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The planned TEN-T railway corridor "Baltic Sea - Black Sea - Aegean Sea" as an opportunity for economic development of Eastern Poland

Abstract: The article describes the basic requirements for the railway infrastructure of the comprehensive, extended core and core TEN-T network resulting from the draft of a new regulation of the European Parliament and of the Council (EU) on this matter. Then, the proposed TEN-T corridor “Baltic Sea – Black Sea – Aegean” is presented, which route is to lead largely through eastern and south-eastern Poland. This corridor, along with its considered link with the “Rail Baltica” route, fits well with the concept of the so-called eastern main line. The condition for creation of the corridor and the link is to ensure technical and operational parameters in accordance with the TEN-T requirements on the sections of railway lines included in their route, therefore the article assesses, what scope of investment works is related to the achievement of this goal and what adjustments and optimization measures should be considered. The creation of the corridor with the link may increase the transport accessibility of Polish regions located within their range of influence, and thus contribute to the economic development of these regions.

Key words: accessibility, railway infrastructure

Introduction

The subject of the article is the characteristics of the proposed technical requirements for the railway component of the trans-European TEN-T transport network resulting from the draft of new regulations of the European Parliament and the Council (EU) on this matter. Then the presentation of the official proposal of the Polish section of the new core or core network corridor extended "Baltic Sea - Black Sea - Aegean Sea" and the considered connector of this corridor with the "Rail Baltica". The course of the hall and the connector was subjected to a general technical and functional assessment by the authors, based on which the necessary corrections or optimization measures were indicated. The article also shows the scope of investment activities that will result from the implementation of the new corridor concept.

Characteristics of new requirements for the TEN-T network

The most significant change resulting from the content of the draft Regulation (EU) of the European Parliament and the Council on Union guidelines for the development of the trans-European transport network, replacing Regulation (EU) 2021/1153 and Regulation (EU) No 913/2010 and repealing Regulation (EU) 1315/2013 is to replace the current two-phase division of the TEN-T network (comprehensive network and core network) with a new three-phase division (extensive network, extended core network, and core network). Implementation of the stages ("milestones") is to take place on the following dates:

- obtaining a complete core network - December 31, 2030,
- obtaining a complete extended core network - December 31, 2040,
- obtaining a complete comprehensive network - December 31, 2050.

Meeting the assumed deadlines will be possible provided that the structure of the TEN-T network is planned with a consistent and transparent methodological approach, i.e. proper assignment of individual sections of transport routes to the core, core extended or comprehensive network, taking into account transport and urban nodes as points connecting long-distance traffic with regional and local transport networks. The comprehensive network is to consist of all existing and planned TEN-T transport infrastructure, as well as measures to promote efficient and socially and environmentally sustainable use of the infrastructure. On the other hand, those parts of the TEN-T network that will be developed as a priority to achieve its development goals will be included in the core network or the extended core network.

The draft regulation characterizes the technical requirements for the railway infrastructure of the individual stages of the TEN-T network, indicates the deadlines for their implementation, and defines the conditions for obtaining derogations. The most important requirements are presented in Table **1.**

Tab. 1. Requirements for the railway infrastructure of the comprehensive, core extended, and core network

Requirements	Comprehensive network	Extended core network		Core network	
		Passenger	Freight	Passenger	Freight
electrification (to the extent required)	31.12.2050	31.12.2040	31.12.2040	31.12.2030	31.12.2030
construction of new lines with a width of only **1435 mm** (with exceptions)	31.12.2050	31.12.2040	31.12.2040	31.12.2030	31.12.2030
adaptation to axle loads of **22.5 t**	31.12.2050	31.12.2050	31.12.2040	31.12.2040	31.12.2030
adaptation to the traffic of freight trains with a length of at least **740 m** (with the fulfillment of the required conditions in the operational scope)	31.12.2050	31.12.2050	31.12.2040	31.12.2050	31.12.2030
ensuring the **P400** standard in combined transport	31.12.2050	31.12.2050	31.12.2040	31.12.2050	31.12.2040
ensuring a minimum operating speed of **100 km/h for freight trains**	–	–	31.12.2040	–	31.12.2030

Requirements	Comprehensive network	Extended core network		Core network	
		Passenger	Freight	Passenger	Freight
ensuring a minimum operating speed of **160 km/h for passenger trains**	–	31.12.2040	–	31.12.2030	–
ERTMS implementation	31.12.2040	31.12.2040	31.12.2040	31.12.2030	31.12.2030
implementation of **ERTMS based on radio transmission**	31.12.2050	31.12.2050	31.12.2050	31.12.2050	31.12.2050
decommissioning of Class B systems	31.12.2040	31.12.2040	31.12.2040	31.12.2040	31.12.2040

Source: Own elaboration based on the draft regulation

As for the requirement to adapt the gauge of railway structures to code P400, it means that they should be adapted to carry combined transport load units with a maximum code of P400 (maximum load height 4330 mm, width 2600 mm). Thus, on the railway lines included in the TEN-T network, the GC structure gauge should be ensured (according to the PN-EN 15293-3 standard).

Characteristics of the planned TEN-T core network corridor "Baltic Sea - Black Sea - Aegean Sea"

Passenger Corridor

The planned passenger corridor of the TEN-T core network "Baltic Sea - Black Sea - Aegean Sea" (Figure **1**) with a length of approx. 995 km is to connect the Tri-City agglomeration with the Polish-Slovak border near Muszyna. Its first section runs from Gdynia Główna to Warszawa Praga via the E-65 main road. From there, it is assumed to travel via Warszawa Wschodnia Towarowa to the Warszawa Rembertów station (i.e. bypassing the Warszawa Wschodnia passenger station) and continue through Łuków and Lublin Północny to Lublin Główny. From Lublin, the corridor was routed through the Central Industrial District (i.e. through Kraśnik, the link Charzewice – Stalowa Wola Rozwadów Towarowy, Tarnobrzeg, and Kolbuszowa) to Rzeszów, using the potential of the recently electrified sections of railway lines No. 68 and 71. From Rzeszów Główny, the corridor to Tarnów is planned, and then along the Podgórze and Mountain railway line No. 96 to the state border with the Slovak Republic.

1. The planned passenger corridor of the TEN-T core network "Baltic Sea - Black Sea - Aegean Sea" (drawing by Andrzej Soczówka)

The railway lines included in the corridor are electrified with 3 kV direct current, except for line No. 30 Łuków – Lublin Północny, which is not electrified.

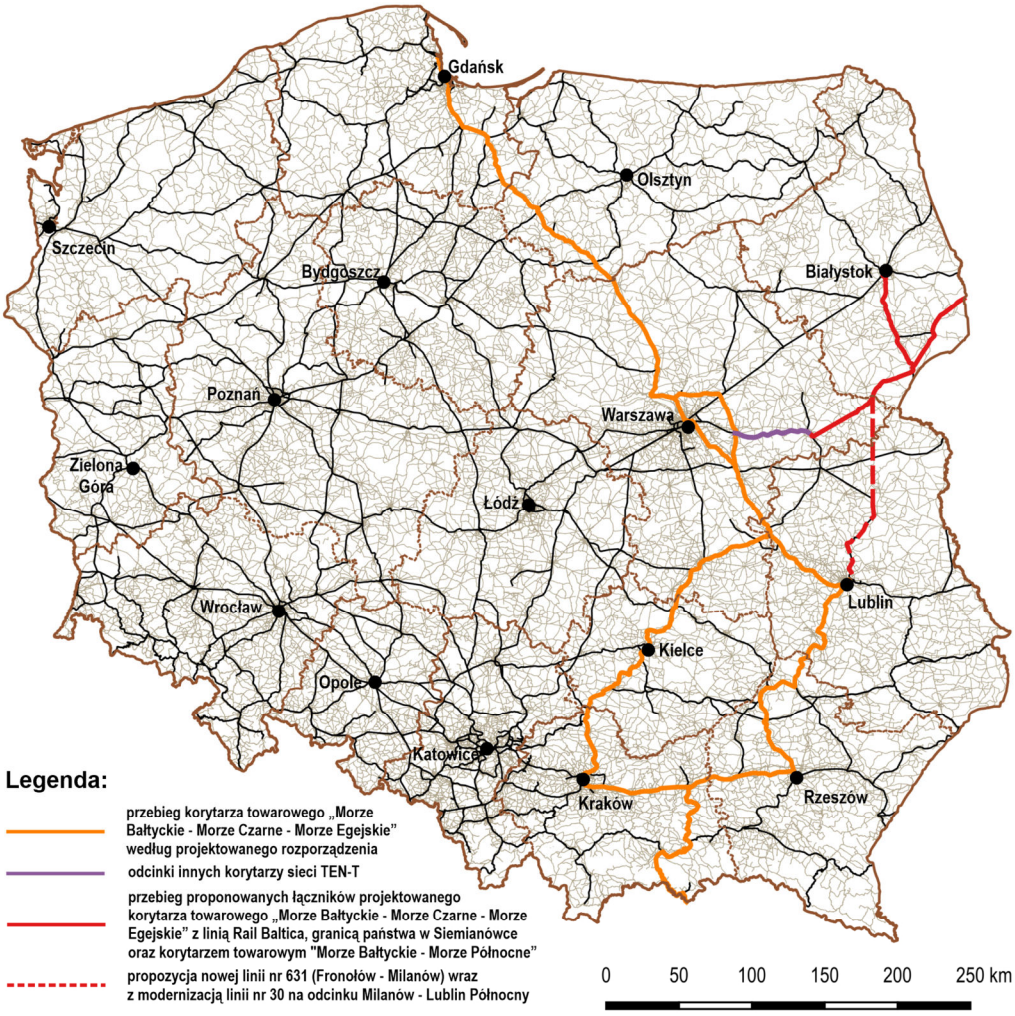
The capacity of the designed corridor is limited by single-track sections, i.e. Łuków – Lublin Północny (railway line No. 30), Lublin Zemborzyce – Charzewice – Stalowa Wola Rozwadów Towarowy (railway lines No. 68 and 565), Grębów – Sobów – Ocice – Rzeszów Główny (railway lines 74, 25 and 71), as well as Tarnów - Stróże and Nowy Sącz - State Border (Leluchów) along the railway line No. 96. Their total length is approx. 449 km, which is approx. 45% of the total length of the passenger corridor.

Some sections of railway lines on the territory of Poland proposed for inclusion in the route of the planned passenger corridor "Baltic Sea - Black Sea - Aegean Sea" are already elements of the existing core and comprehensive TEN-T network, including passenger corridors of the core network "North Sea-Baltic Sea" and "Baltic Adriatic".

Freight Corridor

Similarly to the course of the passenger corridor, the freight corridor of the TEN-T core network "Baltic Sea - Black Sea - Aegean Sea" (Figure **2**) with a length of 922 to 957 km, depending on the variant, is to connect the Tri-City ports with the Polish border -Slovak near Muszyna. The first section of the corridor is to lead from Gdynia Główna to Chotomów via the E-65 main road, with an additional branch Gdańsk Port Północny - Pruszcz Gdański. At

the Chotomów junction post, it is assumed that the corridor will be divided into two variants. The first one bypasses the Warsaw junction and leads to the Pilawa station along the system of ring railway lines through Legionowo Piaski, Radzymin, Krusze, and Grzebowilk. The second variant assumes servicing the Warsaw Praga marshaling yard and then passing through Warszawa Rembertów, Warszawa Wawer, and Otwock to connect with the first variant in Pilawa. From Pilawa to Dęblin, a uniform course of the corridor was adopted, and from Dęblin - a new division into two completely different variants, leading through different routes to Tarnów. The first variant provides for routing the corridor through Radom, Kielce, Kraków Główny, and Bochnia. The course of the freight corridor in the second variant coincides with the passenger corridor, namely, it runs through Lublin Główny, Kraśnik, the link Charzewice - Stalowa Wola Rozwadów Towarowy, Tarnobrzeg and Kolbuszowa to Rzeszów, and from there to the connection with the first variant in Tarnów. From Tarnów, the freight corridor is to run along the Podgórze and mountain railway line No. 96 with large gradients to the state border with the Slovak Republic.



2. The planned freight corridor of the TEN-T core network "Baltic Sea - Black Sea - Aegean Sea" (drawing by Andrzej Soczówka)

The railway lines included in the corridor are electrified with a 3 kV direct current. The capacity of the designed corridor is limited by single-track sections, i.e. Chotomów - Krusze - Pilawa (railway lines No. 456, 511, 10, and 13), Lublin Zemborzyce - Stalowa Wola Rozwadów Towarowy (railway lines No. 68 and 565), Grębów - Sobów - Ocice - Rzeszów

Główny (railway lines No. 74, 25 and 71), as well as Tarnów – Stróże and Nowy Sącz – State Border (Leluchów) along railway line No. 96. Their total length is approx. 343-430 km, depending on the route variant adopted corridor, which is approximately 36-47% of the total length of the freight corridor.

The main stations serving freight traffic along or near the corridor are the following railway stations: Gdynia Port (port station serving the seaport in Gdynia), Gdańsk Port Północny (port station serving the outer part of the seaport in Gdańsk), Warszawa Praga (marshaling yard), Warszawa Wschodnia Towarowa (shunting yard), Lublin Tatary (marshaling yard in the Lublin junction, formally located outside the proposed route of the corridor), Skarżysko-Kamienna (shunting yard), Kraków Prokocim (marshaling yard) and Tarnów Branch (marshaling yard in the Tarnów junction, formally located outside the proposed corridor).

Some sections of railway lines on the territory of Poland proposed for inclusion in the course of the planned freight corridor "Baltic Sea - Black Sea - Aegean Sea" are already elements of the existing core and comprehensive TEN-T network, including freight corridors of the core network "North Sea-Baltic Sea" and "Baltic Adriatic".

Connector to the "Rail Baltica" string

The officially proposed route of the "Baltic Sea - Black Sea - Aegean Sea" corridor, made available for inspection, among others on the portal of the European Railway Agency (including the TENtec Interactive Map Viewer), includes only the railway lines indicated in chapter 3.1 (passenger traffic) and in chapter 3.2 (freight traffic). Currently, however, it is considered to extend the range of the corridor by building its connector with the "Rail Baltica" route, which would enable the implementation of the concept of the so-called eastern trunk line and allowed the Warsaw junction to be omitted in transit freight transport along the meridian axis. Today, the Warsaw junction is the center of significant traffic of passenger trains of various categories, as well as freight trains. Bypassing the junction from the east could relieve it to some extent, and consequently improve the smoothness of train traffic and the overall functionality of the railway network. In addition, the proposed connector, as well as the entire so-called eastern main road, would be factors that would significantly stimulate the economic activity of the areas of north-eastern and eastern Poland.

Passenger connector

The assumed beginning of the connector would be at the Białystok station, from where it would continue along the railway line No. 32 to the Czeremcha station, and then along the section of railway line No. 31 to the point of contact with the newly designed railway line No. 631 Fronołów - Milanów, where it would split into two branches. The first of them, via the remaining part of the railway line No. 31, would provide a connection with the important junction station of Siedlce, located on the route of the passenger corridor "Baltic Sea - North Sea". The second one, running along the planned railway line through Biała Podlaska to Milanów on railway line No. 30, would ensure the connection with the passenger corridor "Baltic Sea - Black Sea - Aegean Sea" (Fig. 1).

The considered section of railway line No. 32 is single-track with a reserve of land for a second track, while line No. 31 is mostly double-tracked. The number of tracks of the planned railway line No. 631 will depend on the results of transport and traffic analyses, but it can be assumed that it will be at least a single-track line with a reserve of land for a second track. The detailed route of the new line No. 631 will be subject to further design work, therefore the location of the contact points of Fronołów and Milanów may change.

Freight connector

For the freight connector, a similar route is assumed as for the passenger connector but extended to connect the Siemianówka border station, located on the Polish-Belarusian border, with the Czeremcha station along the railway line No. 31 (Fig. 2). A section of the broad-gauge railway line No. 59 connects the Siemianówka station from the Belarusian direction. Between Siemanówka and Czeremcha, railway line No. 31 is single-track, but has a reserve of land that allows - if necessary - to add of a second track.

In addition, to carry out freight transport on railway line No. 30, on the Milanów - Zadębie junction post section, it should also be adapted to the requirements applicable to the freight corridor, and at the Lublin junction itself, the freight corridor should be routed from the Zadębie junction post through the Adampol junction post and the Lublin Tatary station to Lublin Główny station (i.e. from line No. 30 via lines No. 561, 562, and 67 to line No. 68).

Comments on the proposed route of the corridor

Analyzing the officially proposed route of the "Baltic Sea - Black Sea - Aegean Sea" corridor, the authors drew attention to several solutions that should certainly be changed or at least subject to verification and possible optimization.

Correction of the passenger corridor at the Warsaw junction. The proposed passenger corridor bypasses the most important passenger stations in Warsaw, leading through the Warszawa Wschodnia Towarowa shunting station dedicated to freight traffic, not equipped with platforms and other facilities for commercial passenger transport. Therefore, the course of the corridor should be corrected in such a way that it passes through the Warszawa Wschodnia passenger station, located at the junction of railway lines No. 2 and No. 9. At the expense of a slight increase in travel time (necessary change of direction), the conditions for passenger service of the largest urban center in Poland.

The alternative route of the passenger corridor along the section of line No. 7 Warszawa Wschodnia - Lublin Główny. The authors propose to consider - as a co-existing variant on the section from Warsaw to Lublin - the course of the passenger corridor along line No. 7 (through Otwock, Pilawa, Dęblin), where the point of contact with the proposed variant would be located through the stations of Siedlce, Łuków, Parczew, and Lubartów. Railway line No. 7 on the section Otwock – Lublin Główny is modernized and adapted to the speed of 160 km/h and axle loads of 221 kN, and the modernization of the Warsaw exit (Warszawa – Otwock) is just beginning. Lines 7 and 9 form the shortest route connecting the Tri-City via Warsaw with Lublin (the primary urban center of Eastern Poland of supra-regional importance), and further - through modernized lines 68 and 71 - with Rzeszów (the primary urban center in South-Eastern Poland). Due to the favorable technical and operational parameters of the above-mentioned railway lines, this route can also offer high-speed passenger connections in the Tri-City - Warsaw - Lublin - Rzeszów route.

The use of the currently proposed variant by railway line No. 30 is, in turn, more favorable in the context of the construction of a connector with the "Rail Baltica" route, that is, in the concept of the eastern main road, leading on the section under consideration from Białystok to Czeremcha, and further through the planned Fronołów - Biała Podlaska - Milanów line and a fragment of line No. 30 to Lublin, where the "Siedlecki" and "Dęblin" variants would connect.

Extending the scope of the freight corridor at the Tri-City railway junction. At the Tri-City junction, consideration should be given to including railway lines serving the port stations of Gdynia Port (railway line No. 201 on the section Gdynia Port - Gdynia Główna) and Gdańsk Zaspa Towarowa (railway lines No. 249 and 227 on the section Gdańsk Zaspa Towarowa - Gdańsk Główny). This will ensure comprehensive support for all ports.

Correction of the freight corridor at the Krakow junction. In the variant covering the Kraków junction, the freight corridor was routed through Kraków Główny, i.e. a station located in the very center of the city, serving only passenger transport. Therefore, it is necessary to change the route of the freight corridor and run it along an extensive ring line through the Kraków Nowa Huta station, i.e. from line No. 8 along slip road No. 607 with line No. 91 at the Podłęże station. It should be noted that the maximum speed for freight trains on railway line No. 607 is 60 km/h, and for the section of railway line No. 95 under consideration, it is from 30 to 80 km/h. Axle loads are 221 kN (206 kN on line 607).

It is also possible to alternate route the TEN-T freight corridor with a small ring line through Kraków Olsza and Kraków Prokocim Towarowy stations, i.e. from the Kraków Przedmieście junction post on line No. 8 through lines No. 602 and 100 to Kraków Bieżanów station on line No. 91.

The alternative route of the freight corridor along the section of the planned Podłęże – Piekiełko – Nowy Sącz line. According to the authors, it is reasonable to consider an alternative route for the freight corridor "Baltic Sea - Black Sea - Aegean Sea" on the section Podłęże - Nowy Sącz, i.e. not - as in the official proposal - by railway lines No. 91 and 96, but using the planned line Podłęże - Piekiełko – Nowy Sacz. On the one hand, such a change will relieve the intensively used passenger traffic railway line no. Nowy Sącz. An additional advantage of the proposed solution would be a partial relief from freight traffic on line No. 96 on the section Tarnów - Nowy Sącz, which is characterized by a difficult longitudinal profile, especially in the area of the so-called Grybów loop (Stróże – Nowy Sącz).

Correction of the freight corridor at the Lublin junction. The extension of the freight corridor to include sections of railway lines No. 67 Lublin Gł. - Lublin Tatary and 930 Lublin Gł. - Lublin Tatary to connect the Lublin Tatary station to the TEN-T freight corridor. In addition, if a decision is made to create a connector of the "Rail Baltica" route with the "Baltic Sea - Black Sea - Aegean Sea" corridor, lines 561, 562, and 67 should also be brought to the parameters of the corridor on the section p. Zadębie – Lublin Tatary, which will allow for the separation of freight and passenger traffic at the junction.

In addition, the course of the freight corridor should include the currently built slip road, which allows the omission of the Lublin Główny station and direct travel from the direction of Warsaw (railway line No. 7) towards Stalowa Wola (railway line No. 68).

The alternative course of the corridor along the section of line No. 25 Ocice - Dębica. The authors propose to consider an alternative course of the freight corridor along railway line No. 25 on the section Ocice - Mielec - Dębica (and further along line No. 91 following the current proposal). This will make it possible to avoid changing the direction of travel at the Rzeszów Główny or Rzeszów Staroniwa stations and to relieve the railway line No. 71, on which a large share of agglomeration passenger traffic is expected.

Correction of the freight corridor at the Rzeszów junction. According to the authors, the possibility of increasing the range and functionality of the freight corridor at the Rzeszów junction should be analyzed by including the Rzeszów Staroniwa station along with the section Rzeszów Główny - Rzeszów Staroniwa of the railway line No. 106 and the railway line No. 611 Rzeszów Zachodni - Rzeszów Staroniwa. As a result, it will be possible to relieve the transit freight traffic of the Rzeszów Główny station much easier.

Correction of the freight corridor at the Tarnów junction. In order to ensure that the Tarnów station can be bypassed by transit trains without the need to change the direction of travel, it is recommended to include the railway line No. 609 Tarnów Branch - Tarnów Wschód in the course of the freight corridor.

Required investment activities to achieve technical compliance of the designed railway corridor with the new requirements for the TEN-T network

The sections of railway lines to be included in the course of the proposed passenger and freight corridors "Baltic Sea - Black Sea - Aegean Sea" should meet the requirements specified for the TEN-T network in due time (Table **1**).

Electrification. The electrification requirement is already met on all sections of railway lines falling within the scope of the passenger and freight corridor, except for the non-electrified section of line No. 30 Łuków – Lublin Północny (106 km), which is part of the passenger corridor. To meet the requirements for the TEN-T core network, it is, therefore, necessary to electrify this line with a 3 kV DC system.

Permissible axle loads. The condition of the permissible axle load of 221 kN is met on a significant part of the designed passenger and freight corridor. Improvement in this respect is required on sections of railway lines with a total length of approx. 194 km.

Length of freight trains. The requirement to provide at least one station track at each railway station with a usable length of at least 740 m along the considered course of the freight corridor in Poland is currently met at 87 stations in the direction from Gdynia and 84 stations in the direction of Gdynia, with a total of 142 stations. Fulfillment of this requirement at railway stations where it is currently not met involves the modernization of these stations to various extents and, possibly, the extension of the railway area.

Combined transport. The new requirements for railway lines included in the TEN-T network specify the requirements to adapt the structure gauge of these railway lines to code P400. This means that these lines should be adapted to carry combined transport load units with a maximum code of P400. Such requirements mean that the GC structure gauge should be provided on the railway lines included in the TEN-T network (according to the PN-EN 15293-3).

On the considered sections of railway lines falling within the scope of the freight corridor in Poland, the GPL-1 gauge is provided according to the nomenclature of PKP PLK S.A., which meets the requirements of the GB gauge according to the PN-EN 15293-3 standard, with local gauge restrictions.

However, it should be noted that the conditions for combined transport are determined primarily by the codification for intermodal transport. The codification of railway lines for intermodal transport defines the maximum code of an intermodal transport load unit that can be transported on a given section of a given railway line. Code 400 refers to the largest cross-section of currently operated intermodal transport units. It can be assumed that already at present some sections of railway lines falling within the scope of the freight corridor in Poland meet this requirement.

However, in order to precisely determine whether a given section of a given railway line meets the requirements for the P400 code, it is required to codify the railway lines and to assume the GC structure gauge when modernizing the railway lines.

Minimum service speed for freight trains. In the proposed route of the freight corridor, the traffic of freight trains with a maximum speed of at least 100 km/h is possible on sections with a total length of approx. 555 km (approx. 40% of the entire length of the corridor), and with speeds below 100 km/h on sections 841 km (approx. 60% of the length of the entire corridor). To meet the requirements of the TEN-T core network, it is, therefore, necessary to increase the speed limit for freight trains on a large part of the corridor, while also considering the possibility of obtaining derogations from the requirements of the Regulation in situations where it is justified. Examples of such situations are running the corridor through railway junctions where train speeds are limited due to line geometry and existing buildings, or in peripheral areas where limiting operating parameters will not cause bottlenecks. According to rough estimates, it may be necessary to increase the speed of freight trains over a total length

of approx. 680 km and the scope of investment works in each case will depend on the currently existing technical and operational parameters.

Minimum service speed for passenger trains. In the proposed route of the passenger corridor, the traffic of passenger trains with a maximum speed of at least 160 km/h is possible on sections with a total length of approx. 407 km (approx. 41% of the entire corridor length), and with speeds below 160 km/h on sections 587 km (approx. 59% of the entire corridor length). To meet the requirements for the TEN-T core network, it is, therefore, necessary to increase the permissible speed of passenger trains on a large part of the corridor, with the reservation of the possibility of obtaining derogations from these requirements in justified situations (similarly as in the case of freight corridors). According to rough estimates, it may be necessary to increase the speed of passenger trains over a total length of approx. 443 km and the scope of investment works in each case will depend on the currently existing technical and operational parameters.

ERTMS implementation. The scope of ERTMS installation on railway lines in Poland is defined in the National Plan for the Implementation of TSI "Sterowanie" (KPW).

In the proposed route of the passenger and freight corridor, the ERTMS level 2 system is currently equipped with railway line No. 202 on section Gdynia Gł. - Gdańsk Gł., line No. 9 on the section Gdańsk Gł. - Warszawa Praga (Płudy), line No. 456 on the section Chotomów – Warsaw Praga (Płudy) and line No. 511 on the section Legionowo R57 – Legionowo Piaski. The total length of the mentioned sections of the line is approx. 333 km.

In addition, following the KPW, in the years 2023-2050, on the sections of the lines included in the planned passenger corridor, ERTMS level 1 is planned to be installed on a total length of approx. 106 km and level 2 on a total length of approx. the composition of the freight corridor includes the installation of ERTMS level 1 on a total length of approx. 423 km and level 2 on a total length of approx. 400 km

On the remaining sections of the passenger corridor (with a total length of approx. 290 km) and the freight corridor (with a total length of approx. 240 km), no level of ERTMS system is planned. These sections are Łuków – Lublin Północny along railway line No. 30, Lublin Główny – Stalowa Wola Rozwadów Towarowy along railway lines No. 68 and 565, Grębów – Rzeszów Główny along the railway lines No. 74, 25 and 71 and Dęblin – Radom along the railway line No. 26. To ensure compliance with the requirements of the TEN-T network, the National Implementation Plan of the Control-Command and Signaling TSI (KPW) should be supplemented with the sections mentioned.

Required investment activities to achieve technical compliance of the designed connector of the "Rail Baltica" route with the corridor "Baltic Sea - Black Sea - Aegean Sea" with the new requirements for the TEN-T network

In order to determine the necessary actions concerning the connector of the "Rail Baltica" route with the "Baltic Sea - Black Sea - Aegean Sea" corridor, it was assumed that it should comply with the requirements for a regular core network corridor or core TEN-T extended corridor, presented in Table **1**.

Electrification. Sections of the line considered as part of the passenger and freight connector of the "Rail Baltica" route with the "Baltic Sea - Black Sea - Aegean Sea" corridor are mostly non-electrified (approx. 227 km). DC 3 kV.

Permissible axle loads. All existing sections of railway lines included in the potential Białystok/State Border (Siemianówka) – Czeremcha – Fronołów corridor are adapted to the axle loads for locomotives and wagons of 221 kN. No need to undertake additional work in this area.

Length of freight trains. 22 stations and 2 passing loops have been identified on the route of the freight connector under consideration. Currently, at 6 stations there is at least one

station track with a usable length of at least 740 m (at the Niemojki station only in the even direction, i.e. from Czeremcha to Siedlce). The Białystok station is currently being reconstructed and after its modernization, it will also have tracks of usable length, which means that the fulfillment of this requirement at railway stations where it is currently not met involves the modernization of these stations to a different extent and, possibly, the extension of the railway area.

Combined transport. The new requirements for railway lines included in the TEN-T network specify the requirements to adapt the structure gauge of these railway lines to code P400. This means that these railway lines should be adapted to carry combined transport load units with a maximum code of P400.

Minimum service speed for freight trains. On all existing sections of the potential freight link Białystok/State border (Siemianówka) - Czeremcha - Fronołów - Siedlce (railway lines No. 32 and 31) and Milanów - Lublin Główny (a fragment of railway line No. 30, railway lines No. 561, 562 and a fragment of railway line No. 67) the maximum speed for freight trains is 40÷80 km/h. To comply with the requirements for the TEN-T core network, it is recommended to increase the permissible speed of freight trains to 100 km/h on the largest possible part of the connector, and due to its peripheral location in relation to the TEN-T network, economic factors and the possibility of obtaining derogations.

Minimum service speed for passenger trains. On all existing sections of the potential passenger link Białystok - Czeremcha - Fronołów - Siedlce (the entire railway line No. 32 and a fragment of railway line No. 31), the maximum speed for passenger trains (rail buses and EMUs) is 60÷120 km/h. In order to comply with the requirements for the TEN-T core network, it is recommended to increase the permissible speed of passenger trains to 160 km/h on the largest possible part of the connector, however, due to its peripheral location in relation to the TEN-T network, economic factors and the possibility of obtaining derogations.

ERTMS implementation. According to the KPW, the ERTMS system has not been built on the considered route of the connector. In order to ensure compliance with the requirements of the TEN-T network, the National Implementation Plan of the Control-Command and Signaling TSI (KPW) should be supplemented with sections included in the proposed connector.

Summary

This article presents the course of the Polish section of the TEN-T corridor "Baltic Sea - Black Sea - Aegean Sea" proposed in official sources, as well as the concept of the connector leading to this corridor from the "Rail Baltica".

The sections of railway lines included in the proposed route of the passenger and freight corridor and the connector only partially meet the requirements set out for the core or core extended TEN-T network, therefore the implementation of the entire idea will require several investment activities. In the case of passenger traffic, the key measure is to achieve the maximum permissible train speed of 160 km/h on the largest part of the corridor, while for freight traffic the most important factors are the permissible axle loads, station track lengths, and conditions for combined transport. An important requirement for both types of traffic is the widest possible implementation of the ERTMS system.

When planning investment activities within the proposed corridor, technical as well as environmental and economic aspects (investment outlays) should be taken into account, bearing in mind that in certain situations both the existing and the newly drafted regulation regulating the issue of the TEN-T network allows for obtaining derogations from general requirements. Situations justifying derogations may be, for example, the location of the line within a railway junction or in peripheral areas of the TEN-T network, which by definition reduces the effect of the so-called "narrow throat".

In the context of the proposed route of the "Baltic Sea - Black Sea - Aegean Sea" corridor, railway line No. 96 Tarnów - Muszyna, running in foothill and mountain areas, as well as along river valleys, requires the most extensive investment activities. The current geometric layout of this line should be considered unfavorable, and most of the stations and passing passages located on it do not have tracks with a usable length of at least 740 m. both corrections to the geometric layout and the extension of station tracks, which would require the purchase of land and the construction of more engineering facilities. Moreover, in the area of influence of this railway line, there are legally protected areas in terms of the environment. In the article, the authors drew attention to the fact that one of the activities that could optimize the scope of reconstruction of line No. 96 on the section Tarnów - Nowy Sącz is an alternative routing of the freight corridor planned for construction shortly by the Podłęże - Piekiełko - Nowy Sącz railway line.

The issue of separating passenger and freight traffic remains valid also concerning other sections of the planned corridor "Baltic Sea - Black Sea - Aegean Sea", which was raised, for example, in relation to the way of passing through the Lublin junction, or on the example of potentially complementary sections of Ocice – Kolbuszowa – Rzeszów Gł. and Ocice – Mielec – Dębica. Passenger and freight traffic is characterized by different characteristics, therefore, for design and operational reasons - where possible and economically justified - separate routes for them should be sought.