can be significantly enhanced if the homepage offers possibilities to make the customer's everyday life easier. For example, it might contain cross-border timetable information, which also shows the connecting trains across the border, or joint ticket sales and sales activities, which can lead to cost-saving effects.

Finally, the European Grouping of Territorial Cooperation is particularly useful when it comes to planning and/or optimising cross-border rail transport, as it promises advantages in terms of joint offer design and joint vehicle procurement.

7.3. Examples of institutionalized cross-border cooperation (EGTC) in the transport sector

EGTC Eurodistrict Strasbourg Ortenau[30]

The tramway Strasburg (FR) was extended to Kehl (DE) in two stages (Kehl Hbf and Kehl Rathaus). The signage in the trains and the passenger information are bilingual. There is also a bus line from Erstein (FR) to Lahr (DE).

EGTC Eurodistrict Saar Moselle

Following a 2012 traffic study in the Eurodistrict Saar Moselle, which revealed that only 1% of residents use public transport for cross-border travel, several measures were developed within the framework of the EGTC. The reactivation of the cross-border bus line MS1 has already been implemented. A cross-border, uniform ticket system and a public transport connection between Saarbrücken (DE) and Forbach (FR) with its lane are also planned.[31]

EVTZ Eurometropolis Lille-Kortrijk-Tournai

Ticket prices for cross-border services between Lille (FR) and Kortrijk (BE) and between Lille and Mouscon (BE) have been reduced by 20%[32] to make the use of regional trains for cross-border services more attractive. The train also runs hourly from Lille to Kortrijk. Another train departs hourly from Lille to Tournai

[30] http://www.eurodistrict.eu/de/th%C3%A8me/mobility%C3%A9

[31] http://www.saarmoselle.org/lgde-page754-opnv.html

[32] http://www.eurometropolis.eu/areas-focused-on/mobility/railways.html

(BE), more often at peak times.[33] Also, there are good bus connections between the cities of Lille, Kortijk, and Tournai that provide tangential connections between all 3 cities.

EGTC new Dresden-Prague line[34]

Four members have joined together to form an EGTC for the construction of the new Dresden-Prague line. These are the Free State of Saxony, the Czech Republic, the administrative district Saxon Switzerland - Osterzgebirge and the district Usti Nad Labem. The EGTC aims to provide organizational and technical support for the construction of a new railway line between Dresden and Prague from a regional perspective, in particular the border area. It shall be achieved with the new line to significantly shorten travel times in passenger transport and to create additional train path capacities in freight transport. Besides, the noise pollution on existing lines should be significantly reduced and the route should be flood-proof. The seat of the EGTC is in Dresden at the location of the Saxon State Ministry for Economic Affairs, Labour and Transport (SMWA).

EGTC NOVUM[35]

An example with a direct geographic link to the area of investigation is the EGTC NOVUM. The EGTC was founded in 2015, based on an MoU signed in 2011 (i.e. about four years of founding process, accompanied by an Interreg project running from 2012 to 2013). The EGTC aims to intensify, facilitate and spread cross-border Polish-Czech cooperation to strengthen economic and social cohesion. The EGTC is based in Jelenia Góra. The EGTC was approved by the Polish Ministry of the Interior. EGTC members are regional bodies in the Polish-Czech border region, including the Lower Silesian Voivodeship, the Liberec district and the Polish and Czech communities of the Neisse-Nisa-Nysa Euroregion. The EGTC is managed by a Polish director and a Czech vice director. The nationality of the director changes according to the frequency defined in the statute. There are also three employees. Personnel expenses, the office and other costs are financed from membership fees and the acquisition of projects (Central Europe, Interreg Va etc.). The base amount of the membership fees is used to finance the own contribution of projects. The topics of the projects so far include cross-border rescue services, the teaching of language skills, marketing of health resorts and cross-border road connections. There is already a working group on transport, which is led by UMWD. This working group usually meets twice a year.

7.4. EGTC as an instrument for coordinating the cross-border use of multi-system vehicles

The EGTC instrument has many advantages. These include, for example, a separate legal entity, additional funding possibilities and the consolidation and transparency of cooperation between public actors across national borders.

There is no general statement on the legal nature of the EGTC as an organisational form.

Insofar as the implementing regulations for the EGTC Regulation do not decide on the supplementary legal provisions to be applied, the tasks, the membership composition and the objectives of the group are decisive for determining the relevant regulations. The legal nature of the EGTC thus determines the applicable

[33] http://www.eurometropolis.eu/life-in-the-eurometropolis/getting-around/takingthetrain.html

[34] http://www.nbs.sachsen.de/index.html; http://www.evtz.eu/EVTZEisenbahn-Neubaustrecke

[35] https://www.euwt-novum.eu/

areas of national law. From the point of view of the approval authority, the association of local EGTCs seems to be the most appropriate.[36]

Special framework conditions also exist concerning the award procedure for invitations to tender for services. The EGTC may choose between the procurement law of the host Member State and that of the Member State in which the EGTC operates. The provision by the EGTC assembly preserves flexibility for future changes. To this end, the choice of law most favourable to the EGTC should be explored. The choice of legal form is also influenced by the national law of the parties involved. Here it is imperative to involve a legal expert in the procedure for setting up an EGTC.

The Table 2 shows other key aspects which must be answered when an EGTC is set up and when vehicle procurement and financing is discussed, considering the legal form chosen.

Aspects	Annotations
Staff	EGTCs can simultaneously employ their staff, work with dispatched staff or employ freelancers temporarily. A combination of national rules is possible.
Membership	Only the institutions listed in Art. 3 EGTC-regulation may be members of the EGTC. It follows that the creation of an EGTC by private bodies is not permitted.
Liability	Agreement with the respective national law. Given the completely different liability systems, the Brandenburg licensing authority, for example, is sceptical about the EGTC, for which Brandenburg members are supposed to be secondarily but fully liable.[37]
Funding	The EGTC is financed from the funds provided by the Union for the (co)financing of cross-border programmes and projects (Art. 7 para. 3 EGTC Regulation). In all other respects, the EGTC shall pay its maintenance costs from the financial contributions of its members. The contributions can be determined e.g. by the number of inhabitants or by another key. Here, the members have a broad scope of action.[38]
Start-up financing	Through subsidies (CEF/Interreg)
Sovereign tasks	The tasks entrusted to the EGTC by its members shall not involve the exercise of powers or obligations of public authority to safeguard the general interests of the State or of other public bodies. This includes, among other things, the design of tariffs for local rail passenger transport.[39]
Subsidies and methods	EGTCs must submit the same grant applications as other bodies. When applying for EU funding, there is no need to integrate additional partners, which is an advantage.
Household	The EGTC has an annual budget which the Assembly is responsible for drawing up (Article 9(1) EGTC Regulation). Other documents (annual accounts and annual report) shall be drawn up in accordance with the law of the Member State in which the head office is situated. The audit and disclosure of the financial statements is also subject to the law of the country of domicile (taking into account international standards).

Table 2: Overview of key aspects of EGTCs

The aspects mentioned in the table are not exhaustive but are intended to provide an orientation to the complexity of the topic.

[36] Marcin Krzymuski, Christian Lüer, Sabine Zillmer: Modellvorhaben der Raumordnung (MORO): Europäische Verbünde für territoriale Zusammenarbeit – Unterstützung bei der Vorbereitung; Berlin, 2019

[37] Ulrich, Peter: Grenzüberschreitende funktionale Kooperation im deutsch-polnischen Grenzraum am Beispiel des Trans Oderana EVTZ

[38] http://www.evtz.eu/EVTZFinanzierungHaushalt

[39] http://www.evtz.eu/Art7EVTZVO

The activities in the EGTC Pamina are a current example. The state of Rhineland-Palatinate is providing approx. 8 million euros to support the local rail passenger transport associations in the north and south so that they can develop rail vehicles that can be used across borders. The budget will be spread over the years 2020 and 2021. In the railway project of the special purpose associations, the new trains are to be used on the lines Neustadt-Wissembourg-Strasbourg, Karlsruhe-Wörth-Lauterbourg-Strasbourg and Trier-Perl-Metz, as well as on other lines. These trains should be able to run on both German and French networks[40]. Also, a new cross-border mobility portal was launched in the Eurodistrict of Pamina in early 2019.

If the initiative and the will for cooperative public transport services exist, there are possibilities for implementation. Many associations and companies are bound to each other by agreements. Examples are the Distribus (lines 602 and 603) and the airport shuttle in Saint Louis: there is a contractual relationship between the French public authority (Stadtverband 3 Frontières), the French operator (Distribus) and the Swiss public authority (Basler Verkehrsbetriebe, also operator).[41]

Each form of cooperation presented has its specific advantages and disadvantages. The best form of cooperation, however, depends primarily on the nature of the offer

[40] Rail Business, 22.05.2019

[41] PTV: ÖPNV in der Metropole Saarbrücken-Moselle Est Verkehrsplan; Straßbourg/Karlsruhe, 2011

8. Guide to vehicle procurement & financing

8.1. Basic requirements and important framework conditions

The most important basis is the selection according to the technical specifications of the vehicles. Also, it must be checked in advance how many vehicles are to be procured, depending on the intended use, the area of use and the transport service to be provided. After electrification of the Dresden-Görlitz section, the use of multi-system local railcars should be aimed at. So far, multi-system local railcars have not been licensed for German-Polish cross-border traffic. However, it can be assumed that the registration and use of such vehicles will be possible in the coming years. The number of vehicles and the vehicle configuration determines the investment costs.

This specification and the preparation of the admission process, i.e. accompanying or preparing the actual procurement, should be regarded as an obvious task for the cooperation to be established, e.g. in the form of an EGTC. The latter must be provided with the necessary technical and financial resources.

8.2. Procurement and financing

The issue of procurement and vehicle financing is very crucial and cannot be resolved without the involvement of all stakeholders, taking into account the specific requirements.

In addition to the question of vehicle financing, possibilities for a joint long-term procurement strategy should also be discussed in the EGTC.

In 2017/2018, the Senate Department for the Environment, Transport and Climate Protection of the State of Berlin commissioned a feasibility study for an eligible model for sustainable, operator-neutral vehicle provision. The decisive area of investigation was the corridor between Berlin-Brandenburg and Poland (Berlin-Stettin). Within the framework of a workshop, three concrete models for an in-depth examination were proposed:[42]

- **Model I:** vehicle provision by the vehicle manufacturer, vehicle ownership by the manufacturer
- **Model II**: Vehicle provision by the Polish authorities
- **Model III:** Contractual obligation of the operator to hand over the vehicles at the request of the public authorities (public authority-induced reuse guarantee)
- **Model IV:** vehicle procurement by the EGTC through the participation of the special purpose associations/traffic associations within the EGTC

Model I (provision of vehicles by the rail vehicle industry) is particularly advantageous if long-distance transport services are also to be offered by rail transport companies on the routes under consideration. The vehicles must be suitable both for long-distance traffic (IR/IC/TLK standard) and for fast regional traffic (RE).

Model II (provision of vehicles by the Polish public authority) would be conceivable in principle, but would only be effective if subsidies can be generated for vehicle procurement.

In Model III (reusability guarantee induced by the public authority), the vehicles are procured by the RU. The Polish and German public authorities agree on their common goals and the respective rights and obligations in a project-specific cooperation agreement. On this basis, the public authorities shall organise a

[42] ETC Transport Consultants GmbH: Machbarkeitsstudie für ein förderfähiges Modell zur nachhaltigen und betreiberneutralen Fahrzeugbereitstellung, February 2018

joint invitation to tender for transport services. The transport contract stipulates that after the end of its transport contract, the RU is obliged either to sell the vehicles to a successor operator selected by the responsible authorities or to rent them out on terms already laid down in the transport contract.

In **Model IV**, vehicles are dealt with jointly by the EGTC and its members. National legislation shall apply as regards tendering procedures. As with other models, the question of financing and the shares of the respective partners is primarily based on the use of vehicles and the level of transport services. Financing models have already been discussed in detail in Chapter 4.

From the perspective of the evaluators, a German-Polish pool model could also be interesting. In this case, the vehicle is procured by the task authorities. There are several possible financing options. Maintenance is carried out by the railway undertaking. It is important here that both sides have the same possibilities of intervention through the shareholder role.

Another possibility would be procurement and financing by the German public authority (or special-purpose association) with state funding. An example for it can be found in South Germany:

The state of Rhineland-Palatinate will make a total of around eight million euros available to the special purpose associations for local rail passenger transport in the south and north for the years 2020/21 for the development of cross-border vehicles. The corresponding approval procedures were concluded by the special purpose associations on 17 and 20 May 19, respectively, so that the all-encompassing cooperation agreement could be signed in July 2019. The railway project planned between the Grand Est region, the state of Rhineland-Palatinate, the Saarland and the state of Baden-Württemberg envisages the deployment of a new type of train on the Neustadt - Wissembourg - Strasbourg, Karlsruhe - Wörth - Lauterbourg - Strasbourg, Trier - Perl - Metz railway lines and other connections that can run on the German and French networks.[43]

The cross-border Franco-German local transport service is to be established from the end of 2024. The primary contracts for the corresponding rail lines have been signed. The aim is to receive European funding for equipping the 30 vehicles already ordered by the Région Grand Est with a technology package for Franco-German signalling technology in the coming Interreg period (2021 - 2027). For this purpose, the course was set contractually on 24.01.2020. An application for the prototype has been submitted in the current Interreg programme (until 2020), but no decision has yet been made on it. The vehicles will be made available by the French to the transport company that has won the competition.[44]

8.3. Possible vehicle requirements

When determining the operating programme and the resulting number of vehicles for continuous cross-border traffic with multi-system multiple units, the existing fleet of electric multiple units on the Polish side and the option of further long-distance connections with typically locomotive-hauled trains must be taken into account. In addition, the efficient use of vehicles on the route between Dresden and Wroclaw has to be considered. In terms of turnaround times, this can be assumed to be approx. 6.5 hours, i.e. approx. three hours travel time and approx. 30 minutes of turning time. The assumption for the travel time is based on the value of 3 h 15 min already achieved with continuous diesel multiple units in the 2010/11 timetable and on the planned travel time gains through electrification on the German side. Under these conditions, four multi-system multiple-unit trains will each be able to complete 2.5 daily rounds and thus achieve a frequency that varies between 1.5 and 2 hours. A corresponding timetable is shown in the following simplified graphic timetable (without presentation of the intermediate stops).

[43] Rail Business. Message from 20.05.2019

[44] https://www.eurailpress.de/nachrichten/infrastruktur-ausruestung/detail/news/deutschlandfrankreich-interreg-mittel-fuer-internationalen-spnv-beantragt.html

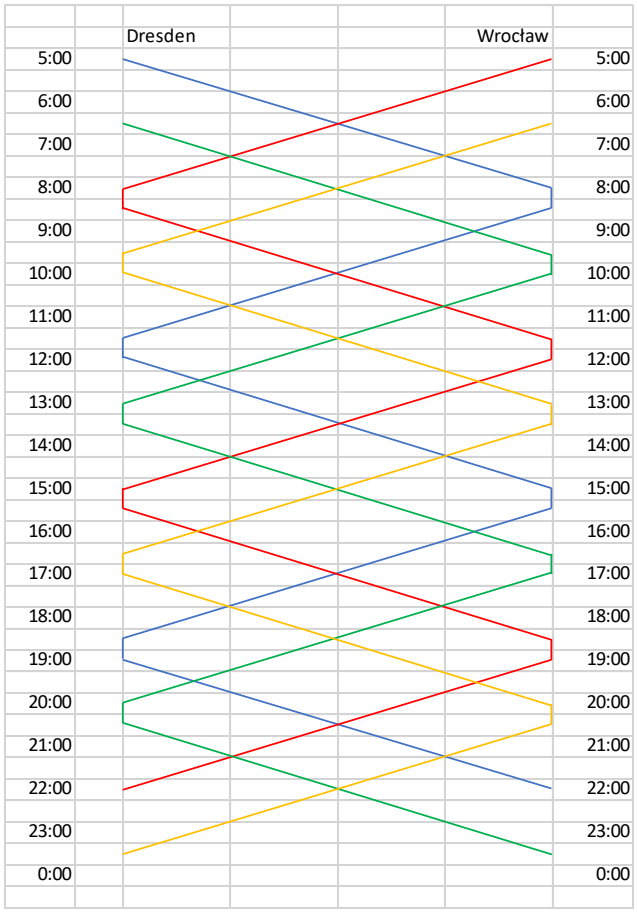

Figure 3: Simplified circulation plan Dresden-Wroclaw

Although no vehicles are yet available on the market for the required vehicle configuration, an example of cross-border traffic between Switzerland and Italy can provide indications of the financing requirements. The Swiss Federal Railways (SBB) and FerrovieNord S.p.A. have jointly ordered 40 FLIRT-TILOs from the manufacturer Stadler, which will operate as dual-system multiple units on the lines of the Ticino under alternating current (15 kV) and Lombardy under direct current (3 kV) from the 2020 timetable change. Concerning the electricity systems, the constellation is thus the same as between Germany and Poland. The trains will be leased by the manufacturer to the regional railway company of Lombardy, Trenord (comparable to KD in Lower Silesia). The subject of the framework agreement signed at the end of 2018 with a term of eight years is the delivery and maintenance (including overhaul) of a total of nine six-car multiple units with a total volume of EUR 114.4 million[45]. Converted to one vehicle, the costs over the entire term of the contract amount to approximately EUR 12.7 million, or approximately EUR 1.6 million per year. Based on the case of operation between Saxony and Lower Silesia, this would correspond to a total volume of approx. EUR 50.8 million or approx. EUR 6.4 million per year for four multiple units. It should be noted here that shorter and thus less expensive multiple units would be used and that the exact conditions of the above-mentioned maintenance contract are not known and are therefore not fully comparable.

[45] http://www.bahnonline.ch/bo/50370/neue-zuege-fuer-tilo-fnm-und-stadler-unterzeichnen-rahmenvertrag.htm

8.4. Funding opportunities and further steps

Poland will receive a total of € 77.6 billion (current prices) from the European Structural and Investment Funds (excluding EAFRD and EMFF) under the EU Cohesion Policy for the 2014-2020 programming period.[46] For example, the new electric local trains in the Dolnośląskie Voivodeship were financed, among other things, by subsidies.

The extent to which ERDF funding can also be generated for cross-border vehicles should be examined in detail. Coordination with the central government (Ministry of Infrastructure and CUPT - Centre for EU Transport Projects) is required. Even when an EGTC is set up, there are no privileges concerning the funding aspect.

The Figure 4 shows the steps taken to clarify the financing and procurement of rail vehicles.

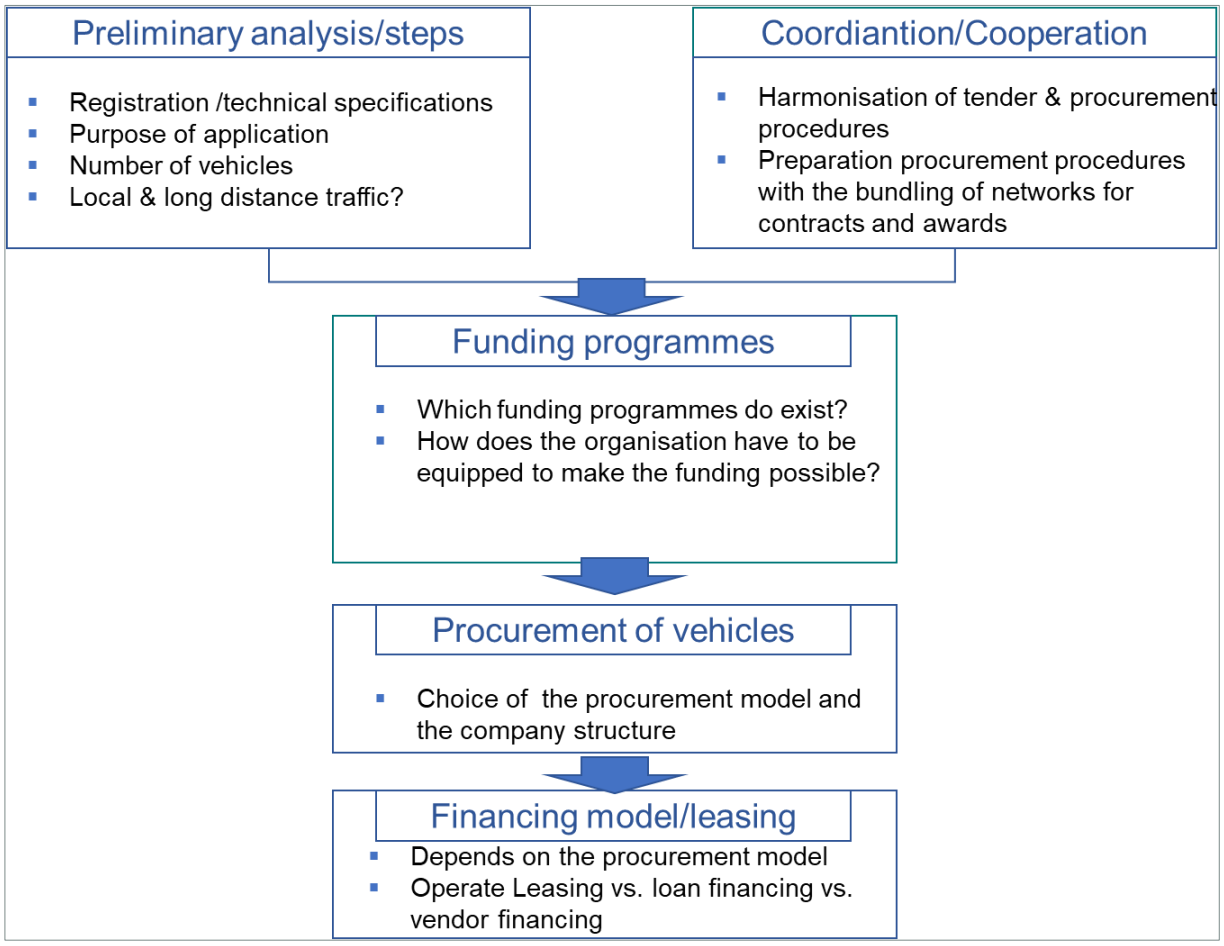

Figure 4: Graphical representation of the necessary steps

As a first step, the framework conditions must be clarified. Questions here are, for example, the purpose of the vehicles, the number of vehicles and the technical equipment of the vehicles. The basic technical equipment of the vehicles essentially depends on the infrastructural and operational conditions. Also, the type of vehicle to be used must be decided in advance.

As can be seen from Figure 4, in the following steps the possibilities for vehicle conveyance are to be examined and which conditions must be fulfilled.

[46] https://www.gtai.de/GTAI/Navigation/DE/Trade/Maerkte/suche,t=polish--eufoerderung-2014-bis-2020,did=1105836.html

A variety of procurement and financing models are available. These are very strongly oriented to specific conditions. A recommendation on possible models is presented in Chapter 8.2. However, it is not possible to make a general statement in this respect.

It is recommended to organise a workshop with all stakeholders to discuss the general framework, opportunities but also the risks of cross-border vehicle procurement and financing. It is important that both sides benefit from the measure (win-win situation) and that a partnership relationship exists.

The following procurement variants are conceivable:

- ZVON together with ZVOE procures the multiple units and tenders the service from Dresden to the border. UMWD orders from the same operator the power for the Sprinter (x train pairs per day) from the border to Wroclaw (in addition to the existing regional trains of KD).
- KD will procure the multiple units and operate the trains from Wroclaw to Dresden. Between Wroclaw and Görlitz the trains are operated at KD's own expense. The services between Görlitz and Dresden are ordered by ZVON/ZVOE.
- A new company to be founded procures the multiple unit trains and puts the traffic out to tender. The ordering and payment of the train services on the German and Polish side is done by ZVON/ZVOE and UMWD/KD.

In all three models, a form of cooperation to be established (e.g. EGTC) will coordinate the transport services for the cross-border line. A further task of the cooperation could be the acquisition of pure long-distance transport services (EC connections), which go beyond Dresden and Wroclaw.

In general, it should be noted that intensive planning for the procurement of two-system vehicles with contact to manufacturers and clarification of technical details should only be sought after a binding completion date for the electrification of Dresden-Görlitz.

Before this, far-reaching aspects and issues must be clarified and agreed on by both sides. This concerns, in particular, the contractual terms of the transport contracts and the corresponding possibilities for bundling cross-border transport as well as all questions regarding financing and the organisational framework.

B. THE LOWER SILESIAN PART

1. Methodological procedure for the elaboration

The basis for the methodological procedure of developing an organisational and financial model for the cross-border public rail transport system in the borderland of the Lower Silesian Voivodship and the Free State of Saxony is the current rules for contracting and financing public transport services in Poland and Germany. Based on this prerequisite, the analytical and economic study started with a detailed analysis of the legal provisions which concern how regional rail passenger services are financed in Poland and Germany. This was followed by a characterisation of alternative potential financing models for the purchase of vehicles for cross-border traffic. This characterisation proceeded in two directions. Firstly, the general principles of organising railway transport that influence the choice of a financing model for the purchase of rolling stock are described, and then the main financing models are reviewed.

In the next step, the possibilities of financing the purchase of rolling stock for cross-border regional traffic were indicated. The most important sources of funding for the purchase of rolling stock were discussed, which are understood to be funds raised by rail transport operators, the provincial government, the governmental special purpose fund, funds made available in the form of credit by European financial institutions, as well as EU funds provided in the financial perspective 2021-2027.

Subsequently, analyses of the main areas of functioning of the cross-border transport connections were carried out. The first one concerned the potential of cross-border traffic, which included long-distance cross-border traffic (on the relations Dresden-Wrocław, Wrocław-Dresden). The second analysis focused on economic issues related to the offer of cross-border connections, i.e. in particular operating costs, sales revenue and compensation for individual cooperation models. Three further analyses dealt with the broadly understood mechanisms of cooperation in the field of cross-border connections, i.e.:

- mixed forms of co-operation involving the interconnection of regional public transport systems through the creation of a system integration node,
- practical examples of cooperation between service providers in cross-border areas in organising public rail transport and providing rolling stock for these services,
- the existing principles of cooperation between the Lower Silesian Voivodship and the Free State of Saxony concerning cross-border rail links.

Recommendations for the desired model of cooperation in the organisation of cross-border passenger connections are presented based on the analyses carried out.

2. Analysis of legal provisions related to the financing of regional rail passenger services

2.1. European Union law

The regulatory framework at the European Union level defining the rules for the implementation and financing of public collective transport is the Market Pillar IV of the Railway Package adopted in 2016. It defines, in principle, the general entitlement of railway companies (railway undertakings) established in one of the EU Member States to operate all types of passenger services throughout the territory of the Union - upon fulfilment of various conditions. The tool whose application is promoted by the 4th Railway Package (market pillar) is open access to infrastructure allowing railway undertakings to run commercial passenger services. However, the predominant mode of operation remains that of a public service obligation, defined, entrusted and financed by the national authorities.

One of the key solutions of the market pillar is the opening of the domestic passenger transport market to competition (both in the "competition for the market" model and in the "competition on the market" model). An important piece of legislation that needs to be cited is Directive (EU) 2016/2370 of the European Parliament and of the Council of 14 December 2016 amending Directive 2012/34/EU concerning opening the market for domestic rail passenger services and railway infrastructure management. This Directive is the main elements of the market pillar of the 4th railway package. The provisions of the Directive grant railway undertakings on fair, non-discriminatory and transparent terms, without prejudice to Regulation (EC) 1370/20074, the right of access to railway infrastructure in all Member States to operate rail passenger services. That right shall also include access to infrastructure connecting service facilities.

Concerning public services executed based on the so-called PSC (Public Service Contract), the basic legal act regulating the principles of financing regional rail passenger transport in the European Union is the Regulation (EC) No 1370/2007 of the European Parliament and of the Council of 23 October 2007 on public passenger transport services by rail and by road and repealing Council Regulations (EEC) Nos. 1191/69 and 1107/70 (hereinafter: Regulation 1370).

As part of the 4th Railway Package, Regulation 1370 has been significantly modified. Regulation (EU) 2016/2338 of the European Parliament and of the Council of 14 December 2016 amending Regulation 1370 introduced the obligation for public transport organisers to draw up so-called public service obligation specifications and to define their scope of application. This should be done in compliance with the principle of proportionality. Specifications of obligations, on the other hand, should be understood as rules for the provision of public services. The specifications may not go beyond what the operator would not undertake to provide without compensation or would not undertake to the same extent under the conditions laid down by the public authorities. Defined at Member State level, the specifications of public service obligations and compensation related to the net financial effect of the public service obligations must lead to

- promote cost efficiency when achieving public transport policy objectives,
- the financial sustainability of the provision of public passenger transport services, as required by the public transport policy in the long term.

It should be added that Regulation 1370, even though it was published in 2007, is part of the so-called market pillar of the 4th Railway Package due to the amendment of this legislation by Regulation (EU) 2016/2338 of the European Parliament and of the Council of 14 December 2016.

It is significant that Regulation 1370, since its amendment by Regulation 2016/2338, explicitly allows operators performing PSCs to use rolling stock owned by a Rolling Stock Company (ROSCO). Key to the rules on the use of rolling stock located in rolling stock pools remains Article 5a of Regulation 1370 (cf. the first

sentence of Article 5a(1): "With a view to launching a competitive tendering procedure, the competent authorities shall assess whether measures are necessary to ensure effective and non-discriminatory access to suitable rolling stock. This assessment shall take into account the presence on the relevant market of undertakings and/or other market actors leasing rolling stock. The report on the assessment shall be made publicly available"). With this provision, the EU legislator introduced rules on the provision of rolling stock by public transport organisers for the performance of PSCs.

The provision of Article 5a (1) of Regulation 1370 is such that the organiser may but is not obliged to, take one of the indicated measures for the provision of rolling stock. However, in any case, the organiser is obliged to assess whether such measures are necessary and to publish the results.

In terms of financial aspects, the key provisions of Regulation 1370 are Annex 1, which sets out the rules for compensation in cases for public service operators.

In light of Annex 1 to Regulation 1370, the amount of compensation may not exceed an amount corresponding to the net financial effect, i.e. the sum of the effects, whether positive or negative, on the costs and revenues of the public service operator in discharging the public service obligation. The impact on costs and revenue shall be assessed by comparing the situation where the public service obligation is met with the situation which would have existed if the public service obligation had not been met.

It should be emphasised that Regulation 1370 lays the foundations for the provision of public services throughout the European Union, including the Federal Republic of Germany and the Republic of Poland. However, areas not regulated at the EU level have been specified in more detail in national regulations.

2.2. Law of the Federal Republic of Germany

The basic legal act in the Federal Republic of Germany on regional passenger transport by rail is the Act on the Regionalisation of Local Public Transport (Regionalisation Act - RegG) of 27 December 1993.

It should be stressed at the outset that, according to German legislation, 'local public transport' is understood to mean the carriage of passengers using transport available to the general public on regular services whose main purpose is to meet the demand for urban, suburban or regional transport. In case of doubt, local transport is taken to be transported where the total distance of the journey does not exceed 50 kilometres or the total duration of the journey does not exceed one hour. Such transport is regulated by the individual federal countries.

Public transport in Germany is divided into:

- regional passenger rail transport (SPNV),
- Public passenger transport by road (ÖSPV) - also referred to as urban or regional transport.

It is noteworthy that RegG contains in paragraph 4 an explicit reference to Regulation 1370, emphasising the primacy of European Union law over national solutions. In light of §4 RegG, Regulation 1370 is applied to ensure adequate public transport services. Authorities defined by federal law are responsible. This means that regulations issued by the countries determine which public authorities are the organisers of public collective transport.

Paragraph 5 of the RegG sets out the rules for financing public services, indicating that the federal countries are entitled to the monetary amounts due to the financing of local public transport. The funding is provided from federal tax revenues and is subject to an annual adjustment of 1.8% from 2017 onwards. The amounts indicated in Annex 1 to the RegG are distributed to the federal countries, with one-twelfth of the annual amounts being transferred to the federal countries by the 15th of each month. The detailed arrangements for the financing and settlement of compensation to operators are laid down by the regulations of the competent authorities in the countries of the Federal Republic of Germany.

2.3. Regulations of the Free State of Saxony

According to the Saxon Public Transport Act, passed by the Saxon State Parliament in 1995, public transport is a task of general interest. Planning, organisation and design of public transport, on the other hand, is a voluntary task of the districts and independent cities acting as towns with district rights. It is these entities, i.e. the counties and the cities with district rights (Leipzig, Dresden, Chemnitz) that work together in the form of five special-purpose associations in specific local traffic areas (cf. Figure 5). Thus, there are in principle five public transport organisers in the Free State of Saxony:

- Zweckverband für den Nahverkehrsraum Leipzig, registered office, Emilienstraße 15, 04107 Leipzig (ZVNL),
- Verkehrsverbund Mittelachsen GmbH, Am Rathaus 2 09111 Chemnitz (ZVMS),
- Verkehrsverbund Oberelbe in Elbcenter 2, Leipziger Straße 120 01127 Dresden (ZVOE),
- Zweckverband Verkehrsverbund Oberlausitz-Niederschlesien, Rathenauplatz 1 02625 Bautzen (ZVON),
- Verkehrsverbund Vogtland GmbH, 08209 Auerbach, Göltzschtalstrasse 16 (ZVV).

The Free State of Saxony is strongly committed to the development of public transport and aims to achieve the following objectives[47] :

- Increasing the share of public transport in motorised traffic in agglomerations and between regional centres;
- Guarantee services of general interest, in particular, the necessary mobility of persons who cannot use other means of transport;
- Further improvement and integration into the overall passenger transport system;
- Development of cross-regional public transportation services, particularly services that cross federal and interstate boundaries.

[47] According to information available on the official website of www.sachsen.de.

Figure 5: Public transport operators in the Free State of Saxony - source: www.sachsen.de

The conclusion of the objectives pursued by the Free State of Saxony is that better connections to neighbouring metropolitan regions are urgently needed.

The legal act laying down the basis for public transport is the Act on Local Public Transport in the Free State of Saxony (ÖPNVG) of 14 December 1995 adopted by the parliament of the Free State of Saxony. The provisions of the act apply to local public transport by rail and road. Local collective transport, according to this act, is also to be understood as taxi or car rental traffic which replaces supplements or condenses traffic and regular services by ferries, mountain railways and other special means of transport. This definition is therefore complementary to the federal legislation - RegG.

The law establishes that the local authority organisers, i.e. the districts and cities with district rights covering the areas of the regional transport areas of Vogtland, Chemnitz/Zwickau, Leipzig, Oberelbe and Upper Lusatia - Lower Silesia, shall cooperate by the Saxon Local Authority Cooperation Act. Responsibilities for regional rail passenger transport were transferred to the associations as of 1 January 2002.

As a result of the regionalisation of public transport, there has also been a transfer of responsibility for the financing of transport services. Thus, the organisers of public transport by rail are responsible for regional transport services procured under transport contracts concluded with transport operators.

By § 5 of the Regionalisation Act, the resources available to the Free State of Saxony are allocated to the five Saxony associations (listed above) for the performance of their tasks in proportion to their shares. The amount, as well as the distribution of funds for the financing of public transport, is determined based on the applicable Ordinance of the Saxony State Ministry of Economic Affairs, Labour and Transport on the Financing of Public Transport (ÖPNVFinVO).

The Free State of Saxony's long-term State Transport Plan 2030 (LVP Sachsen 2030) was adopted in the second quarter of 2019. In the area of transnational projects, it is worth noting the following provisions of the above-mentioned legal act, which are part of the concept of developing international transport relations:

- Electrification and extension of the border Dresden - Budziszyn - Goerlitz - border with Poland;
- making the railway line Berlin - Cottbus - Weißwasser - Goerlitz - Wroclaw a rapid transit railway of supra-regional importance;
- Electrification of the Leipzig - Bad Lausick - Geithain - Chemnitz railway line.

In the light of §7 of the Free State of Saxony on the principles of financing public transport, public transport should, as far as possible, generate its revenue, provided that the organisers of public transport secure their financial basis by taking account of the financing provided by the Federal Government (based on the above-cited law on regionalisation of local public transport) and the Free State of Saxony. Article 8 of the Federal Regionalisation Act (RegG) primarily provides for the financing of local rail passenger transport.

2.4. Law of the Republic of Poland - Act on public collective transport

The main actors on the market of regional railway passenger services in Poland are railway operators, i.e. entrepreneurs authorised to provide rail passenger services, and transport organisers, which are primarily voivodship self-governments (however, it is also possible for transport to be organised by other self-governmental bodies). Regional railway passenger services started to operate according to market principles together with administrative transformations and restructuring of the PKP Company. The formation of this market is influenced by many diverse factors, such as the level of socio-economic development of the voivodship, the layout of the settlement network and the density of the railway network and the state of the infrastructure.

Railway transport in Poland, including general principles of operating by railway undertakings, infrastructure managers and other entities of the railway system are specified in the Railway Transport Act of 28 March 2003, in such areas as, among others

- the rules for the use, management and maintenance of railway infrastructure,
- principles for rail traffic operation and services,
- technical conditions for the operation of railway vehicles,
- principles and instruments for regulating rail transport,
- specific principles and conditions for preparation of investments concerning railway lines of state importance, including conditions for location and acquisition of real estate for this purpose and competent authorities in these matters.

Principles of financing regional passenger transport with the use of railway transport are specified in the Act of 16 December 2010 on public collective transport (UoPTZ). This Act defines the principles of organization and operation of regular passenger transport in public collective transport carried out on the territory of the Republic of Poland and in the cross-border zone. These rules apply to road transport, rail transport, other rail transport, rope, cable and terrain transport, sea transport and inland navigation.

One of the most important tasks of the Act on Public Collective Transport is to define the principles of financing regular passenger transport in public collective transport for public utility transport.

With the entry into force of the UoPTZ on 1 March 2011, the concept of "organiser" was introduced, whose tasks include:

- transport development planning,
- organising public transport,
- public transport management.

The financing of public utility transport may be carried out in several ways. The provisions of the Act on Public Collective Transport contain an open catalogue of such ways, indicating, in particular, the following:

- the collection of charges by the operator or organiser in connection with the provision of public transport services,
- to pay compensation to the operator for:
    - income foregone in connection with the application of statutory rights to reduced fares on public transport, or
    - revenue is forgone in the application of entitlements to reduced fares in public transport established within the area of competence of the organiser in question, insofar as they have been established, or
    - the costs incurred in connection with the provision of public transport services by the operator, or
    - making the means of transport available to the operator by the organiser for the realisation of transport in the field of public collective transport.

All of the above-mentioned tools of financing public collective transport may be applied jointly, however, depending on the will of the organiser; it is possible to apply only some of them. The establishment of maximum prices in public collective transport is the competence of the commune council, county council or voivodship assembly.

Depending on the type and scope of passenger transport, sources of financing public transport come both from the State Treasury and local government budgets. By Article 51 of the Act on Public Collective Transport, the following are used for financing public collective transport:

- own funds of the local government unit,
- state budget funds,
- proceeds from ticket sales and passenger surcharges.

A key concept related to the financing of public collective transport in Poland is that of compensation, which an operator is entitled to if it proves that the loss incurred in providing the service is based on lost revenues and incurred costs. As part of the compensation, the operator is entitled to a reasonable profit, as referred to in the Annex to Regulation 1370/2007.

3. Alternative potential financing models for the purchase of rolling stock for cross-border regional traffic

3.1. General principles of rail service organisation influencing the choice of the financing model for the purchase of rolling stock

How rail services are organised (including how they are contracted) is a factor which influences the strategy for purchasing rolling stock used for regional rail services. At present, public passenger rail transport in Poland is provided by licensed railway undertakings. The market for railway passenger transport is divided into:

- services of general interest,
- commercial transport,
- occasional services.

Services of general interest shall operate based on public service contracts concluded between the organiser and the carrier. The organisers determine the scope and duration of contracts individually. The entity responsible for organising transport changes depending on the scope of transport - the transport organiser in the meaning of the Act on Public Collective Transport is, therefore:

- Minister of Infrastructure - in the case of inter-voivodship and international long-distance transport,
- voivodship self-government - in the case of provincial, inter-voivodeship and cross-border transport of regional character,
- Zarząd Transportu Miejskiego m. st. Warszawy - in the case of transport within agglomerations,
- other units of territorial self-government - in the case when, as part of their transport policy, they envisage subsidising local rail transport.

The organiser of the subsidised transport service is obliged to determine, among other things, the conditions concerning the number of connections, the hours of operation, the amount of the fare, the required quality of the service (comfort, punctuality, equipment, etc.), as well as to impose contractual penalties on the carriers in the event of non-compliance with the established parameters related to the provision of transport services.

The market of railway operators in the field of regional passenger services consists mainly of self-government railway companies established as internal entities, which translates into a low level of competition. Over the last few years, a clear increase in the importance of internal entities can be observed on this market, with simultaneous limitation of the scope of cooperation with Polregio Sp. z o.o. (hereinafter: Polregio). The participation of competitive procedures in the selection of the carrier is also noticeable. Currently, the selection of a rail carrier in regional transport is carried out in the mode:

- tender,
- the direct conclusion of the contract with the local authority operator,
- mixed (tender for a part of a line combined with the direct conclusion of a contract for other lines).

The scope of a contract for rail transport services may cover all transport lines or groups of transport lines (so-called packages).

Notwithstanding the above, the following models for the organisation of regional rail services of general interest can be identified as a prerequisite for adequate provision of rolling stock:

- open invitation to tender and a transport service contract (the carrier provides the rolling stock),
- an own carrier entrusted with the operation of the service (the rolling stock is owned by the local authority carrier),
- own rolling stock (wholly or partly) and own facilities, and cooperate with the carrier entrusted with the operation of the service.

Another category of services is commercial services. These services are operated at the carrier's commercial risk under a decision to grant open access. Commercial services are operated on routes for which the carrier does not receive financial compensation in the event of insufficient ticket revenue. The provision of commercial services requires a decision to grant open access. This decision shall be granted by the President of the Railway Transport Office (UTK). Before issuing the decision, UTK may examine the impact of the new services on the existing ones in terms of influence on the economic equilibrium of the concluded PSC[48,49]. After receiving the decision, the carrier may apply for access to the railway infrastructure with the infrastructure manager for the indicated route.

The last category of transport is occasional services, that is to say, one-off passenger transport provided on a particular route, not based on a public service contract or a decision to grant open access. Occasional services are launched to provide transport for a single, specific purpose. In practice, both occasional and commercial services are provided using the carrier's rolling stock.

3.2. Overview of the main financing models

Investments in the area of rolling stock are an important element of improving the quality and competitiveness of rail on the transport market. Passengers using rail transport services expect an improvement in the transport offer, inter alia in terms of the quality of rolling stock used in passenger transport. The renewal of the rolling stock is one of the most urgent (as the average age of electric multiple units used in Poland in 2019 was 26.51 years[50]) and at the same time the most difficult tasks for transport companies. The high cost of acquiring rail transport assets necessitates an in-depth analysis of financing models for the purchase of rolling stock to support rail traffic, including regional traffic. At present, the purchase of rolling stock can be implemented in several ways. Common delivery models for Germany and Poland are mainly:

- acquisition of vehicles by local authorities,
- acquisition of vehicles by railway undertakings,
- acquisition of vehicles as part of so-called rolling stock pools.

The above-mentioned catalogue of financing models for the purchase of rolling stock does not exhaust all potential possibilities (as there are more, e.g. the supply of vehicles by railway industry companies, which in Poland is a form of lending and is discussed in more detail in Chapter 4.1.2.), but focuses on the most relevant ones that have been and are successfully applied in national conditions.

The ability of local authorities to purchase rail transport is the result:

[48] Public *Service* Contract

[49] The impact on the economic equilibrium of existing services and those provided under public service contracts shall be examined. In particular, the analysis concerns the benefits for passengers resulting from the development of competition, including, among others, increasing the number of available connections, attractiveness of the offer for people who have not used railway transport so far, connecting areas popular with tourists or regions with an unsatisfactory transport offer (source: Office of Railway Transport).

[50] Source: Report on the operation of the rail transport market. Rail Transport Authority, 2019.

- the need to implement public tasks imposed on the voivodeship self-government by the Act on Voivodeship Self-Government51,
- the devolution of regional rail transport.

The voivodeship self-government carries out public tasks defined by statute on its behalf and its responsibility disposes of voivodeship property and runs its financial management based on a budget. The voivodeship is assured a share in public incomes by the assigned tasks - these incomes are its own and general subventions and target subsidies from the state budget. The basic tasks of the voivodeship self-government include, among others, the issues of collective transport and public roads. Moreover, under the provisions of the Act on Public Collective Transport, the voivodship self-government (represented by the Marshal) is responsible for the organisation of public rail transport in the region.

In 2008, a process of self-governmentalisation of the main carrier operating regional transport in Poland, i.e. PKP Przewozy Regionalne Sp. z o.o. was carried out. (established in 2001 based on the PKP Passenger Transport Sector and responsible for the provision of short-distance transport services), as a result of which 16 voivodship self-governments took over - under agreements concluded between voivodship self-governments and the government - all shares in PKP Przewozy Regionalne. Later, in 2015, the Industrial Development Agency took over the majority of shares in the company (50% and one share), with the remaining shares held by all provincial governments.

Since 2004, regional governments have started to establish their own railway companies. A total of seven regional railway operators were established, including six owned by provincial governments: Mazowieckie (Koleje Mazowieckie), Dolnośląskie (Koleje Dolnośląskie SA), Wielkopolskie (Koleje Dolnośląskie Sp. z o.o.), Śląskie (Koleje Śląskie Sp. z o.o.), Łódzkie (Łódzka Kolej Aglomeracyjna Sp. z o.o.) and Małopolskie (Koleje Małopolskie Sp. z o.o.), and one owned by the capital city of Warsaw (Szybka Kolej Miejska Sp. z o.o.).

The second model of financing rolling stock purchase involves the acquisition of vehicles by railway undertakings. The means used by rail transport operators for this purpose can be equity, credit or leasing. Detailed principles of financing the purchase of rolling stock from the above sources are discussed in Chapter 4.

In the situation when purchases of rail vehicles cannot be financed from the carriers' resources or credit resources secured by long-term contracts for the provision of transport services, the supply of rail vehicles to carriers by a public authority or the state comes as a solution. The essence of the solution is that the public authority or the state establishes a so-called rolling stock pool, i.e. a company that makes rolling stock available to transport operators carrying out public utility services. It is also possible for central authorities to set up rolling stock pools jointly with local authorities (also from other countries, mainly in cross-border areas), which translates into a lower unit price for purchasing rolling stock.

The rolling stock company owns the vehicles it acquires. It then lends them to the operators who offer the most favourable conditions in tenders for railway transport services. In this way, carriers are transformed into rail transport operators. Operators bring their staff, qualifications and experience to the transport business. Responsibility for the maintenance of rolling stock during the period of operation of passenger rail services may be contractually agreed.

The main advantages of such a solution include[52]:

- a reduction in the operating costs of leased versus owned rolling stock,

[51] Dz.U. 2020 item 1668

[52] source: https://kurier-kolejowy.pl/aktualnosci/35959/innowacje-w-konstrukcji-pojazdow-szynowych.html

- transferring responsibility for the availability and reliability factor of the rolling stock from the carrier to the rolling stock company,
- to remove the risk of an increase in maintenance and spare parts costs, in particular for the duration of the leasing contract,
- sharing selected data from the fleet's on board systems, both for the lessor (as regards the elements responsible for monitoring the vehicle's condition) and for the lessee (as regards the elements intended to improve the quality of the service provided or to reduce operating costs).

In domestic conditions, carriers are already using rolling stock leasing services, although the scale of popularity of this solution is relatively small. Demand for rolling stock pools is seen in the freight and passenger segments. In the case of passenger services, examples of companies using vehicles owned by other entities include Koleje Wielkopolskie, Koleje Śląskie and PKP IC.

The expected future increase in the transport workload (which, in the case of regional transport, is partly the result of activities aimed at combating traffic exclusion), combined with broader international integration manifested by an increased number of international and cross-border connections, as well as the need to increase transport standards in rail transport, will force purchases of railway transport means. In the financial perspective foreseen for 2021-2027, it should be expected that the EU support for the implementation of tasks related to purchasing and modernisation of the rolling stock will be limited. This means that the need to meet the objectives set for rail transport (including regional transport) may effectively contribute to a wider interest in acquiring vehicles within the rolling stock pools.

4. Possibilities of financing the purchase of rolling stock for cross-border regional traffic

There are many options on the market for financing the purchase of rolling stock. The basic classification of financing sources distinguishes between own and external financing. Internal financing includes funds from its capital, whereas external financing is understood as capital obtained from the environment. The choice of the appropriate financing option does not affect the value of the rolling stock.

The main financing options for the purchase of rolling stock include funds:

- raised by rail transport operators (equity; credit; leasing: financial, operating, sale-and-lease-back),
- the provincial government,
- a government special purpose fund, the Railway Fund,
- made available in the form of credit by European financial institutions,
- EU, foreseen in the financial perspective 2021-2027.

In Germany, mixed forms of financing with public authority support (e.g. debt service guarantee, assumption of interest rate risk by the responsible authority, a guarantee of re-use/re-registration, BW/VRR model) are also gaining[53] in importance. However, in Germany - in contrast to Poland - the rolling stock used in regional transport is not solely owned by the operator and the regional rail transport market is more competitive.

4.1. Funds raised by rail transport operators

4.1.1. Equity

In transport companies, the financing of the purchase of rolling stock, as well as other components that are part of the fixed assets, can be realised based on equity. The sources of equity can be:

- depreciation (the cash equivalent of the consumption of tangible and intangible assets caused by physical wear and tear (use) and economic wear and tear (technical progress)),
- retained earnings (the difference between net profit and the amount of dividends paid),
- capital raised from owners.

The last two items, i.e. retained earnings and capital raised from owners, are particularly important. Retained earnings enable self-financing of the enterprise and, in the long run, influence further development. Using retained earnings in whole or in part for investment tasks may mean depriving the owners of dividends - the lower the dividend paid from net profit, the more funds will remain e.g. for investment purposes (purchase of rolling stock) after profit distribution.

Another source of equity may be capital raised from owners (existing or new). The organisational and legal form of carriers providing regional rail transport services is usually a limited liability company. In these companies, it is possible to increase the share capital, as well as the acquisition of shares in the increased

[53] Source: D.T. 2.2.1. Financing and procurement of rail vehicles for regional passenger transport (version 05/2019)

capital by existing or new shareholders. The Code of Commercial Companies[54] provides that the share capital is increased by increasing the nominal value of existing shares or by establishing new shares. The share capital may also be increased by allocating for this purpose funds from the supplementary capital or reserve capitals (funds) created from the company's profit (increase in the share capital from the company's funds).

4.1.2. Credit

The Banking Law[55] defines a credit agreement as an obligation of the bank to place at the disposal of the borrower, for a period determined in the agreement, a sum of money intended for a specific purpose, and the borrower undertakes to use it under the conditions specified in the agreement, to repay the amount of credit used, together with interest, on specified repayment dates and to pay a commission on the credit granted.

From the point of view of a passenger transport company, investment loans are particularly important. These loans are used to finance tasks aimed at creating new or expanding existing fixed assets (in particular, expenditure on tangible fixed assets - rolling stock - may be financed).

Obtaining a bank loan is preceded by a creditworthiness assessment. In practice, many operators have a difficult financial situation, which makes it impossible to use this source of funding for the purchase of rolling stock. However, when credit is granted, it is often secured by long-term contracts for the provision of transport services (here: in rail transport).

In the case of large credit agreements, the manufacturer of the rolling stock can provide credit. Manufacturers have higher creditworthiness than transport operators. This allows them to finance purchases by the operators. In such circumstances, the payment terms (e.g. deferment of repayment, repayment period, interest rate, etc.) are more attractive than the bank offer.

4.1.3. Leasing

A specific form of acquiring transport equipment is leasing, i.e. a contract under which the lessor conveys to the lessee in return for payment the right to use capital goods (transport equipment) without having to purchase them. Leasing makes it possible to acquire movable and immovable fixed assets in the absence of free funds or sufficient financial resources. Leasing has been established in the Polish and international legal system in the Civil Code, the Accounting Act[56] and the International Accounting Standard.

The essence of leasing is the transfer for use by the lessee against payment of an asset which is not his property. The lessee pays the leasing fees arising from its use for business purposes but does not have to purchase the used asset, hence it remains the property of the lessor throughout the leasing period. The lease payment is determined in such a way that, over the lease term, it is composed not only of a return of capital but also of the coverage of costs and profit.

The use of means of transport (including railways) for consideration may take the form of leasing:

- Finance lease provides for a minimum leasing period equal to the useful life of the leased asset or an option to purchase the asset. The capital is depreciated and interest is a cost. All VAT is accounted for once at the beginning of the contract;
- an operating lease in which the risks and rewards incidental to ownership of the leased asset are partly borne by the lessee; the period of use of the leased asset may be shorter than its useful life. Each

[54] Journal of Laws. 2020 item 1526

[55] Dz.U. 2020 pos. 1896

[56] OJ. 2019 item 351

lease instalment is a cost and VAT is deductible. The depreciation rate for leasing locomotives or wagons is low at 7%. This makes operating leases end with a high buy-out;

- a sale-and-lease-back whereby a company sells its fleet to a lessor and at the same time continues to use it. In this case, the sale proceeds are taxable and lessors do not want to grant sale-leasebacks for liquidity purposes but investment purposes.

The growing demand for means of transport with limited financial resources creates conditions for the development of various forms of leasing. Locomotives, railcars and multiple units (electric, diesel, hybrid, etc.) can be leased by railway companies. Although the costs of acquiring leased assets are often higher than with other forms of financing (e.g. bank credit), acquiring leased rolling stock is an attractive financing method and easier in contrast to credit purchases. This is because leasing is often accompanied by complementary services, e.g. insurance, maintenance, etc.

4.2. Funds of the voivodship self-government

The financial management of the voivodship is based on the budget, which is a financial plan including

- the planned revenue and expenditure of the province,
- sources for financing the budget deficit,
- allocation of the budget surplus,
- expenditures on multiannual programmes, including in particular investment programmes, distinguishing the expenditure to finance each programme.

Voivodship self-governments aiming to increase competitiveness and improve the quality and accessibility of public transport services (as well as improve passenger safety) can finance the purchase of rolling stock. Investments in rolling stock serve the purpose of improving accessibility of transport services, the exclusive organiser of which is the Voivodeship self-government. The Voivodeship self-government has the possibility of securing funds in the budgetary classification chapter 60001 "National passenger railway transport", where property expenditures on investments and investment purchases are indicated. It has become common to include among them the following categories of expenditures for:

- provision of public services for the operation of provincial rail passenger services according to the Act on Public Collective Transport,
- servicing and maintenance of rolling stock owned by the voivodship and in rolling stock owned by the public transport operator used to operate the public transport service contract,
- purchase of rolling stock.

4.3. Funds of the governmental purpose fund - Railway Fund

A special-purpose fund, which constitutes an element of the government programme for a systemic approach to issues of railway transport development in Poland, is the Railway Fund. The Fund started to operate on 9 February 2006 and is intended to contribute to the implementation of such a state transport policy which will be consistent with the idea of sustainable development.

The legal basis for the operation of the Railway Fund is the Act of 16 December 2005 on the Railway Fund[57]. The Fund was established in Bank Gospodarstwa Krajowego.

The Fund's resources come from:

- 20% (19.45% as of 1 January 2022) of the fuel surcharge revenue collected according to the Act of 27 October 1994 on toll motorways and the National Road Fund[58] ,
- interest on the Fund's resources and interest on deposits with banks of Fund resources which are temporarily free,
- revenues from shares in companies transferred by the State Treasury to the minister responsible for transport to replenish the Fund,
- funds from credits or loans contracted for the Fund by Bank Gospodarstwa Krajowego,
- proceeds from bonds issued for the Fund by Bank Gospodarstwa Krajowego,
- investments of the Fund's resources in participation units of money market funds referred to in Article 178 of the Act of 27 May 2004 on investment funds and alternative investment fund management[59],
- donations, bequests, receipts from other public funds.

The Fund collects and allocates resources to finance, inter alia:

- tasks involving the preparation and implementation of construction and alteration of railway lines,
- tasks of carrying out repairs and maintenance of railway lines and decommissioning of redundant railway lines,
- acquisition from Polskie Koleje Państwowe S.A. by the Treasury, represented by the minister competent for transport matters, of PKP Polskie Linii Kolejowych S.A. shares,
- purchase and modernisation of railway vehicles intended for diagnostics, maintenance, repair or construction of railway infrastructure and rescue operations by PKP Polskie Linie Kolejowe S.A,
- activities of railway infrastructure managers which cannot be financed by charges for the use of railway infrastructure,
- financing or co-financing by provinces of tasks in the scope of the purchase, modernisation and repairs of railway vehicles intended for passenger services provided based on an agreement on public services, as referred to in article 4 point 19 of the Railway Transport Act of 28 March 2003 on railway transport on condition that those provinces organize provincial passenger railway services, in particular providing transport connections between neighbouring provinces, included in the plan for sustainable development of public collective transport referred to in Article 9 paragraph 1a of the Act of 16 December 2010 on public collective transport, prepared by the minister in charge of transport (applicable since 1 January 2021).

Annual financial plans which specify inflows and outflows of the Fund constitute the basis for managing the resources of the Railway Fund. The financial plan shall be subject to agreement with the minister in charge of transport, the minister in charge of regional development concerning projects implemented with the participation of European funds and the minister in charge of public finance concerning financial matters.

[57] OJ. 2017 item 510

[58] Journal of Laws of 2020, item 72, 278, 1087 and 1747

[59] Journal of Laws 2016, item 1896, 1948 and 2260

4.4. Funds provided in the form of credit by European financial institutions

4.4.1. European Investment Bank loan

The loans granted by the European Investment Bank[60] shall contribute to the balanced and steady development of the internal market in the interest of the Union. The European Investment Bank shall support the financing, in all sectors of the economy, of projects for development in the least-developed regions, for the modernisation or conversion of undertakings or for the development of new activities which cannot be financed entirely by funds available in the individual Member States and which are of common interest to the several Member States.

The Bank raises funds on the capital markets and lends on concessional terms to projects that support EU objectives, but the institution does not use funds earmarked in the EU budget. The main product offered by the European Investment Bank is loans. Loans exceeding EUR 25 million are granted directly. For smaller loans, credit lines are activated for financial institutions, which provide further loans to borrowers.

Priority areas of support by the Bank include:

- actions aimed at levelling the economic level of EU regions,
- development of the transport and telecommunications sector,
- the development of the energy sector as regards the efficient use of energy and the diversification and security of energy sources,
- environmental protection activities,
- supporting the development of small and medium-sized enterprises,
- promoting economic development based on knowledge and computerisation.

The largest part of the European Investment Bank's credit resources are funds for infrastructure needs and modernisation plans in the public sector, covering projects implemented by various levels of government (national, regional and local), including in the field of public transport. This institution has already financed the rolling stock programmes of some Polish carriers (including PKP Cargo, Przewozy Regionalne, PKP IC). Likely, the reduction of EU funds in the 2021-2027 perspective for co-financing investment tasks will result in the EIB loan being one of the more important sources of financing for public collective transport.

When granting a loan for the purchase of rolling stock, the lender will take into account the stability of the railway undertaking. Its determinant (and also a guarantee for the bank) will be the duration of the contract for the provision of transport services. It would be desirable for its duration to be compatible with the repayment period of the credit.

[60] The European Investment Bank (EIB) was established under the *Treaty of Rome* in 1958 as the investment bank of the European Union. Today the Bank, together with the European Investment Fund, forms the European Investment Bank Group. The shareholders of the European Investment Bank are the 27 EU Member States.

4.4.2. Council of Europe Development Bank loan

The concessional loans provided by the Council of Europe Development Bank[61] are intended to pursue social objectives, in the following areas:

- strengthening social cohesion,
- environmental management,
- supporting public infrastructure of social importance,
- supporting small and medium-sized enterprises.

The Bank's capital is EUR 5.5 billion (at the end of 2019). The support of the Council of Europe Development Bank can be used by local governments, Polish financial institutions and the government of the Republic of Poland. The funds made available by the Council of Europe Development Bank enable the implementation of projects in this EU perspective and allow raising funds for the start of a future EU perspective. Funds obtained from the loan may constitute an own contribution to investments consisting in the construction of railway infrastructure and the purchase of rolling stock.

4.5. EU funding is foreseen in the financial perspective 2021-2027

The Cohesion Policy 2021-2027 will be mainly based on three documents: The General Regulation[62], the ERDF and CF Regulation[63]and the ESF Regulation[64]. The new Cohesion Policy will concentrate its resources on five objectives:

- Objective 1: A smarter Europe,
- Objective 2: a greener, low-carbon Europe,
- Objective 3: a better connected Europe,
- Objective 4: A Europe with a stronger social dimension,
- Objective 5: Europe closer to its citizens.

Among the above-mentioned objectives, the most important in the transport sector is Objective 3 ("A better connected Europe"), which broadly relates to issues related to mobility in its broadest sense and regional ICT connections. The "A better connected Europe" objective covers the areas of action envisaged under:

[61] The Council of Europe Development Bank (CEB) is the Council of Europe's financial institution in which 42 countries from 48 Council of Europe member states participate (excluding, inter alia, Russia, Ukraine, Austria and the United Kingdom). Poland joined the Bank in 1998.

[62] Draft Regulation of the European Parliament and of the Council laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund and the European Maritime and Fisheries Fund and the financial rules for these funds and for the Asylum and Migration Fund, the Internal Security Fund and the Border and Visa Management Instrument (proposal COM(2018)375, 29.05.2018)

[63] Draft Regulation of the European Parliament and of the Council on the European Regional Development Fund and the Cohesion Fund (proposal COM(2018)372, 29.05.2018)

[64] Draft Regulation of the European Parliament and of the Council on the European Social Fund Plus (ESF+) (proposal COM(2018)382, 30.05.2018)

- passenger transport by rail:
  - railway lines,
  - point infrastructure,
  - purchase of rolling stock,
- road infrastructure:
  - provincial roads,
  - city bypasses,
  - local roads to improve the region's transport cohesion and reduce transport exclusion,

  improving digital connection networks.

The Ministry of Investment and Development has prepared a draft of the assumptions of the Partnership Agreement[65], a document which defines the conditions for effective and efficient use of funds for the period from 1 January 2021 to 31 December 2027, especially for the objective "A better connected Europe", as priority financial actions in the perspective foreseen for 2021-2027, including among others the development of cross-border connections and links (of local/regional nature). The Ministry of Investment and Development, in cooperation with the Ministry of Infrastructure and the Ministry of Maritime Affairs and Inland Navigation, has prepared an outline of the Infrastructure and Environment Operational Programme, in which tasks falling into the following areas (the so-called arrangement of priority axes) have been proposed for co-financing:

- development of the main transport links in Poland concerning TEN-T - roads, ring roads, ports and sea rescue, inland waterways, airports
- development of transport infrastructure outside TEN-T: roads, bypasses, inland waterways
- rail and intermodal transport: rail infrastructure and rolling stock, intermodal terminals, dedicated terminal access infrastructure, rolling stock and equipment, light rail,
- urban transport: sustainable multimodal urban mobility.

According to the draft budget of the European Union for 2021-2027, Poland is to be a beneficiary of funds of EUR 64.4 billion[66], compared to EUR 83.9 billion for Poland in the perspective 2014-2020. This means a reduction in the so-called "Polish envelope" by about 23%. It should be added that lower co-financing rates will also be introduced, depending on the level of development of the region - see Table 3: Co-financing rates in the financial perspective 2021-2027.

Limit of EU contribution	Criterion
70%	regions below 75% of the EU-27 average GDP per capita - the so-called less developed regions
55%	regions between 75% and 100% of the EU-27 average GDP per capita - so-called transition regions
40%	regions above 100% of the EU-27 average GDP per capita - the so-called more developed regions

Table 3: Co-financing rates in the financial perspective 2021-2027

[65] source: https://www.funduszeeuropejskie.gov.pl/strony/umowa-partnerstwa-na-lata-2021-2027-zalozenia/

[66] Source: European Council conclusions of 21.07.2020 at constant 2018 prices.

5. Analysis of cross-border traffic potential, including long-distance cross-border traffic (Wroclaw - Dresden and Dresden - Wroclaw)

With a population of approx. 2.9 million, the Lower Silesian Voivodeship and the Free State of Saxony with a population of approx. 4.1 million are strongly linked regions. There are numerous passenger flows between them, which offers great potential for the development of cross-border rail links. The still unsatisfactory offer of rail transport between Lower Silesia and Saxony - which has been developing in recent years, but is still not as developed as in other countries (more on this in Chapter 8) - hinders the smooth development of cooperation between these regions.

The need for efficient rail transport between Lower Silesia and Saxony is demonstrated primarily by statistics on the labour market and tourist flows. According to estimates from March 2020, at least 10 000 Poles living permanently in Poland commute daily to work in Saxony. On the other hand, the number of Poles living permanently in Saxony is approx. 25 000 - which also represents a potential for the efficient functioning of public transport, as some of these people regularly (e.g. for weekends) return to Poland.

The improvement of the railway transport offer should also be a response to the high demand for transport of a tourist nature. According to the analysis "Study of tourist traffic in Lower Silesia 2019" prepared on behalf of the provincial government, tourists from Germany account for the largest percentage of visitors to Lower Silesia. According to this research, in 2018, the number of overnight stays provided to tourists in Lower Silesia in 2018 was 3,654,787 (representing a number 332,391 higher than in 2017). The number of nights provided in 2018 to tourists from Germany was 271,215, which accounted for 7% of all nights provided and as much as 39% of nights provided to visitors from abroad.

A similar percentage applies, for example, to the city of Wrocław itself: 134,000 overnight stays provided to tourists from Germany in 2018 in Wrocław accounted for 34% of all overnight stays provided to tourists from abroad. There is no doubt that the figures for the number of overnight stays provided are underestimated, as the domain of recent years has been the development of short-term accommodation offers (e.g. short-term flat rentals via specialised online portals), which are often unrecorded. However, taking into account registered arrivals, the number of foreign tourists visiting Lower Silesia increased by as much as 36% in 2014-18.

Spa facilities in Lower Silesia are very popular with visitors from Germany. In 2018, almost 47 thousand overnight stays were provided to Germans in Lower Silesian spas, which accounted for as much as 67% of the overnight stays provided to foreigners in Lower Silesian spas. The data concerns the following spas: Niemcza (Przerzeczyn-Zdrój), Duszniki-Zdrój Kudowa-Zdrój, Polanica-Zdrój, Bystrzyca Kłodzka Lądek-Zdrój, Świeradów-Zdrój, Jedlina-Zdrój, Szczawno-Zdrój, Jelenia Góra.

Arrivals from abroad in Lower Silesia most often take place in Wrocław, which is due to the very high tourist potential of the voivodeship's capital (in 2016, the popular worldwide tourist website TripAdvisor ranked Wrocław among the 10 most interesting European cities). In the second-order, according to the above-mentioned analysis prepared by the provincial government, the most popular destinations are the Jeleniogórski (and the city of Jelenia Góra) and Kłodzko districts: mountainous areas with very high potential for mountain tourism and winter sports. In the third place, the districts of Lubañ and Zgorzelec are the most popular. These counties are located in a border area (Zgorzelec county: at the border with Germany; Lubański county: close to the border), which further increases the demand for efficient cross-border public transport.

The number of tourist nights spent in Saxony was more than 20 million, of which more than 1 million were spent by tourists from abroad. Among the foreign guests were 78.5 thousand Poles, who stayed 201 thousand nights. Within 10 years, the number of Polish tourists staying overnight in Saxony increased by 277%. This is the highest growth rate of all foreign tourists coming to Saxony.

According to data from the Saxon Tourist Promotion Organisation, Poland is the largest incoming tourism market for Saxony, larger than the Netherlands, Austria, Switzerland and the USA among others. Most Polish tourists coming to Saxony live in southern and western Poland. All of this means that the most frequent transports between Poland and Saxony - both in terms of commuting and tourism - take place primarily in the logic of cross-border transport rather than international/long-distance transport.

The most frequently visited areas in Saxony by Polish tourists are Dresden, Leipzig, Switzerland Saxony, the residence of August II the Strong Moritzburg, Meissen and Görlitz. In recent years there has also been an increase in short, one-day visits related to active tourism (e.g. cycling along the Elbe, the artificial lake Berzdorfer See, the Lusatian Foothills / Zittau Basin).

In the context of the partnership between Lower Silesia and Saxony, the cooperation between the regional capitals of Wrocław and Dresden is of particular importance. Partnerships between the two cities were established as early as 1963, at a time of serious political tensions between Poland and Germany, when travelling abroad, both from Poland and Germany (East Germany), was subject to rationing. The partnership agreement between Breslau and Dresden was signed in 1991 and since then the cooperation between the two cities has been intense. The programme of intercity cooperation between Breslau and Dresden includes above all:

- exchange of experience in the field of self-governance,
- exchange of experience in preserving the historic character of the old town and the development of spatial solutions within it,
- cultural exchange,
- exchanges of children and young people from schools in Wroclaw and Dresden.

The need to improve cross-border railway connections is stressed in the Spatial Development Plan for the Lower Silesian Voivodship[67]. This document is the main tool for shaping the voivodeship spatial policy, indicating its main directions and objectives. In terms of transport, the following strategic goal 7 has been defined (Contractor's emphasis): Establishment of efficient and safe transport and communication systems connected with the national and European system, as well as efficient technical infrastructure networks ensuring water and energy supply, proper waste management and prevention of breakdowns and negative consequences of natural disasters[68]. The document also defines several directions and corresponding principles of spatial development, such as:

- Shaping a coherent system of external and internal rail transport links:
    - Improving transport accessibility of the main settlement centres of the voivodeship with the national and European railway system;
    - Expansion of cross-border regional public transport;
    - Planning, design and reconstruction of railway transport systems taking into account the requirements of the protection of the natural and cultural environment;
    - Reducing journey times in passenger traffic and freight traffic;
    - Preservation and extension of rail connections between central locations for cross-border traffic;
    - Expansion of cross-border regional public transport.
- Improving the performance of the railway network:

[67] Document adopted by the Lower Silesian Regional Parliament by Resolution No. XLVIII/1622/2014 on 27 March 2014.
[68] Spatial Development Plan of the Lower Silesian Voivodship, 2014, p.89.

- Carrying out the modernisation of existing railway routes with the upgrading of their technical parameters;
- Improving and expanding cross-border connections;
- Improving travel conditions through urban areas.

- Shaping a coherent, intermodal system of public collective transport providing high-quality travel opportunities within the region, the metropolitan area, development areas and settlement units:
  - Spatial, functional and tariff integration of the different forms of collective transport;
  - Choosing the optimum means of public transport for the scale of demand for transport while applying tools that are compatible with the principle of sustainable mobility, which shapes the travel demand.

- Shaping a coherent system of internal links of the region both within and between development areas - improving internal accessibility:
  - Improving internal communication accessibility of the main settlement centres;
  - Coordinate settlement development with the existing and planned transport network, minimising journey times, access costs and emissions;
  - Improving conditions for transit through urbanised areas and the development of public transport taking into account the specific characteristics of historic and intensively built-up areas;
  - Comprehensive solution of transport problems in the border area including cross-border connections;
  - Improving transport links in the tourist areas of the Giant Mountains, the Jizera Mountains and the Lusatian Mountains via Zittau.

In the context of the development of tourist connections, the provisions of the Strategy of Integrated Territorial Investments for Jelenia Góra Agglomeration 2014-2023 should also be cited. This document, in addition to planning investments within the agglomeration itself (which, according to the defined area, also includes the entire Jelenia Góra district and parts of the districts of Lwówek and Złotoryja), indicates the need to improve the railway transport offer in a transnational system.

The most important postulates in the diagnosis of the current state of the Jelenia Góra agglomeration include the following:

- maintenance and development of railway connections within the agglomeration including connections to such centres as Wroclaw, Prague, Dresden, Berlin;
- maintaining rail bus services to Germany and the Czech Republic;
- modernisation of railway infrastructure to ensure attractive international connections.

The information presented above demonstrates the necessity of developing the cross-border rail links between Lower Silesia and Saxony, especially on routes that will improve mutual interconnections:

- on the Polish side: Wrocław, Jelenia Góra and Jelenia Góra County (especially Szklarska Poręba), Lubań Śląski and Zgorzelec,

- on the German side: Dresden, Görlitz, Leipzig and Zittau. The station in Zittau already plays a very important role as an interchange for cross-border journeys between the Czech Republic and Germany (more on this in chapter 8), whereas its role in terms of serving journeys to and from Poland is marginal, among other things due to the lack of a well-developed range of connections.

6. Economic analysis of cross-border connection offers for individual cooperation models

The economic analysis was made for two possible and feasible models of cooperation. There are two basic cooperation models for organising cross-border connections:

- The implementation of interchange connections, i.e. from Wrocław to Görlitz by a Polish carrier, and on the Görlitz-Dresden section by a German carrier (similar to the current rules), but with the assumption that the line to Görlitz will be electrified to allow the use of electric rolling stock. The use of electric rolling stock allows higher speeds to be achieved, which will significantly reduce journey times and consequently improve passenger comfort (compensating for the time spent changing trains in Gorlitz). Since Gorlitz station is located in a larger urban centre than Zgorzelec, the analysis assumes that the station on the German side would be the transfer point;
- Implementation of direct connections, i.e. from Wroclaw to Dresden, assuming complete electrification of the line to Gorlitz. To provide an attractive connection, the entire line should be electrified so that higher speeds can be achieved, thus reducing journey times and increasing demand.

The costs of such services have been estimated based on current data received from the Office of the Marshal of the Silesian Voivodeship concerning the services operating in 2019 on the route of the potential railway line, i.e.:

- Węgliniec - Wrocław Główny - Węgliniec;
- Lubań Śl. - Wrocław Główny - Lubań Śl;
- Legnica - Węgliniec - Legnica;
- Legnica - Zgorzelec - Legnica;
- Węgliniec - Görlitz - Węgliniec.

For the above-mentioned connections, the average unit cost of the task was estimated per 1 train-kilometre of transport with the distinction of the type of rolling stock (electric, diesel). The figure below shows that the average cost of carrying out the task with electric rolling stock is 23.38 PLN/train km, while for diesel it is 19.92 PLN/train km (see Figure 6). However, the key issues here are the achievable speed and the external costs of transport (pollutant emissions to the environment), which are significantly higher when using diesel. This is why the electrification of the entire railway line was assumed for this analysis.

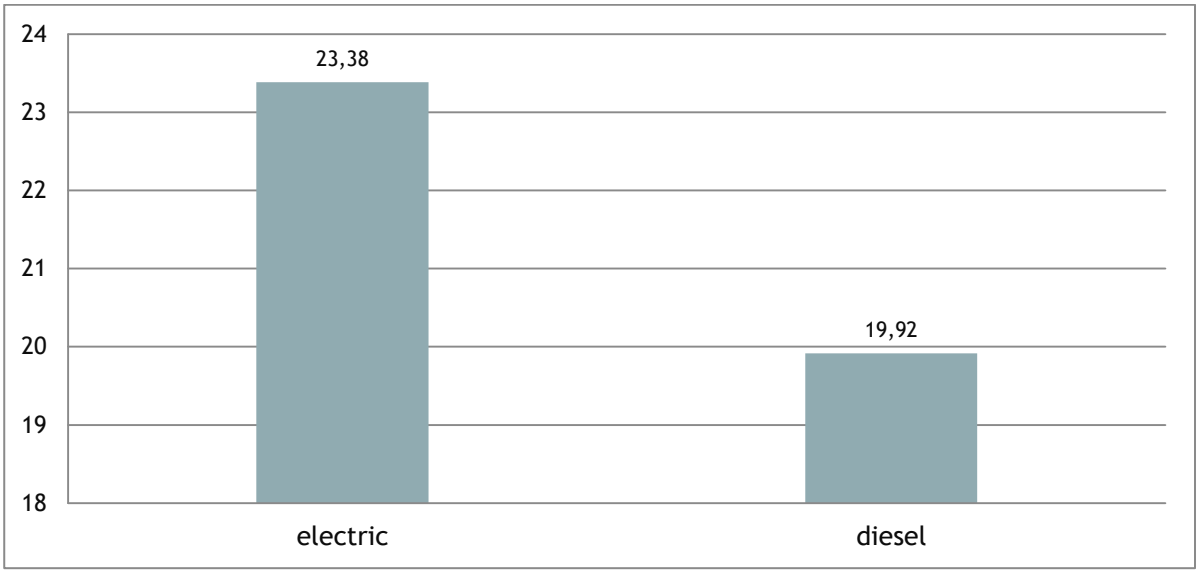

Figure 6: Average cost of task execution with a given type of rolling stock calculated per 1 train km - source: own study

For the analysis, it was assumed that the distance in option 1 (connection with a transfer in Görlitz) is 164 km, while in option 2 (direct connection to Dresden) it is 270 km.

Based on historical data, costs were estimated for two merger options.

It is assumed that 12 connections will be operated per day in each direction (analogous to the current number of connections on the longest routes, i.e. Wrocław Główny - Lubań Śląski and Wrocław Główny - Węgliniec).

The estimated cost of 1 connection between Wroclaw Główny and Görlitz with a unit rate of 23.38 PLN/train km operated with electric rolling stock will be 3,834.88 PLN (one way), thus in both directions, the cost will amount to approximately 7,669.77 PLN, which with 12 connections per day and 365 days per year will generate a cost of approximately 33.6 million PLN.

In the case of option 2, i.e. direct connections from Wrocław to Dresden, it would be necessary to purchase a two-system rolling stock that would be adapted to the safety systems in both Poland and Germany. The purchase of such rolling stock is more costly than the purchase of traditional single-system rolling stock, thus in addition to the natural increase in costs due to the increased transport work, the maintenance costs for the rolling stock will also increase. It is estimated that the maintenance costs of the rolling stock amount to around 4% of the purchase costs[69], so the difference in maintenance costs can be as much as 3.6 million zloty. A significant cost for railway undertakings is the fee for access to infrastructure which accounts for ca. 18% of total costs connected with the provision of transport services[70]. Therefore, the costs of direct connections to Dresden will increase additionally on this account. In Poland, the average unit charge for the minimum access to infrastructure is 7.77 PLN/train km, whereas in Germany this charge is even half as high. For this reason the toll in the section Görlitz - Dresden will increase by PLN 2 million in comparison to option 1 with the extension of the route.

To sum up, it is estimated that the cost of providing 12 daily connections from Wrocław Główny station to Görlitz station will amount to approximately 33.6 million PLN, while in the case of providing 12 direct connections from Wrocław to Dresden, the cost would increase to 56.9 million PLN (an increase of 23 million PLN, i.e. 70% - cf.Figure 7).

[69] Jan Raczyński, *Decision-making factors in the process of rolling stock purchase*

[70] Railway Transport Authority, Report on the operation of the rail transport market in 2018.

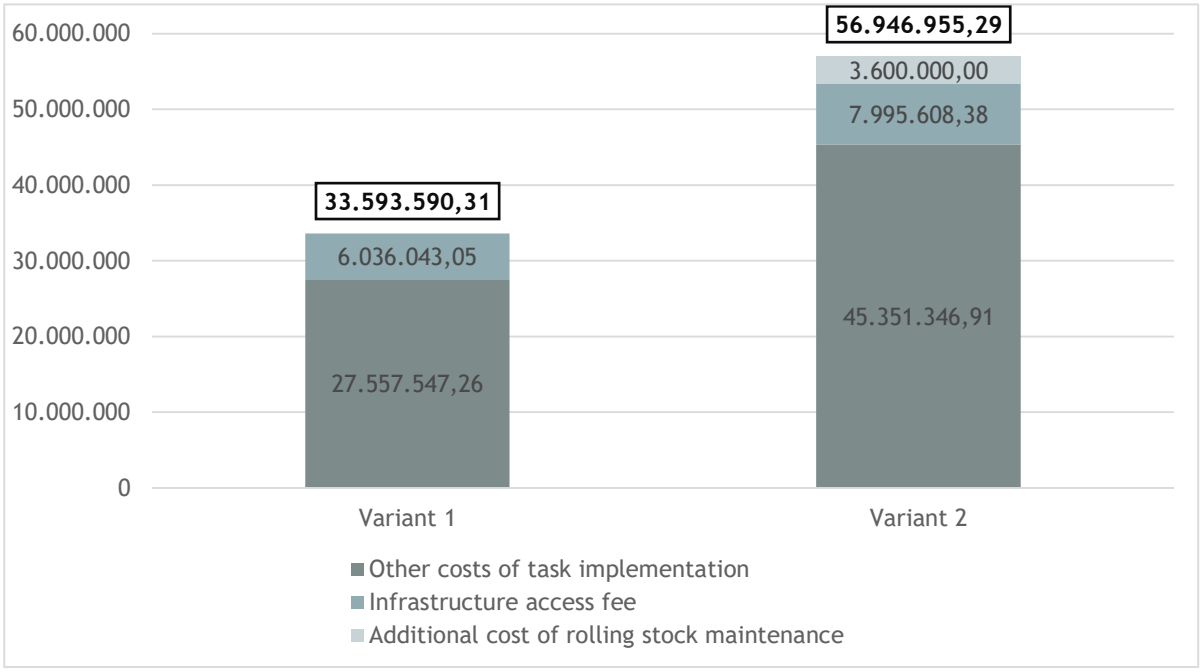

Figure 7: Total costs of task implementation - source: own elaboration

In the next step, an attempt was made to estimate revenues. Due to the lack of demand analyses, revenues were estimated indicatively based on historical data. For this purpose, publicly available reports were used. The UTK report shows that in 2019 335.88 million passengers were transported in Poland, of which 4.2% were passengers of Koleje Dolnośląskie, which means that Koleje Dolnośląskie transported 14.1 million passengers in the entire area of its operation. In turn, according to data from the Lower Silesian Marshal's Office, the average number of passengers carried on the route Wrocław - Zgorzelec/Görlitz is 2.78, which is 19.7% of the total number of passengers carried by Koleje Dolnośląskie. According to data received from the Lower Silesian Voivodship Office, the revenues of the company Koleje Dolnośląskie were as follows in 2019 PLN 114.05 million, which, assuming that the number of passengers is proportional, allows us to estimate that the revenue from the Wrocław - Zgorzelec/Görlitz line was around PLN 22.49 million. The average revenue per passenger is, therefore, PLN 8.08, while the average number of passengers in relation to the transport work (in train km) is 1.90. The above data were the basis for estimating revenue for the compared options.

In the variant 1 (interchange in Görlitz), it is assumed that as a result of the improved connection, the number of passengers on the Wrocław-Görlitz line will increase by an additional approximately 5% compared to the status in 2019. Thus, taking into account average revenue per passenger of PLN 8.08, the revenue in the variant 1 will be approximately PLN 23.6 million. In the variant 2 (direct connection Wrocław - Dresden), assuming that the number of passengers transported in the Görlitz-Dresden section will increase proportionally to the increase in the transport work and will additionally increase by 5% as a result of an improvement in the quality of the connection (as a precautionary measure 5% was assumed, although it is not excluded that the increase will be much higher), the number of passengers will amount to 4.7 million, which will translate into revenues of PLN 38.0 million (cf. Figure 8**Fehler! Verweisquelle konnte nicht gefunden werden.**).

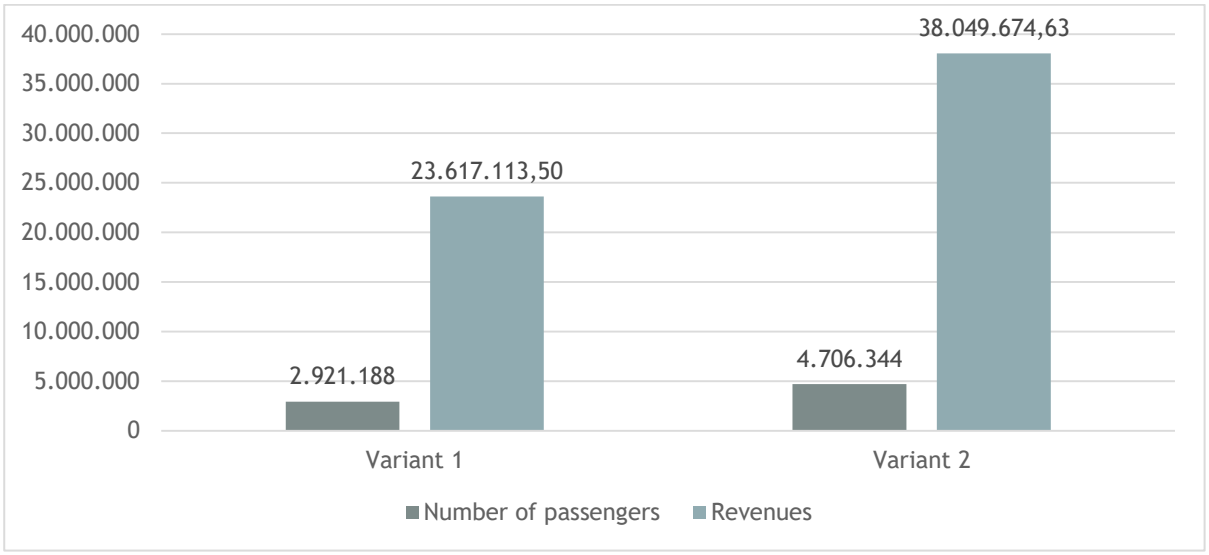

Figure 8: Forecasted demand and income from task execution - source: own elaboration

The final stage of the analysis was to try to estimate the expected level of compensation. According to the transport contract, the compensation is calculated using the following formula:

$$Compensation = cost\ of\ the\ task - revenue + reasonable\ profit$$

Under current regulations, a reasonable profit can be a maximum of 6% of equity. According to the balance sheet of the company Koleje Dolnośląskie, as at 31.12.2019, the company's equity amounted to PLN 126.7 million, and therefore a reasonable profit can amount to a maximum of PLN 1.5 million. Therefore, the compensation in option 1 will be about PLN 11.5 million (average PLN 8/train km), while in option 2 it will be PLN 20.4 million (average PLN 8.62/train km) - cf.Figure 9 and Table 4)

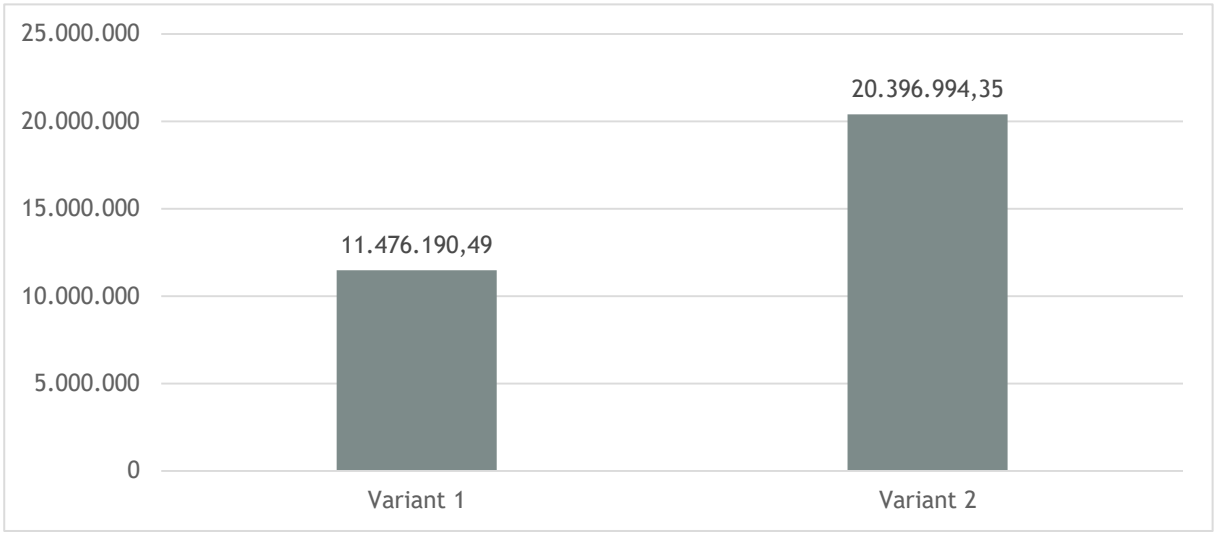

Figure 9: Forecasted level of compensation - source: own elaboration

Specification	Option 1	Option 2	unit
Task costs	33 593 590,31	56 946 955,29	PLN
Revenue from the implementation of the task	23 617 113,50	38 049 674,63	PLN
Reasonable profit	1 499 713,69	1 499 713,69	PLN
Compensation	11 476 190,49	20 396 994,35	PLN

Table 4: Calculation of the compensation level - source: own elaboration

7. Linking of both regional public transport systems through the creation of a nodal station integrating the systems

A major problem faced by public transport operators in integrating their offerings at the boundaries of their respective areas is the divergence of goals and priorities of the different stakeholders. It is natural that each stakeholder first strives to ensure connections to the regional and administrative centres in their area, where the greatest passenger flows occur. In this case, the service hours are first of all adjusted to the needs of people working and studying in such a centre, and the arrival and departure times to destinations in border regions are a result of these assumptions. Also, regions away from major cities tend to have the lowest frequency of services, which is linked to the zonal supply method where additional trains are operated on shorter routes to meet the increased demand for services in agglomeration areas. The combination of these two factors can result in significant travel difficulties for passengers moving between regions, in particular, due to insufficient numbers of connections, unsuitable journey times and increased travel time waiting to change between uncoordinated connections.

Ensuring an adequate offer between neighbouring regions and the most important centres within their area, therefore, requires special attention from organisers and carriers. Several actions and solutions can be distinguished, which are applied to improve connections on such routes. These can be grouped into three categories:

The organisation of inter-regional services by a higher organiser

According to the Act on Public Collective Transport, the responsibility of organisers of public collective transport in Poland is hierarchical. Individual local authorities are responsible for the organisation of transport on their territory, while connections with neighbouring authorities of the same level are the responsibility of higher authorities (e.g. the organisation of connections between two counties in the same voivodeship is the responsibility of the voivodeship), unless the local authorities of the same level establish cooperation with each other - in such a case, transport is organised at the level of those authorities. It is, therefore, possible to provide a connection between the Lower Silesian Voivodship and the Free State of Saxony through the organiser of international connections, which in Poland is the minister responsible for transport. However, such connections are not currently being established, nor are they envisaged in the current transport plan for inter-voivodship and international connections[71].

Even in the case of launching such connections, there is a high probability that they will not be sufficient to satisfy the needs of the inhabitants of both regions. An important feature of the long-distance services organised by the Minister of Transport in Poland is their high commercial speed, associated with a small network of commercial stops, limited only to significant urban centres. This is a positive feature for travellers travelling between the main cities of the regions but leaves a significant number of towns and cities in both regions without the possibility of using non-stop connections. An additional significant problem is the lack of tariff integration between regional and long-distance carriers, resulting in the need to potentially purchase two separate tickets for such a journey. Another inconvenience is the low frequency of long-distance connections - according to the national transport plan, the minimum frequency for international connections is one pair of trains per day. This does not meet the differing needs of the residents of the two regions.

Given the above, it should be noted that the implementation of measures aimed at improving the quality of connections between the Lower Silesian Voivodship and the Free State of Saxony should take place in-

[71] Plan of sustainable development of public collective transport in the scope of transport network in intervoivodeship and international passenger transport by rail, Dz. U. 2018, item 874

dependently of any measures related to the organisation of international connections by the minister responsible for transport.

Provision of direct connections by the cooperating regions

Neighbouring regions acting in concert have the opportunity to establish direct links between key urban centres in both regions. This type of organisation allows the two parties involved to jointly establish the frequency and timings of services so that they also provide the necessary intra-regional functions wherever possible. This solution is certainly the most attractive for passengers who do not have to change transport modes, but it raises several organisational problems for cross-border connections. The vehicles used to operate such a service must have the relevant approvals for operation in both countries, the conductors and traction staff must be trained in the regulations in force on the other side of the border and the operation of the rolling stock of the foreign partner; knowledge of a sufficiently high level of a foreign language, confirmed by a certificate, is often also required, which can reduce staff potential. In special cases, the difference in the power supply systems used on electrified lines can be an obstacle to cross-border traffic. Also, the disproportion in passenger flows in the regions (large differences in the importance of rail transport on the two sides of the border) may cause problems, which may lead to over-or under-supply in particular sections.

Provision of interconnection links by the cooperating regions

This solution is less attractive from the passenger's point of view because of the need to change trains when travelling between regions, but it is a co-operation model which significantly reduces the operational disadvantages discussed above. Cross-border traffic is facilitated by allowing trains to enter a border station with a minimum of formalities, without having to obtain all the approvals and authorisations otherwise required. At the same time, this allows each region to use rolling stock with a capacity appropriate to the transport needs in its area. This is currently the case in Lower Silesia (e.g. entry of Polish rolling stock to Görlitz, Lichkov, Adršpach, as well as entry of rolling stock from the Czech Republic to Szklarska Poręba and Sędzisław), as well as in other regions (e.g. entry of Silesian Railways trains to Bohumin).

A key issue when organising interchange services is to choose an appropriate point (station) at which to make the interchange. This should be a significant destination so that trains from both directions can end logically. Where possible, the organisation of the interchange should minimise any inconvenience. It is desirable that the connecting services stop at the same platform, door to door, and that the time for interchange is relatively short in order not to lengthen the whole journey (at the same time there must be a guarantee of interchange in case of possible delays). An additional important factor is to ensure that it is possible to make changes in directions other than the primary direction. Due to operational requirements, an important factor is the station infrastructure, in particular the presence of a sufficient number of stand-off tracks and platform edges.

It is worth noting that from the timetable point of view the difference between the solutions described in points 2 and 3 is relatively small. It is worth noting that from the timetabling point of view the difference between the solutions described in points 2 and 3 is relatively small - interchange connections are possible at the same hours as direct trains. The only significant difference between these cases is the time needed to change trains, which with appropriate organisation (especially changing trains on the same platform) can be about 3-5 minutes, slightly longer than the typical stop time of 1-2 minutes for a passenger train at a station. With this in mind, it is desirable to first define a connection model taking into account the desired frequency, journey time, commercial stops and service times, and only then to define a concrete solution to achieve the objective thus defined.

In the case of connections between the Lower Silesian Voivodship and the Free State of Saxony, first of all, two potential stations can be identified, where functional integration of connections operating on both sides of the border could take place: Zgorzelec and Görlitz. To select the recommended integration

point, a simplified analysis of the railway connections organised by both regions to/from the indicated stations was carried out, together with the infrastructure present at both stations.

1. **Free State of Saxony**

a) Dresden - Görlitz (RE1/RB60)

The service is operated by Die Länderbahn (DLB), the trains run under the brand name Trilex. The service operates in two segments - accelerated (service line RE1) and regional with stops at all stations and passenger stops (service line RB60). Both lines have a frequency of 60 minutes, with departures from Dresden scheduled alternately every half hour. Some of the connections on route RE1 are extended to Zgorzelec (more on this also in chapter 9). Some of the RB60 services require a change of train at Bischofswerda station. All connections of both lines are operated with diesel rolling stock and the line is only electrified in the section Dresden Hbf - Dresden-Klotzsche (11 km). The overhead contact line on this section is supplied with 15 kV 16.7 Hz alternating voltage.

b) Hoyerswerda - Görlitz (RB64)

The service is operated by ODEG (Ostdeutsche Eisenbahn GmbH). The service operates with a frequency of 60 minutes during peak hours, 120 minutes outside peak hours and at weekends. At Görlitz station there is no convenient connection to the trains of the RE1 and RB60 lines - the transfer time in each direction is usually around 30 minutes. All connections are operated with diesel rolling stock. The line is electrified between Hoyerswerda and Niesky, the overhead contact line is supplied with 15 kV 16.7 Hz AC.

c) Cottbus - Görlitz - Zittau (RB65)

This service is operated by ODEG (Ostdeutsche Eisenbahn GmbH). The service operates with a frequency of 60 minutes. At Görlitz station there are convenient connections from Cottbus to the RB60 in the direction of Dresden and vice versa; however, there are no convenient transfers between Görlitz and Zittau: the transfer time is usually around 35 minutes. All connections are operated with diesel rolling stock and the line is not electrified.

d) Görlitz station

The station is a large interchange station, completely non-electrified. It is located in the central part of the town of Görlitz (approx. 56,000 inhabitants), with a bus station and stops for public transport (trams and buses) near the station. The station has 6 platform edges and several parking tracks used for parking the rolling stock between the services.

2. **Voivodship Lower Silesia**

a) Wrocław - Legnica - Zgorzelec (D10)

The service is operated by KD (Koleje Dolnośląskie). Services operate with a frequency close to 120 minutes during peak hours, and a total of 7 pairs of trains are operated on the Wrocław - Zgorzelec route and 1 pair on the Legnica - Zgorzelec - Görlitz route. Except for the train to/from Görlitz, all connections are operated with electric rolling stock. Some connections are of an accelerated nature and stop only at certain stations and passenger stops. The line Wroclaw - Zgorzelec is electrified, the catenary network is supplied with 3kV DC voltage. The border section Zgorzelec - Görlitz is not electrified.

b) Jelenia Góra - Luban Śląski - Zgorzelec - Görlitz (D19)

The service is operated by KD (Koleje Dolnośląskie). Services operate with a frequency close to 120 minutes, and a total of 7 pairs of trains are run. All connections are operated with diesel rolling stock. The line is electrified on the section Jelenia Góra - Lubań Śląski, the catenary network is powered with 3kV DC voltage.

c) Zielona Góra - Żary - Węgliniec - Zgorzelec - Görlitz (D19)

The operator of the connection is Polregio. The service operates with a frequency close to 120 minutes, with a total of 5 pairs of trains running, of which one runs in a shortened connection to Zgorzelec station. At Węgliniec station there are relatively convenient connections (waiting time of approximately 10 minutes) with trains running in the direction of Wrocław. All connections are operated with diesel rolling stock. The line is electrified on the Węgliniec - Zgorzelec section, the catenary network is powered with DC 3kV.

d) Zgorzelec station

The station is a small junction station, located in the peripheral part of Zgorzelec (approx. 30,000 inhabitants). There are no public transport stops in the immediate vicinity of the station. The track layout of the station is forked. The part located on railway line no. 274, serving connections towards Lubań Śląski and Jelenia Góra, is equipped with two platform edges and two additional tracks and is not electrified. The electrified part located on railway line no. 278, serving connections in the direction of Węgliniec, Zielona Góra and Wrocław, has only two platform edges and no auxiliary or back-up tracks. Electrification of the entire Zgorzelec station is planned, but this will not solve the problems with its limited capacity (the need for shunting and directional changes in the case of having to pass between lines 274 and 278).

Taking into account that Görlitz station is located in a larger urban centre, has a better location in the context of the functional centre of the city, has better transfer possibilities to regional and city transport and has a more favourable track layout, it is the natural choice as a station to integrate both systems of regional passenger connections. The key transport route for both regions is the section connecting their capital cities, i.e. Wroclaw - Zgorzelec - Görlitz - Dresden. According to the above-defined models of integration measures, two basic ways of providing connections in this relation can be distinguished:

- A direct connection between Wroclaw and Dresden based on existing connections. The most advantageous way of providing such a connection is to extend the existing accelerated connections of the RE1 line to Wroclaw, also providing them with a limited number of commercial stops on the Polish side in order to achieve attractive travel times between important urban centres. Due to the lack of electrification on the German side, the connection should be operated with diesel and/or bimodal rolling stock (allowing power supply from the overhead line or internal combustion engine). However, this solution carries some risks (more on this in chapters 9 and 10);
- Connection with the interchange at Görlitz station between trains to/from Wroclaw and to/from Dresden. The trains should, as far as possible, be connected on the same platform with as short a transfer time as possible (up to approx. 5 minutes). The most advantageous option would be to ensure connections with the existing connections of line RE1 Görlitz - Dresden by establishing an accelerated connection between Wroclaw and Görlitz. The use, on both sides of the border, of connections with a limited number of commercial stops, will make it possible to ensure attractive travel times between the most important centres of both regions. A key factor for the success of this organisation of connections will be to ensure electrification in the border section Zgorzelec - Görlitz, which will allow connections to/from Wrocław to be established with electric traction, using rolling stock with a high maximum speed.

Connections in the remaining directions (to Zielona Góra and Jelenia Góra) should run to Görlitz station, where they will provide the shortest possible transfer in the priority connection to/from Dresden. Cyclical regional connections in the remaining directions (to Cottbus, Zittau, Hoyerswerda) will ensure regular travel opportunities with acceptable waiting times at the Görlitz interchange station. This organisation of the connections will allow journeys of any length to be made with a maximum of one change of train at the same place - at the Görlitz interchange station, which is the point of integration of the systems.

8. Analysis of practical examples of cooperation between service providers in cross-border areas in terms of organising public rail transport and cooperation in providing rolling stock for service

There are many examples in Europe of successful cooperation between neighbouring countries in organising cross-border rail links. The examples described below show that rail routes crossing a border do not have to be less well served than those within a single country and that cross-border connections can have a typical regional or even agglomeration character.

Győr - Sopron - Ebenfurth

GySEV (Győr-Sopron-Ebenfurth Vasút, Hungarian Railway Győr - Sopron - Ebenfurth) is a Hungarian-Austrian company that operates railway infrastructure and passenger services in the border regions of both countries - the county Győr-Moson-Sopron and the states of Burgenland and Lower Austria[72]. The company is headquartered in Sopron, and its shares are held by the Hungarian (65.64%), Austrian (28.24%) and Strabag SE (6.12%) governments. The mainline on which it operates is the 120 km Győr - Sopron - Ebenfurth section, and in total the company manages over 500 km of a railway line, mainly in Hungary.

The majority of transport operations are carried out with rolling stock owned by GySEV, with some routes being operated with rolling stock owned by the national railway operators of both countries (MÁV and ÖBB). GySEV also operates services outside its railway network, among others to Bratislava and Budapest.

Liberec - Zittau - Varnsdorf, Liberec - Zittau - Dresden

Liberec is a city in northern Bohemia, located close to the German and Polish borders. The city has 100,000 inhabitants and plays an important regional and administrative role as the capital of the Liberec Region ("Region" is the equivalent of a Polish voivodeship) and the fifth-largest city in the Czech Republic. Liberec station is a five-way railway junction with intensive national regional and interregional traffic. Trains in four directions on the national lines are operated by České Dráhy, on the cross-border line Liberec - Zittau by Die Länderbahn DLB (under the brand name Trilex and Trilex Express).

The services on the route in question are operated on a basic connection between Liberec and Varnsdorf, located in the Ustecky region of the Czech Republic, with transit through Germany. The trains stop at four stations and passenger stops within the Free State of Saxony: Zittau, Mittelherwigsdorf (Sachs), Hainewalde and Großschönau (Sachs). The connection was also in operation before the Czech Republic joined the Schengen Area (in Zittau the train stopped at a separate platform and border clearance took place at the crossing between this platform and the station building).

The basic frequency is 60 minutes, in peak hours there are additional trains with shortened connections increasing the frequency to 30 minutes. At Zittau station passengers can change trains (with a waiting time of approx. 20 minutes) for the RB61 and RE2 services to Dresden.

The direct fast connections of the Trilex Express between Liberec and Dresden fulfil a supplementary function. They function as an extension of the RE2 connection between Zittau and Dresden. Three direct connections of this type are operated on weekdays and at weekends the trains run in a 120-minute cycle with a total of 7 pairs of connections in the full train connection.

[72] Committees and Länder correspond administratively to Polish voivodships.

All services on both lines described are operated by the carrier using its own diesel rolling stock.

Nuremberg - Marktredwitz - Cheb - Hof

Cheb is a town in western Bohemia, in the Karlovy Vary Region, located close to the German border. The town has about 35,000 inhabitants and is an important railway junction in national and cross-border transport. Three sections of the railway network crossing the Czech-German border run out of the town: Cheb - Marktredwitz, Cheb - Aš - Hof and Cheb - Bad Brambach. Also, there are important domestic connections to the west (Karlovy Vary, Usti nad Labem, Prague) and south-west (Plzeň, Prague).

The basis for transport on the lines to Marktredwitz and Hof are passenger trains operated by Die Länderbahn between Marktredwitz - Cheb - Aš - Hof Hbf. The trains run under the Oberpfalzbahn trademark on service line OPB2 with a service frequency of 120 minutes. The operator uses its own diesel rolling stock for this transport line. Within the Czech Republic, trains stop at 8 stations and passenger stops; Czech Railways tickets are valid for journeys between these commercial points.

Nuremberg - Marktredwitz - Cheb fast trains play a supplementary role. The connections are operated by DB Regio and run with a basic frequency of 120 minutes. A total of 5 pairs of connections run per day.

The line Cheb - Bad Brambach is served by passenger trains operated by Die Länderbahn between Zwickau Stadthalle - Bad Brambach - Cheb. The trains run as part of service line RB2 and the framework frequency is 120 minutes. A total of 5 pairs of services are operated per day by the carrier's diesel rolling stock. Within the Czech Republic, trains have scheduled stops at 6 stations and passenger stops; Czech Railways tickets are valid for journeys between these points of sale.

Bratislava - Vienna

The Slovak capital Bratislava (approx. 440,000 inhabitants) and the Austrian capital Vienna (approx. 2 million inhabitants) are located approximately 55 km from each other. The cities are connected by two railway lines, on which connections are run in an agreement between Slovak Railways (ZSKK) and Austrian Railways (ÖBB).

On the line Bratislava Hlavna Stanica - Devínska Nová Ves - Marchegg - Wien Hbf there are 17 pairs of fast trains per day. The basic train frequency is 60 minutes. The rolling stock for the services is supplied jointly, with the ÖBB diesel locomotive carrying wagons owned by both companies.

The second line Bratislava-Petržalka - Kittsee - Wien Hbf is served by 22 pairs of fast trains per day. The frequency is 30 minutes in peak hours and 60 minutes off-peak. The rolling stock for this service is owned by an external company, GySEV, which lends its electric multiple units. As part of this cooperation, some of the trains run in extended connections to Ebenfurth or Deutschkreutz stations.

The operation of these two railway lines, which are de facto independent of each other, shows that cooperation between the Slovak and Austrian sides is very advanced and that both sides, by developing rail transport, in practice promote the interaction of the two agglomerations. The mentioned stations in Bratislava (Hlavna Stanica and Petržalka) are located on two sides of the Danube. The operation of two independent railway lines connecting Bratislava and Vienna caters for the different groups of travellers from Slovakia travelling to the Austrian capital.

Copenhagen - Malmö

Copenhagen is the capital and largest city of Denmark (approx. 1.4 million inhabitants in the metropolitan area). It is located on the Baltic strait of the Sound, on the other side of which lies the Swedish city of Malmö (approx. 320,000 inhabitants). The distance between the urban centres is approximately 40 km.

The cities are connected by road and rail via a bridge over the strait (the fourth longest bridge in Europe and the second-longest with a railway line).

Rail links between the cities are operated through the Öresundståg project, which is an cooperation between the Danish State Railways (DSB) and six Swedish companies that organise and carry out regional transport tasks in Sweden: Blekingetrafiken, Hallandstrafiken, Kalmar länstrafiken, Länstrafiken Kronoberg, Skånetrafiken and Västtrafiken.

The service, operated with electric rolling stock specially purchased for the project, connects several Swedish cities such as Stockholm, Karlskrona, Kalmar, Gothenburg and Helsingborg with Copenhagen. On the Malmö - Copenhagen section, the total service frequency is around 10 minutes and connections are made almost 24 hours a day. This route also provides access to Copenhagen Airport (Københavns Lufthavn), among other destinations.

9. Analysis of experiences to date with the organisation of regional cross-border rail passenger services

The history of cross-border traffic between Lower Silesia and Saxony goes back to the 1950s. In 1959, an agreement between the governments of the Polish People's Republic and the GDR regulated the rules for running traffic on the Hagenwerder - Zgorzelecka Krzewina - Zittau - Porajów route, which crosses the Polish-German border several times. Based on this agreement and the provisions implementing it concluded between the general directorates of PKP and DR, Krzewina Zgorzelecka station became accessible to passengers using German trains running, amongst others, on the Zittau - Görlitz - Cottbus route. Passengers disembarking from German trains at this station crossed the bridge over the Lusatian Neisse to Ostritz under the escort of Polish border guards. Interestingly, at the same time, Polish trains to Bogatynia (these trains crossed German territory but did not stop in the GDR) also stopped at this station.

After the political transformation, the Krzewina - Ostritz border crossing was covered by the local border traffic regime and was closed in 2007, when Poland joined the Schengen area. In the meantime, passenger traffic to Bogatynia was eliminated in 2000 and since then only German trains stop at Krzewina Zgorzelecka station. This is the only situation in Poland, apart from Świnoujście Centrum station (not connected to PKP PLK network), where foreign trains, not connected in any way by offer and not connected with trains run by Polish operators, stop at a railway station on Polish territory.

The railway route through Zgorzelec/Görlitz is crucial for the cross-border traffic between Saxony and Lower Silesia. In 1945, the railway bridge over the Lusatian Neisse was blown up by the retreating German army. The rebuilt crossing was opened in 1957, but due to the new political situation and the restrictions on travel abroad for citizens of both the People's Republic of Poland and the GDR, no regional connections were established. Until the end of the People's Republic of Poland, only long-distance trains ran along this route, connecting Warsaw and Katowice with Leipzig and Berlin. Long-distance trains via Zgorzelec were suspended in the 1990s.

At the beginning of the 1990s, the first substitute for a cross-border connection was established: the Wrocław - Dresden train. At first, these were trains with compulsory reservation, later with optional reservation. This was not an attractive offer for travellers, as the trains were operated - also in the case of domestic connections - at an express tariff, and in the case of cross-border journeys: at an international PKP tariff, which was expensive and analogous to the tariffs for long-distance international connections, valid, among others, between Warsaw and the capital cities. After the split of the state-owned PKP enterprise, these trains were operated on the Polish side by PKP Przewozy Regionalne (under the InterRegio brand). They ran until 2005, and then their service was reduced to the section Wrocław - Görlitz, at the same time changing the status of some connections (from fast to passenger, stopping at all stations and stops).

One of the significant barriers to the development of cross-border connections on this route was - and still is - the lack of electrification of the border section (Węgliniec - Görlitz - Dresden; electrification of the Węgliniec - Zgorzelec section was completed in 2018). For this reason, the connections were operated for many years by wagon trains (which often harmed the quality of the service, while increasing operating costs). An additional negative factor was the necessity to change the locomotive from electric to diesel in Zgorzelec and again to a German locomotive in Görlitz. Around the year 2000 discussions were held between the PKP and DB directors regarding the possibility of Polish SU46 diesel locomotives operating direct services to Dresden (and, similarly, German 232/234 locomotives to Węgliniec). However these talks were not successful, and the SU46 diesel locomotives only served the section up to Görlitz station (the permission to enter Görlitz concerned only a fragment of the station). Interestingly - in parallel, long-distance trains (PKP Intercity) running in the first decade of the 21st century via Zary, Forst, were served by SU46 locomotives on the Legnica - Cottbus section (and not just to the border station of Forst).

The direct rail link between Wroclaw and Dresden was reactivated in 2009 as part of the EU project "Neighbour: Concept of Integrated Transport for the Upper Lusatia - Lower Silesia Region" with a view to its subsequent commercialisation. On the Polish side, the organiser was the minister responsible for transport, on the German side - the Transport Federation Upper-Lusatia - Lower-Silesia (ZVON). In 2012, the financing of these routes was taken over on the Polish side by the Lower Silesian Voivodeship. This decision resulted, on the one hand, from the entry into force of the Act of 16 December 2010 on public collective transport, under which provincial governments became responsible for the organisation (and financing) of cross-border rail services as well, and on the other hand, from a lack of interest on the part of carriers in operating these services on a commercial basis.

These trains were operated with German diesel multiple units (Siemens Desiro 642), which were approved for operation on the PKP PLK network. The operator was still Przewozy Regionalne (and on the German side: Deutsche Bahn DB), 3 pairs of accelerated trains were run, still at a slightly more expensive tariff (Regio Express) than passenger trains.

In March 2015, the Polish side decided to abandon the launch of these connections, which was primarily related to falling attendance (the ongoing modernisation of the E30 trunk line meant that the difference in journey times between passenger trains and Regio Express was small, and the latter was also disadvantaged by the more expensive fare) and, at the same time, the lack of consent from ZVON to modify the offer (increasing the number of stops or changing the ticket price).

The services were reactivated in December 2015. The new contract was concluded for 3 years, at which time there was a change of carriers: on the Polish side, it became Koleje Dolnośląskie KD, on the German side it was the private carrier Die Länderbahn (DLB), which rented rolling stock from DB Regio to operate the service (these were the same Siemens Desiro vehicles that, before the suspension of the service, DB used independently). The connections in the new offer differed from the previous ones from what the Polish side postulated before the suspension: a change of the stop network (trains still had the status of accelerated, but had more stops: e.g. in Chojnów, Bolesławiec, Środa Śląska) and unification of tariffs (ticket prices in trains to Dresden on the domestic section became identical as in other KD trains).

DLB's 3-year contract for the lease of rolling stock was not renewed, which also meant that the direct Wrocław - Dresden trains were again terminated in December 2018. This was due, on the one hand, to the increasing lease rates for rolling stock expected by DB, as well as to the rapidly increasing number of KD travellers in the Wrocław conurbation area and on the Wrocław - Legnica section: the limited capacity of the German diesel multiple units was not a sufficient response to the growing demand on this section.

Instead, from December 2018, for one year, the German side temporarily launched 2 pairs of Dresden - Węgliniec trains, connected with trains to and from Wrocław, operated by electric trains (EZT) of the KD Company; formally the operator of Dresden - Węgliniec trains on the Polish side was also KD. From December 2019, following the commissioning of the electrification of the Węgliniec - Zgorzelec section, the form of cooperation was changed: DLB has since been running trains between Zgorzelec and Dresden, which are connected in Zgorzelec with trains to and from Wrocław (direct to or, in individual cases, with the need to change trains in Węgliniec). In the 2020-2021 annual timetable, 6-8 pairs of direct trains per day Zgorzelec - Węgliniec are planned (depending on the day of the week).

Formally, tickets for the section Zgorzelec - Görlitz are free of charge, so that the problem of revenue settlement between the operators does not arise, but the costs are shared between KD and DLB (also for the connection Jelenia Góra - Görlitz, which is discussed further on). DLB pays for the German section and KD for the Polish section (access to infrastructure, station fees). Rolling stock and fuel issues are not settled. DLB pays KD for the fact that Polish drivers operate the border section (this was also the case in the past when direct Dresden - Wroclaw trains ran: Polish drivers operated Siemens Desiro vehicles on the Görlitz - Wroclaw section).

The existing offer of connections between Lower Silesia and Saxony is complemented by trains operated by Polish diesel multiple units, running on the routes Jelenia Góra - Lubań Śląski - Zgorzelec - Görlitz (operator: Koleje Dolnośląskie) and Zielona Góra - Węgliniec - Zgorzelec - Görlitz (operator: Polregio, former

Przewozy Regionalne). Such relations have been implemented since 2015, the formal operator on the German side is also DLB.

Serving the above-mentioned relation by Polregio, results from the fact of dividing transport tasks between KD and Polregio in the scope of connections between Lower Silesian and Lubusz Voivodeships, which is a reflection of agreements signed between the voivodeships. The logic of running Polregio trains to Görlitz is also such, that in Węgliniec there is guaranteed connection between KD trains in Wrocław - Lubań Śląski relation and Polregio trains in Zielona Góra - Görlitz relation. Polregio and KD honour each other's tickets on the jointly operated section (Węgliniec - Zgorzelec/Görlitz), so from the passenger's point of view, it is irrelevant that this section is operated by more than one operator.

In total, taking into account all supported directions, the number of trains between Zgorzelec and Görlitz stations in the 2020-2021 timetable will amount to 23 pairs daily. This is a very extensive offer, especially considering the standard of rail transport services in most Polish regions. Despite this, it should be pointed out that cooperation is characterised by some problems. The main ones include such issues as:

- The problem of the lack of electrification of the border section and the unresolved problem of how to implement this investment for years (different approaches of the Polish and German sides: the problem described above);
- Ongoing problems with the operation of trains in the border section (a quite common cancellation of trains by DLB on the Görlitz - Zgorzelec section, often without prior notice) and in the Zgorzelec - Węgliniec section (frequent changes to timetables by PKP PLK as a result of track closures, resulting in loss of connections, especially with DLB trains in Zgorzelec);
- Many formal restrictions related to the entry of Polish vehicles into Görlitz:
    - The granting of permission for Polish diesel multiple units to enter Görlitz station was preceded by several years of prior formalities;
    - There is a requirement for two drivers with certified German language skills to operate the vehicle;
    - Only one vehicle from Poland is allowed to stay in Görlitz, which means that multiple technical journeys have to be made between Görlitz and Zgorzelec; the German side also does not agree to a vehicle from Poland staying for a longer period (which means, for example, that if the time between arrival in Görlitz and the return journey is e.g. 1 hour, there still has to be a technical journey to Zgorzelec and a return journey to Görlitz in between). The limitations in this regard are primarily due to the lack of compatibility between the Polish and German train driver control systems (PZB and SHP).

Poland is treating the current solution - interchanges in Zgorzelec - as temporary. The target plan is to electrify the entire section between Zgorzelec - Görlitz - Dresden, but the German side is currently declaring that the planning for the electrification of the section between Görlitz and Zgorzelec will only start in 2029.

To be able to extend the train journey from Wroclaw - Zgorzelec to Görlitz and to increase the role of Görlitz as a cross-border regional interchange, it is necessary to electrify at least two tracks at one island platform in Görlitz station and at least one buffer track, in the Polish power supply standard (3 kV, direct current), with power supply from the substation in Zgorzelec.

The issue of electrification of the border section has been protracted for many years, among other reasons due to the lack of agreement between the Polish and German sides regarding the future location of the power supply system interface (the German railway uses 15kV/ 16.7 Hz alternating current). However, there now seems to be a chance of reaching an agreement, as expected by the Polish side. The German

railway infrastructure manager (DB Netz AG) has commissioned investment documentation for the electrification of the border section using direct current and a substation in Zgorzelec.

10. Conclusions of the analyses carried out and recommendations for the desired model of cooperation in organising cross-border passenger connections

The idea of creating an interchange in Görlitz as an "integrating" point of the Polish and German transport system is optimal from the Polish side (which is described in detail in chapters 7 and 9). Electrification of only about 800 m of the border section (between Görlitz and Zgorzelec stations) is a feasible project in the short term, especially if no new substations have to be built (on the occasion of the electrification of the Węgliniec - Zgorzelec section, a new substation was built in Zgorzelec which is also able to serve the border section without additional investments).

The realisation of this investment will enable the creation of an efficient interchange in Görlitz which will guarantee connections - at a frequency of every 60 or 120 minutes (depending on the time of day) - to Dresden, Zittau and Cottbus from primarily Wroc³aw, but also Jelenia Góra (and possibly Szklarska Poręba). Although transfers are always to some extent necessary for the passenger, on the other hand, it is not possible to establish direct connections on all of the above-mentioned routes with a high, satisfactory frequency. In this context, the guarantee of connections in Görlitz with a relatively high frequency is a more attractive solution. This also coincides with the long-standing rail transport policy of the Lower Silesian Voivodship Self-Government to increase the role of interchange stations in parallel to increase the number of direct connections to collectively increase the available number of connections between individual centres. This applies, for example, to such stations as:

- Jelenia Góra: transfers from Wrocław towards, among others, Gryfów Śląski (and in the future, after completion of the planned investments, also towards, among others, Kowary, Karpacz and Lwówek Śląski);
- Jaworzyna Śląska: transfers from the direction of Wrocław towards, among others, Świdnica, Dzierżoniów and Bielawa;
- Węgliniec: transfers from Wrocław towards, among others, Lubań Śląski.
-

The idea of creating an interchange in Görlitz is from the point of view of the Local Government of the Lower Silesian Voivodship not only much more realistic but also much more favourable in terms of financial possibilities. Striving for the reopening of direct connections between Wroclaw and Dresden (considering the limited supply of the currently available rolling stock - Siemens Desiro) will require very costly investments in rolling stock - and in rolling stock designed practically only for cross-border connections. Additionally, if - due to the specific nature of the infrastructure on the Polish and German sides - the rolling stock is technologically complicated (e.g. fuelled with hydrogen), this will drastically increase investment costs, including investments in rolling stock facilities.

Given this, the launch of a direct service between Wroclaw and Dresden is primarily associated with the following risks:

- Very high investment and operating costs;
- Expected low profitability of connections (especially if we return to the idea of starting these connections in the logic of accelerated trains, and de facto fast trains, with a very rare net of stops and a higher tariff, not linked to the basic tariff of the Lower Silesian Railways - a risk of low use of trains on national routes);
- Expected procedural problems (difficult to resolve issues such as homologation of vehicles; agreement on whose side the obligation to purchase the rolling stock and its maintenance as well as covering the

deficit will lie); given experience with, inter alia, problems with agreeing with the entry of Polish vehicles to Görlitz, such arrangements may even take many years.

It follows from the above that while launching direct connections further into Germany (then to Görlitz) will be a very big organisational and financial challenge for the Polish side, striving for the creation of an interchange in Görlitz will be a logical development of the existing offer at practically no operating cost (extending by a few hundred metres the existing train connections which currently end in Zgorzelec) and very little investment cost. The creation of an interchange in Görlitz will facilitate cooperation between the Polish and German sides, as this cooperation will be based on the assumption that "each pays its way“ and the electrification of the border section will consume considerably lower expenditures than the purchase of a single-vehicle for the direct connections between Wroclaw and Dresden.

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