RM-111-163-17

RESOLUTION NO 173/2017

OF THE COUNCIL OF MINISTERS

of 7 November 2017

on the adoption of the Investment Preparation and Implementation Concept: Solidarity Airport – Central Transport Hub for the Republic of Poland

The Council of Ministers adopts the following:

§ 1. The Council of Ministers recognises that it is in line with the Government policy to take measures described in the document entitled *Investment Preparation and Implementation Concept: Solidarity Airport – Central Transport Hub for the Republic of Poland*, hereinafter referred to as "Concept", that constitutes an attachment to this Resolution.

§ 2. The Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland shall be obliged to take measures described in the Concept.

§ 3. The resolution shall enter into force on the day of its adoption.

PRIME MINISTER

BEATA SZYDŁO

Checked for compliance
with legal and editorial terms

Secretary of the Council of Ministers
Jolanta Rusiniak

Director of the Department of the Council of Ministers
Hanka Babińska

Attachment
to Resolution No. 173/2017
of the Council of Ministers
of 7 November 2017

Investment Preparation and Implementation Concept: Solidarity Airport – Central Transport Hub for the Republic of Poland

Warsaw, November 2017

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I. SYNTHESIS

Recommendations outlined in this document focus on its main objective, i.e. the construction and operation of a profitable, innovative transport hub that, on the one hand, will rank among the world's top ten airports and, on the other hand, will result in the creation of a national passenger railway system as an attractive alternative to road transport, while ensuring the sustainable development and integration of Warsaw and Łódź agglomerations.

This objective has been formulated on the basis of the following diagnosis:

First of all, the **development of air traffic based on a hub system may greatly contribute to Poland's economic growth**, first and foremost owing to the bilateral relationship between GDP per capita and the development of the aviation market. For instance: a 10-percentage-point increase in air connectivity of a given market brings about an additional 0.5-percentage-point increase in GDP per capita and an increase in average labour productivity by 0.07 percentage points; each new job in the aviation sector engenders the creation three new jobs in other sectors of economy; every EUR 1 generated in the aviation industry translates into additional EUR 3 in other sectors. The development of air cargo is also very effective (as much as 35% of world trade measured by value and only 0.5% measured by volume is transported by air). In turn, the development of hub traffic is the largest contributor to air traffic growth, in particular in terms of intercontinental traffic. Large hub airports have a positive impact on the economic growth and the labour market of the country: Charles de Gaulle Airport (CDG) provides 195,000 jobs and generates additional EUR 17 billion of the French GDP; Madrid-Barajas Airport (MAD) employs 300,000 people and contributes EUR 15.2 billion to the Spanish GDP. It should be noted that despite the dynamic growth of the aviation market in Poland and in Central Europe, the absence of a transfer hub has limited its development potential. In this respect, Poland is at a particular disadvantage – air connectivity indicator for Poland is 77 percentage points lower than the average for the 15 Member States of the "old" European Union and 27 percentage points lower than the average for Central and Eastern Europe. Given that all prerequisites (geographic, economic etc.) are met, it is particularly difficult to understand why a transportation hub for the CEE region has yet to be established in the vicinity of Warsaw.

Secondly, it has been found that the **Chopin Airport is no longer capable of meeting the demands of the growing aviation market in Poland**. In the period between July 2016 to July 2017, the number of passengers increased by 24.7%. The market is growing rapidly and - given certain impassable environmental restrictions (the limit of 600 operations per day will be reached in 2019/2020) and infrastructural limits (railway tracks, Aleja Krakowska, S79 road and S2 road) - the capacity of the Chopin Airport will soon be saturated.

Thirdly, it has been found that the **Polish rail network in its current form hinders the competitiveness of rail transport**, even though, in principle, it is the most effective means of domestic public transport (especially in Poland, given the direct impact of the railway sector on GNP growth). For historical reasons, Poland has no railway network hubs, which significantly impedes the organization of an efficient transport system. Due to this imperfect configuration of the railway network, road transport prevails over rail transport due to the latter's limited competitiveness. On average, Poles travel by train less than 7 times a year, as compared to 17 in the Czech Republic, 32 in Germany, 71 in Switzerland and over 100 in some countries of the world (e.g. Japan). Regrettably, Poland also ranks high among European countries with the largest number of medium-sized cities without railway access. Approximately one hundred cities with a population of over 10,000 inhabitants - 2.1 million

people in total – are deprived of access to rail services. It is in stark contrast with other countries of the region: in the Czech Republic there is only one such city, in Slovakia - 8, in Hungary - 6 and in Austria - 5. It is observed in major tourist regions (Masuria, Central Pomerania together with the central part of the Pomeranian Lake District, Sudety Mountains, Bieszczady Mountains and Zamość region).

Based on the above diagnosis, the concept of the Central Transport Hub as a transportation hub was adopted. It shall consist of integrated air and railway hubs, effectively integrated into the road network. The Solidarity Airport is to become the centre of an improved rail transport system. The profitability of the planned airport is contingent, on the one hand, on a suitable market environment (organisation of transfer traffic until the opening of the CTH, intercontinental air connections, ensuring a sufficient capacity of Chopin Airport) and, on the other hand, on the highest standards in terms of development opportunities for the new airport (ensuring timeliness, sufficient area of land earmarked for the project, convenient public transport connections with Warsaw agglomeration, etc.). The competitiveness of the railway system depends on ensuring access to Poland's largest cities within 2-2.5 hours and on the increase of both the commercial speed of trains and the number of passengers.

Authors of the document assumed that a portion of analyses had already been carried out. They may only need updating. Both in terms of the capacity of the first CTH module and the location for the port, the study was based on earlier analyses (given that no changes had occurred that would justify rejecting them). Maximum amounts specified in the latest studies have been cautiously adopted (provided that it is easier to reduce the scope of investment than to expand it), i.e. the capacity of 45 million passengers per year and approx. 3,000 ha of land (based on the assumption that the target CTH throughput may exceed 100 million passengers). Results of previous analyses were also applied for the selection of port location, with the following requirement: the possibility of integrating air and rail traffic into a single hub (this limited the number of locations to Międzyborów-Jaktorów, Skierniewice, Koluszki, Łowicz and Stanisławów in the municipality of Baranów), as well as the possibility of providing the necessary area of land for investment (which effectively reduced the selection to Stanisławów). The proximity of Warsaw was an auxiliary criterion (another factor that speaks in favour of Stanisławów). Finally, the two locations nearest to Warsaw, i.e. Międzyborów-Jaktorów and Stanisławów, as well as locations explored in recent studies (Babsk and Mszczonów) were analysed from the point of view of environmental protection. Analyses seem to point to Stanisławów (Baranów commune) as the optimum location.

The system of railway network extension, recommended in the document, is an important novelty. Investments into the construction of new railway lines shall not lead to the creation of a new and autonomous subsystem of transport, but rather complement the existing railway network. The initial stage (a prerequisite for the CTH) would require the construction of a hub and direct connectors enabling quick access to and departure from the hub via north-south and east-west railway lines operated by interregional, regional and suburban trains. The document also outlines potential scenarios for a further development of the railway network, some of which could be put into place prior to the completion of the Solidarity Airport.

In terms of road investments, the concept assumes the reconstruction of the A2 motorway, as well as the construction of Warsaw Ring Road provided for in the National Spatial Development Concept 2030; in the minimum option, the construction of a 65 km section connecting DK 92 (Sochaczew node) - CTH node on A2 motorway - S8 expressway - S7 expressway (Grójec node); in the maximum option, (ensuring easy access to CTH and redirecting lorry traffic around Warsaw), the construction of sections with a total length of 248 km, connecting Grójec (S8) - Kołbiel (S17 node) - Mińsk Mazowiecki (A2 node) and Sochaczew - Wyszogród - Zakroczym - Serock - Wyszków. It should be emphasized that the entire ring road does not need to meet the A standard.

In terms of investments aimed at the integration of Warsaw and Łódź, the concept provides for the creation of legal and infrastructural opportunities to locate a new city in the vicinity of Solidarity Airport, including, for example, business parks, a world-class exhibition and congress centre for the region of Central Europe, conference centres, office and administrative buildings, or, for instance, a joint campus created by the federation of Polish universities. The concept also encompassed the implementation of development programmes related to important national heritage sites or revitalization projects in nearby urban areas (e.g. in Łódź).

The implementation of the above concept would require taking immediate action, including:

- **adoption of a multiannual programme** (ensuring the necessary level of budgetary financing) **and taking necessary steps in order to obtain EU funding**;
- **preparation of the Chopin Airport for the transfer of passenger traffic to the Central Transport Hub, while taking necessary steps to ensure the former's sufficient capacity until 2027** (including, *inter alia*, administrative division of airport traffic, necessary investments, banning night operations, introducing the Quota Count during the day etc.);
- **adoption of a law supporting the investment process** that would introduce procedural improvements (e.g. combining environmental and localization procedures, adopting the so-called boundary envelope design, possible extension of the scope of special procedures specified in the law onto associated investments), anti-speculation (ensuring the pre-emption right, provided for in other acts regulating public investments, to entities implementing the investment, mechanisms allowing Poland to benefit economically from this public investment), planning (related to the location of the new city), political (empowering a Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland) and regulatory (supporting the development of the aviation market);
- **initiation of environmental procedures** aimed at obtaining enforceable, legally binding environmental and location decisions.

The cost of the aviation component is estimated at PLN 16-19 billion (evaluated on the basis of the cost of constructing comparable airports in other parts of the world), the rail component at PLN 8-9 billion (based on the estimates presented in the *Feasibility study of the construction of a high-speed railway line "Warsaw - Łódź – Poznań/Wrocław"*), the road component between PLN 1.75 billion (if 65 km of roads are constructed) and PLN 6.87 billion (if Warsaw Ring Road is extended; based on the estimates of the General Directorate for National Roads and Highways). In total, the implementation of the basic assumptions outlined in this document (in their widest scope) should, therefore, cost between PLN 30.9 and PLN 34.9 billion. Due to the diversity of individual components, a different strategy for obtaining financing may be considered for each of them; therefore, at the present stage, it is not deemed advisable to specify the exact manner in which they should be obtained. According to adopted schedules, the primary investment process should be completed by 2027, provided that individual investment projects are carried out simultaneously. However, it should be noted that some of the measures referred to in this document might require a strategic environmental impact assessment. Environmental procedures may result in delays.

II. INTRODUCTION

A. DEFINITIONS, ABBREVIATIONS AND ACRONYMS

1. HUB-AND-SPOKE SYSTEM

H&S system. In order to understand the essence of the presented concept, it is crucial to explain the principles of the hub-and-spoke system. Thus: The hub-and-spoke model requires a transport hub and radial transport lines (spokes) that join it. Transport within this system takes place first to the transportation hub, and then from the hub to a selected destination. The hub transport model is often used in transport and logistics as an alternative to the point-to-point system, based on direct connection between start and end points. From the point of view of a passenger, the advantage of the system is the ease and intuitiveness of travel planning.

H&S in air transport. In air transport, the H&S system is also referred to as *hubbing* (according to IATA, ICAO, see: Compendium of international Civil Aviation, IATA 2nd edition 1998/99, Manual on the regulation of International Air Transport 3rd edition 2016). Optimization of the H&S system is manifested in the shortening of the time between the arrival to the hub and departure from it. Thus, a passenger arriving from any point can get an air connection to a great number of destinations. The strength of this air transport system lies in the possibility of transporting passengers traveling from many cities in a single aircraft, offering connections on routes that would otherwise not be profitable. The H&S system enables arrivals and departures from/to different points (spokes) at the hub, minimizing the connection time. The largest hubs in the world are Atlanta-Hartsfield-Jackson in the US with 104.2 million passengers (2016), Dubai (83.6 million passengers), London Heathrow (71 million passengers) and Hong Kong (68.1 million passengers). The potential generated by a hub airport is well illustrated by the Finnish airport of Helsinki-Vantaa, with a total of 17 million passengers in 2016 (of which 14 million were foreign passengers), which is three times more than the population of Finland and 11 times more than the population of Helsinki.

H&S in railway. The H&S system is also used in rail transport, where it reduces the use of rolling stock, energy consumption, environmental burden and transport costs. The H&S system is popular mainly in countries with a regular shape and a strong centre located in the middle part of the country (usually the former capital of a monarchy), for instance in France and Spain. In France, Paris is the TGV hub (due to the layout of the main Paris train stations, there is no single station for all trains of this type). In Spain, the Ave high-speed train system is also based on the hub-and-spoke model, and the hub for all high-speed transport within Spain is the Puerta de atocha station in Madrid. In Poland, the IC/EIC express system also operates according to this model, with Warsaw Central Station as its hub. Communication systems based on the hub-and-spoke model are also typical of regional rail transport, especially in regions with strong urban centres (for example, in Mazovia, Greater Poland, Lower Silesia, Lesser Poland).

2. GLOSSARY

- **Central Rail Line** - railway line No. 4, with a total length of 223,833 km, connecting Grodzisk Mazowiecki with Zawiercie. It was built in 1971-1977 and is one of the most important main railway lines in Poland (source: MTBiGM 2013)
- **Connectivity** - **hub connectivity** – indicator specifying the number of air connections of an airport providing hub connections that enable transfers, which are served by the airport in question, taking into account the minimum and maximum transfer times, and the quality of these connections weighted as actual travel time and connection time - Business connectivity (source: PPL)
- **connectivity** - a synthetic indicator describing the number of available direct and indirect air connections, taking into account their quality measured as the duration of travel

- **connectivity per capita** - connectivity indicator per inhabitant
- **H&S** – hub-and-spoke system
- **hub** - transport node
- **Intermodality** - the capacity of a means of transport to operate satisfactorily in different environments (road, rail, water), eliminating or limiting defects and weaknesses of traditional combined and intermodal transport systems (source: MTBiGM 2013)
- **High-speed rail** (HSR) - a subsystem of passenger rail transport characterized by significantly higher commercial speeds of travel compared to other types of transport, i.e. in principle equal to or greater than 200 or 250 km/h (cf. Annex I to Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the community (OJ L 191 of 18.7.2008, p. 1, as amended)
- **Great circle (orthodrome)** - the shortest route between two points on the surface of the Earth. This line is always a fragment of a large circle. The orthodrome is the point of intersection of the sphere with a plane passing through two points on its surface and through the centre of the sphere. In geographical terms, Poland is located at the interconnection of transcontinental communication routes between Asia, Western Europe and North America (at the point of intersection of the globe with a plane - orthodrome), characterized by the shortest distance of a long-haul connection, and thus generating lowest travel costs. (source: PPL)
- **long-haul** - long-distance connections
- **Megalopolis** – large, polycentric settlement system, strongly urbanized, functionally and communicatively connected and consisting of several agglomerations with a total population of over 20 million inhabitants (the term was first used by Jean Gottmann, *Megalopolis: The Urbanized Northeastern Seaboard of the United States*, The Twentieth Century Fund, New York 1961, p. 3 with respect to the "Supercity" on the North-West coast of the US, with a total population of 49 million and an area of 130,000 km^2)
- **Central Metropolis** - metropolitan area located in central Poland, whose core are the agglomerations of Warsaw and Łódź; it has the potential of becoming a global metropolis with a population of 45 million.
- **Southern Metropolis** - metropolitan area in southern Poland, whose core are the agglomerations of Kraków and Upper Silesia, including Bielsko-Biała, Rybnik and Moravian-Silesian agglomerations; potentially, it is a global metropolis with a population of 7-8 million inhabitants.
- **Catchment area** - the zone of influence of a given airport, understood as its ability to attract visitors and passengers. It depends on the population of the nearby area and the capacity of land transport. (source: European Court of Auditors)
- **P2P** - point-to-point model – network connection model
- **O&D passengers** - passengers arriving at or departing from a specific airport (number of passengers, excluding passengers who remain on the plane in order to reach another destination)
- **PPL** - Przedsiębiorstwo Państwowe "Porty Lotnicze" (Polish Airports State Entreprise)
- **Gross Domestic Product (GDP)** - in economics, one of the basic measures of the effects of the work of the population of a given state used in national accounts. GDP describes the aggregate value of final goods and services generated by domestic and foreign factors of production in a given country over a period of time (usually a year). GDP is a measure of the size of the economy. An increase or decrease in real GDP and their dynamics are the measure of economic growth. When calculating the value of GDP, the geographical criterion is unique and final. The origin of capital, the ownership of enterprises etc. is irrelevant (source: NBP)
- **Gross Domestic Product GDP per capita** - one of the most widely used measures of economic growth in the world. It is calculated by dividing the GDP (Gross Domestic Product) of a given country by the

number of its inhabitants. Application: The concept of per capita GDP has been adopted, because the national income of countries cannot be used for comparing the level of prosperity of its citizens. GDP does not take into account depreciation, and therefore GDP growth does not automatically translate into an improved standard of living of citizens. The global GDP per capita gap amounts to USD 102,595 (2011), the average global GDP per capita stands at approx. USD 10,000 (a total of over USD 69 trillion globally in 2011) (source: NBP)

- **Gross National Product (GNP)** - measure of the value of all final goods and services generated in a given period by national factors of production (i.e. owned by the citizens of a given country) in all countries in which these factors have been involved in the production process. Gross National Product (GNP) is the Gross Domestic Product (GDP) supplemented by the balance of income generated by ownership between the country in question and the rest of the world (source: NBP)
- **RPK** (revenue passenger kilometres) - one of the measures of air traffic growth.
- **Slot –** duration of airport operations, i.e. the permission issued by the coordinator for the use the all airport infrastructure (necessary to conduct air services at the coordinated airport at a specific time) for landing or take-off, in accordance with the allocation made by the coordinator (for example, in the case of Chopin Airport in Warsaw, it is the British Airport Coordination Limited), pursuant to Regulation (EC) No 793/2004 of the European Parliament and of the Council of 21 April 2004 amending Council Regulation (EEC) No 95/93 on common rules for the allocation of slots at Community airports (Official Journal L 138, 30.4.2004, p. 50) (source: ULC and ASW)
- **SRT** (Strategia Rozwoju Transportu) - Transport Development Strategy 2020 (with a prospect until 2030)
- **Non-Schengen zone** - an area where controls at internal borders has not been abolished and strictly defined uniform rules do not apply with respect to: external border controls, templates of visas issued to foreigners, mutual cooperation between the services of signatory states, in particular in terms of police and court cooperation in criminal cases, as well as the so-called Schengen Information System (source: KG SG)
- **Low-cost carrier (LCC)** - airlines operated by low cost carriers offering point-to-point passenger air transport services (without transfers) at lower prices compared to those of traditional airlines. In order to reduce passenger transport costs, airlines use cheaper airports (often located far away from the nearest city) and do not provide passengers with many services offered by traditional airlines, such as free meals and drinks on board, access to newspapers and radio or full baggage handling. Costs are reduced as a result of minimizing administrative costs and reducing the number of cabin crew (to the minimum required by applicable regulations), as well as shortening the aircraft parking time at the airport. Savings are also generated through the unification of the aircraft fleet and a significant concentration of seats (smaller spaces between rows of seats on the plane). The introduction of large-scale direct ticket sales (mainly via the Internet and by telephone) also contributes to cost reduction. (source: MTBiGM 2013)
- **Trans-European Transport Network (TEN-T),** - system of major transport connections within the European Union (road, rail and inland waterway connections) as well as EU transport system points, i.e. airports, seaports, inland waterway ports, logistics terminals. The legal basis for the functioning of TEN-T is Title XV of the Treaty on European Union (TEU). According to Article 154 of TEU, the network is to contribute to the steady operation and development of the internal market and to ensure economic, social and territorial cohesion. Details regarding the TEN-T network and its operating rules are set out in Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on EU guidelines for the development of the trans-European transport network and repealing Decision No. 661/2010/EU (Official Journal L 348 of 20.12.2013, p. 1, as amended).
- **ULC** - Urząd Lotnictwa Cywilnego (Civil Aviation Authority)

- **Railway density indicator** - coefficient calculated through dividing the total length of the railway network by the country's total area.

B. CONTEXT OF THE DOCUMENT

On 17 March 2017. the Economic Committee of the Council of Ministers adopted the recommendation for the construction of the Central Transport Hub. On 27 April 2017. the Council of Ministers adopted a regulation on the appointment of a Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland (Dz. U. item 874), whose tasks, pursuant to § 2 (1) of the regulation included preparing and supervising the implementation of the Central Transport Hub project, in particular analysing legal, technical and economic conditions for the preparation and implementation of this investment, drafting its objectives and the concept of the implementation of measures necessary to carry out the investment and to prepare proposals for legislative amendments and changes to government strategic documents required by the investment. Pursuant to § 4 (1) of the Regulation, the plenipotentiary has been authorized to submit to the Council of Ministers, with the consent of the Prime Minister, draft government documents prepared by the plenipotentiary. From the procedural point of view, this document defines the action plan of the Council of Ministers and outlines basic principles for the preparation and implementation of investments related to the concept of the Central Transport Hub. Therefore, this document forms part of the implementation process of the standard provided for in § 2 and § 4 of the Regulation of the Council of Ministers of 27 April 2017 on the establishment of a Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland. The attachments to the document are for illustration purposes only and in no way determine the choice and scope of investments undertaken.

From the point of view of material qualification, the present document shall not be considered a development programme, as defined in the Act of 6 December 2006 on the principles of conducting development policy (Dz. U. of 2017, item 1367, as amended). Following the adoption of this Concept and the adaptation of strategic documents to the new medium-term national development strategy, i.e. the Strategy of Responsible Development 2020 (with prospects until 2030), adopted by the Council of Ministers on 14 February 2017, the Council of Ministers shall consider the scope of possible amendments to be introduced, *inter alia*, in the following strategic documents: Transport Development Strategy 2020 (with prospects until 2030) (SRT), National Railway Programme 2023, National Road Construction Program for 2014-2023 (with prospects until 2025). In the case of programme documents, it is necessary to specify sources of financing or to provide funds form existing sources (funds or/and the state budget). Changes to these documents shall be subject to consultations and a strategic assessment of environmental impact, pursuant to the requirements of the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Dz. U. of 2017, item 1405, as amended). Any adjustments of the content of this document, resulting from analyses carried out in the course of the above-mentioned strategic environmental impact assessment regarding strategic documents, shall not require a modification of the Concept document.

C. STRUCTURE OF THE DOCUMENT

In the third chapter devoted to the diagnosis of the socio-economic situation, **assumptions upon which this Concept has been developed are discussed**. The focus is both on opportunities (their use should be among Poland's main strategic goals) and on the main shortcomings of the transport system that the planned investments should remove or minimize. First, the significantly beneficial impact of hub-and-spoke air traffic development on the economic growth of Poland shall be expounded, with particular emphasis on the specific

advantages of hub traffic, followed by an overview of the development of the aviation market in Poland and in Central Europe. Furthermore, the document explains why the absence of a transfer hub has impeded and will continue to impede the development of the aviation market in Poland and in Central Europe; geographical, economic and economic conditions suggesting the location of a hub for the CEE region in the vicinity of Warsaw are be presented, as well as reasons why Chopin Airport in Warsaw is no longer capable of meeting the demands of the growing aviation market. Secondly, the analysis of chances and limitations of passenger rail transport in Poland are presented, with a particular emphasis on the analysis of the current state and density of the railway network. Results of previous analyses regarding the Central Airport and proposed changes to the railway network have been used in the process of drafting the present document. They are discussed in chapter three. They pertain, *inter alia*, to information on the Interministerial Report of the Interdisciplinary Team for the Location of the Central Airport for Poland (of 2003); Feasibility study of the "Central Airport for Poland" project (of 2006); Central airport concept for Poland – Analyses (of 2010) and a number of documents regarding the integration of the Central Airport with the railway network.

The fifth chapter is of fundamental importance from the point of view of this Concept, as it discusses the **mission to be outlined in the light of the adopted assumptions, the most important goals** of the aviation and the railway sector, as well as in the economic development of Poland and complementary transport investments. The main goal and specific objectives are discussed, along with their specific indicators. The SWOT analysis of the planned project is presented in the same chapter.

Chapter six is devoted to the **vision**. It discusses the priorities and directions of intervention in territorial terms. In order to reach the goals set, it is assumed that CTH should aim to become an air transport hub for Central and Eastern Europe. Main investment plans and module-type extension of the Port are also outlined. In addition, the chapter discusses the target capacity of the airport and its space requirements. This part of the Concept document also covers the impact of the construction of the Central Transport Hub on regional ports. The location of the planned Central Transport Hub is subsequently analysed. Location proposals were considered through the prism of specific prerequisites: the possibility of integrating air and rail traffic in a single hub and the fulfilment of space requirements, as well as those based on the following assessment criteria: appropriate location in relation to Warsaw and Łódź and minimal negative impact of planned investments on the environment. Further aspects of the investment, which will contribute to the implementation of the strategic objectives of the programme, are presented. The CTH should, therefore, serve as Poland's main transportation hub. The adjustment of the hub-and-spoke system to local conditions is taken into account and basic rules for the development of the railway network are presented. Furthermore, requirements regarding the railway network necessary for the implementation of the CTH are described in detail. This part of the document also includes a proposal of connecting the Solidarity Airport with the road network, as well as the possible integration of the Warsaw-Łódź agglomeration through CTH. The chapter is concluded with a forecast of the impact of CTH on the development of industry and new technologies.

It is followed by the description of **key actions to be taken in order to achieve the goals, immediately upon the adoption of the Concept document by the Council of Ministers.** First, steps that should be taken to ensure the financing of the investment are described, as well as measures necessary to transfer traffic from the Chopin Airport and to ensure that the latter airport has the necessary capacity until the construction of CTH is completed. Vital solutions that should be included in the law supporting the investment process are discussed in detail. Emphasis is put on steps necessary to promptly initiate and efficiently carry out environmental procedures, including the environmental impact assessment of the planned undertaking.

The eighth chapter contains conclusions regarding the **preliminary financial analysis of the project**. Initial cost estimates are presented, taking into account assumptions adopted for the purpose of calculation. Apart from general assumptions, the financing of preparatory work within the aviation and the rail component are all

discussed in detail. The implementation schedule is the subject of the final section of the document, i.e. chapter nine.

D. THE RELATIONSHIP TO OTHER STRATEGIC DOCUMENTS

1. THE RESPONSIBLE DEVELOPMENT STRATEGY UNTIL 2020 (WITH PERSPECTIVE BY 2030), THE CONCEPT OF NATIONAL SPATIAL DEVELOPMENT 2030 AND THE TRANSPORT DEVELOPMENT STRATEGY BY 2020 (WITH PERSPECTIVE BY 2030)

The Responsible Development Strategy until 2020 (with perspective by 2030) envisages carrying out of analyses related tot the Central Airport and possible decision on its construction or addressing its function on the basis of extension of existing infrastructure of airports. This document implements the objective set out in the Strategy. At the same time however, the range of impact of the indicated document makes it expedient to consider the amendment of the Responsible Development Strategy until 2020 (with perspective by 2030) it the relevant area. In this respect, the Government's Plenipotentiary shall cooperate with the Minister of Economic Development and Finance in order to develop the final position on the necessity (or the absence of necessity) to amend the Responsible Development Strategy until 2020 (with perspective by 2030).

The National Spatial Development Concept 2030 was adopted by the Government in December 2011 and is the most important strategic document on spatial development of Poland. The document presents the vision for spatial management of the country by 2030, defines objectives and directions of spatial management policy and lays down the principles guiding human activities in space. Due to the nature of this Concept, its implementation may require that changes be introduced to the NSDC.

The Transport Development Strategy by 2020 (with perspective by 2030). The Transport Development Strategy by 2020 (with a prospect until 2030) (TDS) currently in place and adopted by the Council of Ministers on 22 January 2013 lays down the most important directions for development of transport in Poland. The Strategy is relevant to all sectors of transport: road, rail, air, sea and inland, urban and multi-modal. The objectives of implementation of TDS included increased transport accessibility of Poland (easier moving around with various means of transport, improved safety of participants of traffic and moved cargo, increased effectiveness of the transport sector, creation of a modern, consistent network of transport infrastructure, improved manner of organisation and management of the transport system.

The directions of intervention of TDS objectives dedicated to the aviation sector included in particular increased throughput capacity of infrastructure of existing airports, ensuring conditions for effective development of aviation in regional airports, in particular in Eastern Poland and North-Western Poland, as well as increasing the share of air transport in inter-modal transport and ensuring the development of the Polish aviation market that would be sustainable for the environment. In the scope of implementation of item 1, TDS states directly that "the primary action facilitating implementation of the designated direction of intervention shall be development of infrastructure of airports (airside and landside zones) so that in 2030 they have combined throughput capacity at the level of ca. 80-65 million passengers a year (ULC forecasts).

The document mentions the issue of development of of the transit node in Poland (hub&spoke): "possible commissioning of the central airport (CA) shall potentially have an impact on the increase of air traffic in Poland". The final decision on this investment "shall depend on factors such as: the decision on development of the so-called Y HSR, present and forecast macroeconomic trend in the country and resulting forecasts of

demand for transport, conclusions from project feasibility studies undertaken and its economic justification, as well as the market position of the national airline". The directions of TDS interventions dedicated to the railway sector include: consistent modernisation and revitalisation of the existing network of railway lines, modernisation and construction of inter-modal terminals; taking a decision by 2020 on construction of high speed railway, development of systems streamlining management of passenger transport services; modernisation of infrastructure of railway stations and stops, replacement of obsolete engines and carriages for new rolling stock, revitalisation and development of railway lines (within cities' functional areas); integration of rail and road transport. In the area of the railway sector TDS also points to directions of intervention related to improved organisation and management of transport system. The work on updating the provisions of TDS has already started in connection with the adoption of the Responsible Development Strategy until 2020 (with perspective by 2030).

2. LOWER LEVEL STRATEGIC DOCUMENTS RELATED TO AIR TRANSPORT

TDS Implementing Document in the area of air transport. The Implementing Document to the Transport Development Strategy until 2020 (with perspective to 2030) of 2014 points to the fact that "the absolute size of the potential of Polish aviation infrastructure against the backdrop of richer European countries looks rather modest, but in relation to the volume of air traffic there seems to be no deficit of throughput of civilian airports, while in 2010-2012 - thanks to investments planned with a view to organisation of EURO 2012 the throughput was greatly increased in 4 largest airports". Implementing document to the Transport Development Strategy by 2020 (with perspective by 2030), the Ministry of Infrastructure and Development, Warsaw 2014). The concept point to the need to consider an update of the Implementing Document.

The Programme of development of a network of airports and flight control and security devices located on the ground. The government document presently in place, which provides guidelines for the development of air transport infrastructure is the document adopted by the resolution No. 86/2007 of the Council of Ministers of 8 May 2007 "The Programme of development of a network of airports and flight control and security devices located on the ground". For the first time in many years this document materialised the State's transport policy towards the sector of civil aviation. By definition it is a guidance document, using forecasts for development of air traffic in Poland to point to the needs in the area of development of airports included in TEN-T network and infrastructure related to communication, navigation and oversight in air navigation by 2020. The document states directly that "Independently of the need to develop regional and local ports it is expedient to continue the work on future central airport, which will play the role of the hub functioning on the basis of network of connections of PLL LOT S.A. The efforts related to the selection of location shall be brought to completion and the land shall be secured as the reserve for future airport investment". (The Programme of development of a network of airports and flight control and security devices located on the ground, Warsaw, Resolution No 86/2007 of the Council of Ministers of 8 May 2007, p. 10). It states that "fundamental trends in the sector on a global scale in recent years include development of the network of connections via hub and spoke ports, particularly on intercontinental routes". As a result of the work on updating of the Transport Development Strategy, the provisions of the above Programme shall be adapted in order to reflect current Government priorities in the context of interests of the aviation sector.

3. LOWER LEVEL STRATEGIC DOCUMENTS RELATED TO RAIL TRANSPORT

TDS Implementing Document in the area of rail transport. The document presents shortening of the average travel time in passenger transport as a strategic result. This is because it has been notes that the railway network is characterised by low speeds against the backdrop of remaining EU countries: the average commercial speed of a cargo train in Poland in the 1st half of 2012 amounted to 25.75 km/h only, with 25.63 km/h in 2010 and 25.58 km/h in 2011. The comparison of the average travel time by rail in 18 Voivodeship centres has been adopted as the method for assessment of effectiveness of planned investments in the railway network. The average travel time on 153 routes between 18 Voivodeship centres in 2013 amounted to ca. 5 hours 30 minutes. Thus, the objective of the investment in 2014-2020 has been to shorten the average travel time by rail between Voivodeship centres by 33% to ca. 3 hours 40 minutes, which was to result in an average travel time saving of ca. 1 hour 50 minutes.

The objective (and even to a greater extent the means of achieving the strategic result mentioned above) has been to **continue modernisation of key transport corridors** (in particular investments on E 20 / C-E 20 and on E 30 / C-E 30). According to the document, the investments listed were to compliment modernisation of two East-West corridors relevant both fro domestic and international transport. The priority in passenger traffic was to ensure increased standards on routes connecting large urban centres Szczecin - Poznań - Wrocław; Poznań - Warsaw; Warsaw - Kielce. Also operational objectives focused on modernisation of the railway network, including in particular of routes with international significance (in line with the ID ca. 86% of base network and ca. 45% of comprehensive TEN-T passenger network shall be modernised by 2023, as well as 90% of base network and ca. 60% of comprehensive TEN-T cargo network). The Implementing Document has not envisaged construction of new networks or increasing intensity of revitalisation efforts. In this respect this document introduces a new perspective on achieving strategic objectives indicated in the Implementing Document, and in fact on achievement of the basic strategic result set out in this document and the measure of effectiveness of railway investments. i.e. shortening of travel time by railway in the country.

National Railway Programme The National Railway Programme continues to be the lower level strategic document, which lists investments aiming at achieving objectives set out in TDS and ID. Due to the nature of this Concept, its implementation may require that changes be introduced to the NRP.

4. STRATEGIC DOCUMENTS RELATED TO ROAD TRANSPORT

Among specific objectives of TDS dedicated to **the road sector**, the following have been listed: extension of the system of motorways and express roads (in line with the Ordinance of the Council of Ministers of 20 October 2009, amending the Ordinance on the network of motorways and express roads (Dz. U., item 1446)); development - in cooperation with territorial self-government units - of local roads and their connections to the network on national and voivodeship roads; taking transit traffic out of cities through construction of ring roads in town most burdened by truck traffic; development of infrastructure of road safety; development of infrastructure of innovative technological solutions (including telematic applications) optimising traffic flows and contributing to reducing congestion. This document is in line with the premises presented above, however it requires additions or modification of planned road network in the area of Warsaw agglomeration.

TDS Implementing Document in the area of road transport. The document's envisaged strategic result is achievement of a situation in 2023, where ca. 83% of base network and ca. 33% of comprehensive TEN-T network is modernised, as well the average travel time between voivodeship centres is shortened by 15% (40 minutes) to 3 hours 40 minutes for passenger cars. The Implementing Document envisaged construction of new express roads and motorways. In this respect this document envisages introduction of correction of the planned shape of the road network in the area of Warsaw agglomeration.

National Road Construction Programme for 2014-2023 (with a perspective to 2025). The National Road Construction Programme continues to be the lower level strategic document, which lists investments aiming at achieving objectives set out in TDS and ID. Due to the nature of this Concept, its implementation may require that changes be introduced to the National Road Construction Programme, including indication of new sources of financing or ensuring additional funds within existing sources (funds or the state budget).

III. THE DIAGNOSIS OF SOCIO-ECONOMIC SITUATION

A. DEVELOPMENT OF THE AIR TRAFFIC BASED ON H&S SYSTEM MAY CONSIDERABLY CONTRIBUTE TO THE ECONOMIC GROWTH OF POLAND.

1. THE DEVELOPMENT OF THE AVIATION MARKET HAS DIRECT IMPACT ON ECONOMIC GROWTH

The bilateral relation between *per capita* GDP and the development of aviation market. The growth of gross domestic product is one of the fundamental drivers of development of the aviation market. There is a very strong correlation between the level of GDP *per capita* and the number of air journeys *per capita*. This correlation is bilateral: if the economy grows, the aviation sector generates better results, but at the same time increased traffic in air transport supports economic growth. Air transport acts as a growth catalyst.

The aviation sector is very strongly connected with economic growth - there is a strong correlation between the number of journeys and the value of GDP for a given country as well as region. However, this impact may by bidirectional - increase connectivity is conducive to economic growth.

Connectivity and hub connectivity. The impact on economy Connectivity and hub connectivity are commonly adopted measures of transport accessibility to the public, used in research and assessment of mobility of the public. They are respectively: a synthetic indicator specifying the number of direct and indirect air connections, taking into account their quality measured by travel duration and an indicator defined fro any port offering hub connections. specifying the number of air connections that enable transfers, which are served by the airport in question, taking into account the minimum and maximum transfer times, and the quality of these connections weighted as actual travel time and connection time. Building connectivity is crucial to economic interest of the state due to close correlation to economic growth and creation of new jobs:

- Increase of connectivity by 10% stimulates: (i) GDP growth *per capita* by additional 0.5% as well as (ii) labour productivity increase by 0.07% (Source: *InterVISTAS, 2015, Economic Impact of European Airports A Critical Catalyst to Economic Growth; PwC)*;
- According to the European Commission each job created in the aviation sector generates three new jobs in other economy sectors; every 1 EUR generated in the aviation sector generates 3 EUR of added value for the rest of the economy. *EUROPEAN COMMISION AVIATION STRATEGY FOR EUROPE*);
- Labour productivity in aviation is on average 3.6 times higher than in other sectors (*data of ATAG Aviation Benefits Beyond Borders - May 2016*)*;*
- Aviation supports trade in goods with high added value (as much as 35% of world trade in terms of value, but only 0.5% in terms of volume is transported by air (*ATAG Aviation Benefits Beyond Borders - May 2016*)).

2. THE DEVELOPMENT OF HUB TRAFFIC IS PARTICULARLY ATTRACTIVE FROM THE POINT OF VIEW OF ACCESSIBILITY OF TRANSPORT SERVICES AND IMPACT ON ECONOMY

Benefits of adopting the H&S model. The model of air transport based on the hub and spoke system is complementary to the point-to-point system, co-existing with the network of airports supplying hub airports with relevant passenger flows. Thus, the model does not replace operation in the point-to-point model. The development of so understood hub air traffic brings numerous benefits:

- Thanks to the so-called cumulated effect on the grid, i.e. appropriate correlation of local connections (feeders) to the hub, transfer airports facilitate serving markets to small for direct connections (e.g. between numerous city pairs inside the Central and Eastern Europe region);
- Hub airports offer opportunities to operate long distance routes to local players, as well as encourage other partner airlines to open such connections;
- Hub airports also ensure higher quality and viability of connections in terms of standards and quality (obligatory delivery of air operations on designated destinations) due to systemic connection with the entire grid of a local carrier and higher frequency of flights (also because of the necessity of providing transit opportunities), which is particularly beneficial to business traffic.

Intercontinental transfer connection are an attractive source of revenue for traditional airlines. Air traffic based on the H&S system is the fundamental condition for traditional airlines to develop international connections, which are characterised by the highest return per passenger In this way transit traffic generates above average revenues per passenger. The impact of the long-haul sector on profits of network air carriers is generally even higher, which is related to limited competition from low-cost carriers and other forms of transport in this segment. The development of long-haul connections also has a substantial and beneficial impact on economy. It is estimated that a 10% increase of supply of long-haul flights increases the number of seats of large companies in a region by 4%.

Intercontinental transfer connections are a source of additional revenue for airports. Supplying an airport with long-haul transfer connections also generates traffic inside this airport, as transfer passengers use airport infrastructure, including shops and services, which to a large extent translates into non-air revenues of airports. These revenues are an important component of the entire revenue structure of airports, representing up to 30% of total revenues.

Large hub airports have a positive impact on economic growth. Large airports are catalysts of economic growth, directly and indirectly impacting regional and domestic markets, having positive influence on employment, added value and budgetary income. **Construction of air hubs** alone has a positive impact on economy because of expenditure for development of airports and accompanying infrastructure. The part of investment related expenditure incurred within the country (e.g. materials and equipment, construction services, etc.), generates additional production and employment in companies involved in construction. Due to ties of companies involved in construction of the port, the results of increased production of these operators generate the so-called multiplier effect, spilling over the entire economy. **Operational airports** in turn stimulate economic growth:

1. **Directly**: creating jobs and added value in domains directly connected with supplying services satisfying operational needs of carriers and airports (technical and ground services, fuel supply, catering, security and cleaning), commercial activities (shops, restaurants, rent-a-car, parking lots), ground transportation (passenger and cargo);

2. **Indirectly:** ensuring function of subcontractors (goods and services to direct contractors, e.g. suppliers of foods for the needs of air catering, refineries supplying aviation fuel, suppliers of legal and accounting services to air carriers, travel agencies and tour operators, etc.;

3. **Inducing**: through increasing incomes of employees created in areas directly and indirectly generating employment, primarily through personal consumption of employees in the employed in above areas (e.g. in shops, restaurants, for needs related to childcare, health services, repairs), satisfying of which must take place also through increased employment in relevant service domains;

4. **Catalysing**: through supporting (facilitating) activities of other sectors of the economy, e.g. through facilitating access to sales markets of goods and services, by influencing decisions of entrepreneurs on location of offices, manufacturing plants, service facilities etc., through increasing tourist and business traffic and development of sector of services for these clients (hotels, catering, entertainment and recreation), through providing access to new markets (economies of scale) and highly qualified staff to domestic entrepreneurs.

The construction of air hubs is also conducive to increasing business attractiveness of the country and facilitates attracting additional foreign investments, located directly in its vicinity. As a result, creation of a new hub airport attracts also additional investments and renters in the port itself and in its neighbourhood. Airlines operating in such airport, as well as operators providing services in the area of technical maintenance and handling agents cooperating with airlines, use spaces in the new airport and create additions resources in its neighbourhood, thus supporting export of services.

Implementation of such investment also has an impact on development of competences and specialised staff. Commissioning of a transfer hub calls for drafting of the programme for development of education at all levels in order to supply staff and develop competences in the area of air traffic services, logistics and associated sectors. Thus it contributes to improvement of qualifications and professional opportunities for future employees of such port.

International experiences show that for reasons indicated above large airports have a substantial share in generating GDP, for example the **Paris airport** of Charles de Gaulle (CDG) solely through direct and indirect effects was responsible in 2011 for 195 thousand jobs and EUR 17 billion of French GDP (61 million passengers, 2011, **the airport of Madrid-Barajas** (MAD) through direct, indirect, induced and catalysed effects was in 2012 responsible for 300 thousand jobs and EUR 15.2 billion of GDP of Spain (45 million passengers, 2012), the airport in Zurich (ZRH) through direct, indirect, induced and catalysed effects was in 2013 responsible for 75 thousand jobs and CHF 13 billion of spending (25 million passengers, 2013). (source: EY „The impact of Central Transport Hub on Polish economy" of 11 July 2017)

3. THE AVIATION MARKET IN POLAND AND CENTRAL EUROPE IS DEVELOPING VERY DYNAMICALLY WITH A PROSPECT FOR STRENGTHENING OF THIS TREND.

The volume of air traffic in Central Europe and Poland. In 2016 Polish airports served the total of ca. 34 million passengers (according to CAA data). Markets, which followed in terms of volume of passengers carried continue to be significantly smaller - Romania, Ukraine, Czech Republic and Hungary all generated traffic at the level of ca. 10-13 million passengers each.

Prospect for further increase of air traffic. Both the historical pace of economic development and long-term forecasts for the Central and Eastern Europe confirm the high potential of this market. In the long term the average pace of GDP growth has been many time higher in comparison to Western Europe (CAGR in 2000-2015: 0.6% in Western Europe vs 3.5% in Central and Eastern Europe). The forecast for the next 3 years is 1.7% for Western Europe and 2.9% for Central and Eastern Europe. The pace of increase of air traffic measured in RPK (revenue passenger kilometres) remains in a similar disproportion.

The average annual pace of increase of passenger traffic in Central and Eastern Europe measure by the number of passengers in 2010-2015 amounted to 5.7% (against 3.1% for Western Europe). In Poland alone it amounted to 6.9%, which was still a result below the average for the past decade and substantially deviates from the current dynamics of growth. In 2016 the pace of growth of passenger traffic in Poland amounted to 12.4%. In total in 2016 34,186 passengers passed through Polish airports. It means that within a year the number of passengers increased by more than 3.8 million persons.

Intensive increase of the value of the air travel market. The value of the market of Central and Eastern Europe measured by revenues from passenger transport in 2015 amounted to ca. USD 24.0 billion, over a half more than in 2010. It is typical however that as little as 15% of this revenue is attributable to local carriers (with majority stake of local equity).

Forecasts of sectoral institutions. All sectoral institutions hold the common ground when it comes to enthusiastic assessment of further prospects for the development of aviation market in Poland and the region:

- According to the forecast of the Civil Aviation Authority the pace of increase of passenger traffic in Poland shall remain at the level of 5% in the perspective of the next 15 years, leading to doubling of the present size of the market (30.392 million passengers) already in 2028;
- The latest available IATA forecasts saw the annual average increase of traffic from/to Central and Eastern Europe until 2020 at the level of ca. 6.5%, increasing the number of O&D passengers in the region from 95 million in 2015 to 129 million in 2020 and 175 million in 2025 (assuming continuation of the trend). This shall mean achievement of a ratio of 1 travel per 1 resident, which shall still be the level twice as low as in the Western Europe.
- Long-term (until 2035) forecasts of aircraft manufacturers (Boeing and Airbus) point to stable prospects for the development of passenger flows, which may be naturally served by hubs located in Central and Eastern Europe, including: Western Europe – China 5.3% annually, Central and Eastern Europe – China 6%, CIS – USA 4.6%, Europe – South Asia 6,5%, Europe – South-East Asia 4.6%, China – USA 5.9% (source: *Boeing : CURRENT MARKET OUTLOOK 2015-2034,Airbus: Global Market Forecast 2016-2035 Global Market Forecast 2016-2035 DATA SET).*

4. ABSENCE OF A TRANSFER HUB LIMITS THE POTENTIAL FOR THE DEVELOPMENT OF THE AVIATION MARKET IN THE REGION OF CENTRAL EUROPE AND IN POLAND.

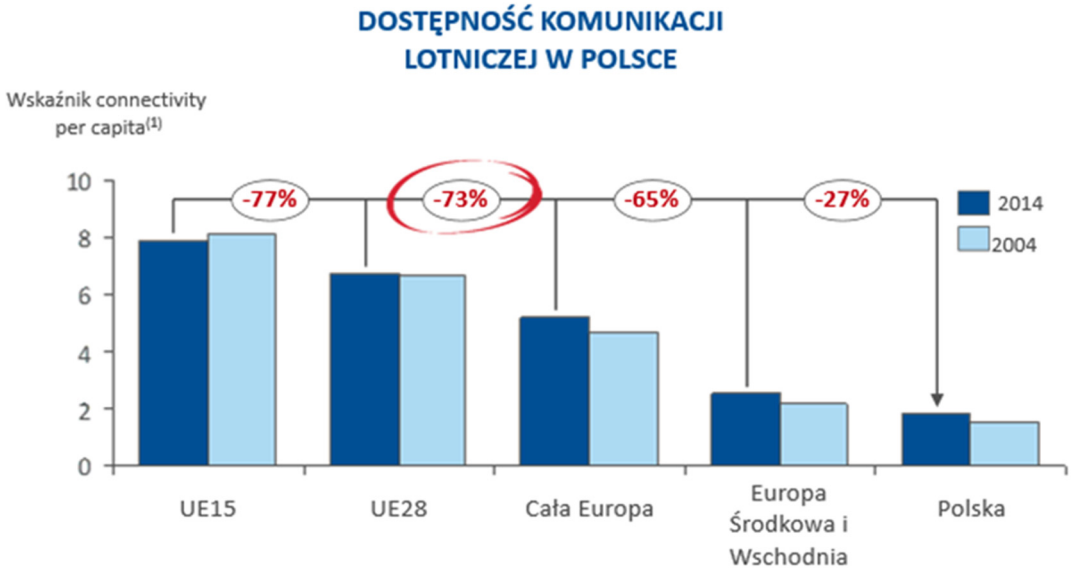
Absence of a transfer hub in the CEE region. Despite the fact that there are as many as 15 urban centres with more than 1 million residents, none of the airports has developed to the level of a significant hub on a European scale. The largest airports in the region are now WAW and PRG (ca. 12 million passengers annually). The region lacks a strong centre offering long-haul flights. The airport in Helsinki, adapted to handle more than 150,000 operations annually, is a good example of the potential of the market. In 2016 the airport in Helsinki served 17.1 million passengers, i.e. ten times the number of residents of this agglomeration and more than

three time higher than the number of resident of entire Finland. The increase of the number of transfer passengers in the past year amounted to 5.2%.

Largest EU airports in terms of number of passengers in 2015 (EUROSTAT)									
Rank	**Country**	**Port**	**Air transport (thousand pax)**	**Domestic**	**Inside EU-28**	**Outside EU-28**	**Increase 2014-2015 (%)**	**Total passenger flights (thousand)**	**Increase of the number of passenger flights 2014-2015 (%)**
1	UK	London/Heathrow	74954	5141	25808	44005	2.2	470	0.3
2	FR	Paris/Ch. De Gaulle	65698	5941	25720	34036	3.2	443	1.8
3	DE	Frankfurt/Maine	60889	6881	24936	29072	2.5	439	-0.5
4	NL	Amsterdam/Schiphol	58168	0.2	33404	24763	5.8	439	3.0
5	ES	Madrid/Barajas	46297	12965	20289	13042	11.4	349	6.9
6	DE	Munich	40861	9550	19487	11824	3.3	361	1.2
7	UK	London/Gatwick	40257	3597	26082	10578	5.7	263	3.2
8	IT	Rome/Fumicino	40231	11950	17681	10601	5.2	311	2.1
9	ES	Barcelona/El Prat	39425	10646	22439	6340	5.4	275	1.5
10	FR	Paris/Orly	29663	13988	9669	6006	2.8	232	1.8
11	DK	Copenhagen/Kastrup	26512	1778	17166	7568	3.8	243	1.1
12	IE	Dublin	24924	71	20888	3965	14.9	185	9.5
13	ES	Palma de Mallorca	23717	5588	17054	1075	2.8	168	3.3
14	BE	Brussels	23269	2	15744	7523	7.0	208	3.1
15	SE	Stockholm/Alranda	23155	5072	12614	5469	3.2	212	-1.0
16	UK	Manchester	23093	2382	13850	6861	5.2	164	1.1
17	AT	Vienna/Schwechat	22740	527	14673	7540	1.2	220	-1.8
18	UK	London/Stansted	22514	1746	19432	1336	12.9	145	8.1
19	DE	Dusseldorf	22448	4377	10752	7319	2.9	203	-0.6
20	DE	Berlin/Tegel	20995	7756	9179	4060	1.6	177	1.3
21	PT	Lisbon	20111	2474	12660	4977	10.8	160	6.9
22	IT	Milan/Malpensa	18445	2535	9032	6878	-1.2	144	-4.7
23	EL	Athens/Eleftherios Veniz	18090	6440	8027	3622	19.1	163	15.5
24	FI	Helsinki/Vantaa	16418	2590	9843	3984	3.0	158	0.8
25	DE	Hamburg	15581	5281	7240	3061	5.7	142	2.6
26	ES	Malaga/Costa del Sol	14360	2034	11082	1244	4.8	101	2.1
27	UK	London/Luton	12263	946	9902	1415	17.0	86	16.0
28	FR	Nice/Cote D`Azur	12013	4298	5520	2195	3.1	156	0.6
29	CZ	Prague/Ruzyne	11868	50	8443	3374	6.6	118	1.8
30	PL	Warsaw/Chopin Apt	11214	1174	7150	2890	5.8	131	1.8
37	HU	Budapest/Liszt Ferenc Int	10228	0	8092	2136	13.0	80	7.1
40	RO	Bucarest/H. Coanda	9274	503	7190	1582	12.0	88	4.9

62	CY	Larnaca	5316	0.0	3257	2058	1.5	40	-0.2
64	LV	Riga	5146	0.2	3793	1352	7.2	63	3.5
69	MT	Luqa	4620	0.3	4188	431	7.7	35	6.0
82	BG	Sofia	4057	158	3256	642	6.5	37	5.2
91	LT	Vilnius	3333	0.2	2448	884	13.4	35	6.2
98	LU	Luxembourg	2652	1.0	2280	371	8.9	43	1.1
102	HR	Zagrzeb/Pleso	2576	432	1519	625	6.5	34	7.0
118	EE	Talin	2161	20	1622	520	7.0	32	10.7
136	SK	Bratislava/ M.R.Stefanik	1556	19	1258	278	16.4	13	12.3
142	SI	Ljublana/Brnik	1436	0	814	622	9.9	24	4.3

Connectivity per capita in Poland. The „connectivity per capita" indicator for Poland is 4 times lower than average for the EU-15. It is also 27% lower than the average for the region of Central and Eastern Europe. Moreover, over the past decade there was no noticeable improvement when it comes to these disparities. Poland faces a substantial challenge in this area, as against the backdrop of other EU countries it continues to remain in the middle of the third ten (EC reports from 2004 and 2011).



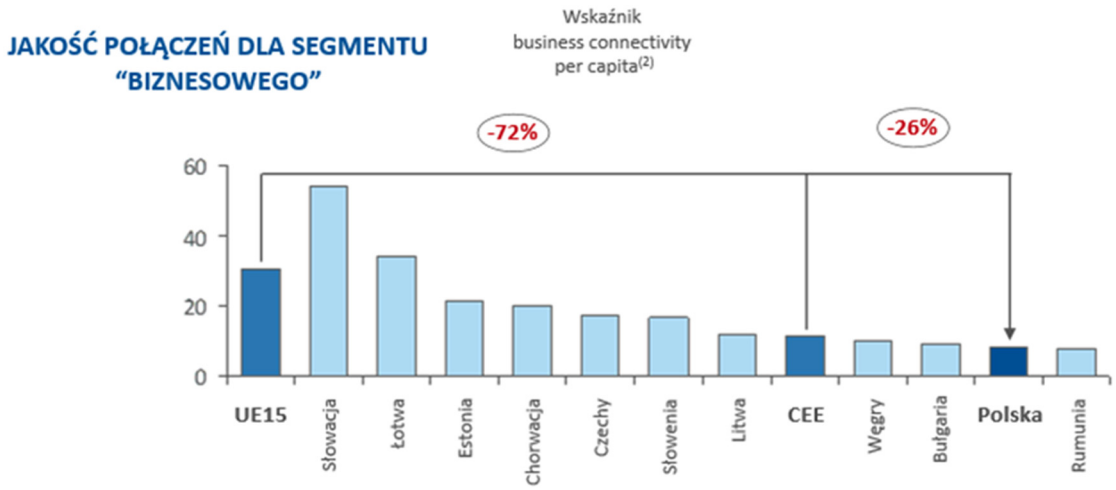
Source: *PwC commissioned by the European Commission „Overview of Air Transport and Current and Potential Air Connectivity Gaps in the CESE Region"*

Limited possibilities of traffic based on the point-to-point system. One of the reasons for dramatic disproportions in the area of connectivity between Poland and Western Europe results from over-proportional increase of offering in the grid (point-to-point) model, employed by low-cost players (Low-cost carriers, LCC). This model effectively stimulates selected markets and contributes to a leap in the number of passengers, at the same time not being able to supply properly diversified point-to-point offer. This results from the following reasons:

- the grid of largest LCCs is focused on several/dozen connections, responsible for more than 70% of their entire traffic and remains "single dimensional" - carriers are strongly focused on the stream of traffic between Poland and Western Europe; the absence of transfer opportunities dramatically limits the number of city pairs served;
- the grid of point-to-point carriers is much less stable than that of network carriers and is characterised by strong seasonality due to law entry/exit barriers in individual markets;

- in the point-to-point model the possibility of offering intercontinental flights is practically excluded, as is serving of less developed short-haul markets, therefore intercontinental travel is served by hubs located outside of the country;
- LCCs, using relatively large air-planes, limit the number of frequencies on individual routes (on average it is 2,5 lower than that of network carriers).

Limitations of mobility of CEE residents resulting from the point-to-point model. Limited supply of aviation services measures by the connectivity indicator also translates into limited inclination of residents of Central and Eastern Europe and Poland to air travel. In 2015 there were only 0.7 air trips per one resident of Poland, while in Western countries the value of this indicator amounted to 2.7. Similarly to Poland, availability of air transport to CEE residents is substantially lower than to resident of the "old" part of the European Union. When it comes to business connectivity per capita (connectivity indicator weighted by the quality of connections - measured by their frequency and the weight of cities, to which connections are available, per one resident) disproportions are similar, and in this respects Poland remains one of the most poorly connected countries in Europe, even among the CEE countries.



Source: *PwC commissioned by the European Commission „Overview of Air Transport and Current and Potential Air Connectivity Gaps in the CESE Region"*

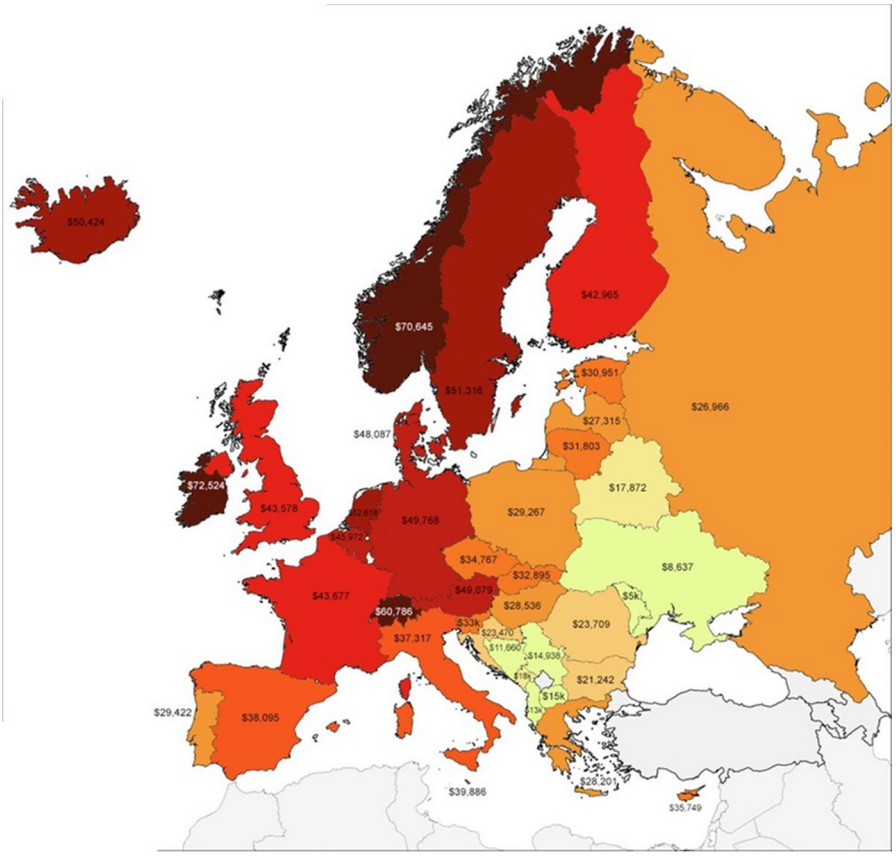
Limitations to possibilities of intercontinental travel. Presently as much as 90% of long-haul traffic from/to Central and Eastern Europe takes place via transfer ports located outside of its area, thus depriving the CEE region of benefits coming from this traffic. Limited offering in the segment of long-haul flights leads not only to strengthening of the position of competing airlines and airports, but also to anomalies, where most of the traffic between CEE and Far east takes place via hubs located in Western Europe. This in turn leads to ineffectiveness from the point of view of (i) passengers (longer travel time), (ii) environment (suboptimal flows, generating higher emissions) and (iii) effectiveness of use of airspace (which is a limited resource).

Limited possibilities of hubs in Western Europe to serve the CEE market. Efficiency West European hubs is also subject to substantial limitations. West European airports are facing serious capacity limitations, which puts a question mark over the possibility to effectively serve the dynamically increasing demand in the region of Central and Eastern Europe by hub airports in Western Europe in the long term. The problem of limited throughput capacity has been clearly pointed into in the strategy for development of aviation recently published by the European Commission (The European Strategy on Aviation, European Commission, 7 December 2015).

5. GEOGRAPHIC AND ECONOMIC CIRCUMSTANCES SPEAK IN FAVOUR OF LOCATING THE HUB FOR CENTRAL AND EASTERN EUROPE IN THE VICINITY OF WARSAW.

Demographic potential of the CEE region. The region of the Central and Easter Europe is the area with a very big demographic potential, inhabited by the total of ca. 180 million inhabitants in 19 countries (including Ukraine with 45.5 million, Poland 38.5 million, Romania 20 million, Czech Republic 10.5 million, Hungary 9.9 million, Belarus 9.5 million). It is a potential, which is substantially larger than the potential of natural markets of any of Western carriers (e.g. natural markets of the Lufthansa Group: Germany, Austria, Switzerland, Belgium represent the total of ca. 110 million residents). The countries mentioned are similar not only in terms of historical and political experiences, but also in terms of similar evolution of air sector (when it comes to the role of local carriers, penetration of the market by LCCs, bilateral agreements, etc.). It should be noted that a national carrier operates (or operated) in each of the countries of the region. However, practically none of the was able to prepare in time for competition under the open skies in Europe. This led to their gradual marginalisation in local markets and absence of an opportunity to develop a relevant scale of activities. As a consequence of emergence of substantial financial problems several operators went bankrupt (e.g. Hungarian MALEV, Estonian Airlines, Fly LAL Lithuanian Airlines, Bulgarian Balkan), while most carriers from the region until this day face or faced (e.g. PLL LOT S.A.) significant operational and financial problems.

Demography and size of Polish economy. Poland ids the market with the largest potential for development of air transport in the region of Central and Eastern Europe. It ranks second in terms of population (only Ukraine surpasses us), representing more than 21% of the population of the entire region. The size of GDP puts us in the first place, with nearly 30% share and nearly two and a half times advantage over Romania in second place. In terms of GDP per capita Poland concedes the ground slightly to several other countries, but with the result of USD 26,261 (IMF 2015) it is located substantially above the average for the region (USD 18,600).



The level of GDP (purchasing power parity) per capita in 2017 on the basis of IMF

Strong demographic and economic foundations and the high level of local demand for flights predestine Poland to play the leading role in consolidation of the regional aviation market in the basis of a strong hub.

The potential of PLL LOT S.A. for consolidation of the CEE aviation market. LOT Polish Airline, following successful process of restructuring and in line with owner (the State Treasury) approved development strategy based on a harmonised connection network and transit traffic, achieved a substantial increase of offered routes and number of passengers carries, at the same time generating a positive financial result, and are ready for further fast growth. The carrier could play the part of a potential "consolidator" of the CEE market (for details see Attachment No 1). This translates into position of Chopin Airport in Warsaw, which is the base of this carrier. Chopin Airport has become one of the largest airport in the CEE region, although with substantial limitations to the capacity to accommodate rapidly growing passenger and cargo traffic.

The role of regional traffic. Construction of a leading hub is much easier and less risky, when a stream of transit passengers can be complemented with passengers from within the region. This allows airlines to achieve higher average revenue per seat and improve the profitability of services to and from the hub. It also makes the airport itself less dependent on operations and financial condition of the local (home) network carrier. **Placing a hub in a location that encompasses the whole region, or its significant part, generates an increase in the number of flights independent of the connecting traffic and it makes the profitability of an airport independent of the national carrier's condition.**

Warsaw as a central point of the CEE region. Warsaw is the largest metropolitan area among all cities in "new" EU countries. With 3.3 million of residents (Eurostat data), it comes second only to Kiev in CEE region. It is also the strongest economic area in the whole CEE region, with an estimated GDP of over USD 141 billion (Brookings

Institution, 2014). Its potential is comparable to such cities as Stockholm or Berlin. Many international companies choose Warsaw as regional headquarter. The vicinity of Łódź agglomeration, with over 1.06 million residents, special economic zone and international and home industry productions plants, is another asset.

Warsaw's location from the air traffic perspective. Warsaw's central location, in the country, as well as in the whole CEE region, motivates the development of a large, intermodal transit centre for passengers and goods carried by air, in its immediate vicinity. The majority of cities in the region can be reached from Warsaw on a 90-minute flight. Locating an air hub in Warsaw allows more efficient air services between Western Europe and the Far East. Warsaw lies on the so-called "great circle" route between such cities as Beijing, Seoul or Shanghai in Asia and Barcelona, Milan, Geneva and Munich in Europe. Similarly, the traffic to and from Central Asia can be operated from Warsaw very efficiently, as it is located within the flying range of a typical narrow-body aircraft. The carriers from Western European airports are forced to use wide-body aircrafts (or new-generation narrow-body aircrafts), which has negative effect on their operational costs and the possibility to offer high frequencies. What is more, the location of Warsaw near the eastern border of the time zone allows favourable night rotations schedules for short- and medium-haul eastbound flights. Carriers can operate the majority of long-haul flights, using a 24-hour aircraft rotation, which facilitates timetable planning. The U.S. East Coast, as well as a large part of China's territory fit into this range. At the same time, the aircraft rotations are long enough to allow efficient utilisation of home-base carrier fleet. Locating the hub near Warsaw would offer substantial competitive advantages over other European airports.

B. THE WARSAW CHOPIN AIRPORT WILL NOT BE ABLE TO FACE THE CHALLENGES OF INCREASING AERONAUTICS MARKET IN POLAND

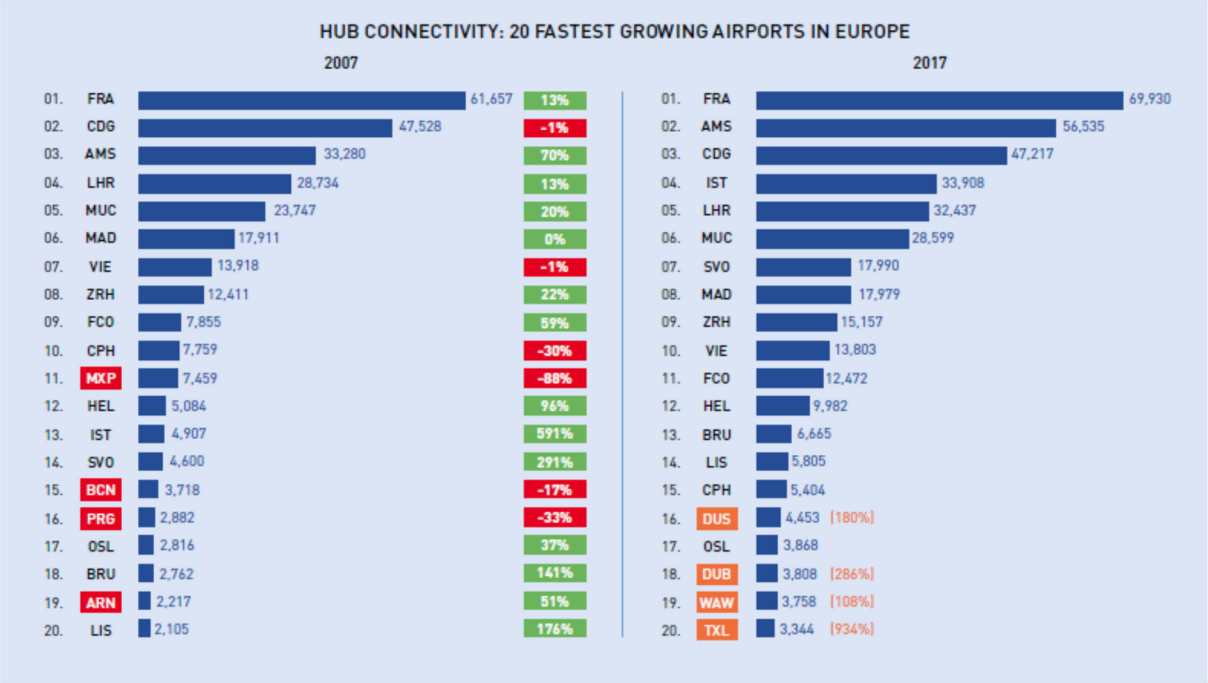
1. THE CHOPIN AIRPORT — CURRENT STATUS

Intense development of air connections from Warsaw. The Warsaw agglomeration airports are already serving the largest number of passengers in this part of Europe (15.6 million passenger total: Warsaw Chopin Airport – 12.8 million, Warsaw Modlin Airport – 2.8 million), competing with airports in Prague (12 million) and Budapest (10 million). The Chopin Airport is also the only airport in the region to maintain a substantial number of long-haul services. According to the already published schedule, there were over 4,000 flights to/from Warsaw to/from eight destinations in Asia, between June 2016 and June 2017. This represents a 24% y-o-y increase (2016/2017 dynamics). It is quite meaningful that the airport in Warsaw provides more such services than, for example, the Berlin-Tegel airport.

Inferior position of the Chopin Airport among European airports. On the other hand, the airport is on a mid-twentieth position among European airports, as far as the number of intercontinental flights is concerned. According to the abovementioned data on *connectivity* and the number of passengers per inhabitant, the airport ranks far below the average for European, or even regional countries. As far as *hub connectivity* is concerned, the Chopin Airport is an exception in the CEE region. It ranked only 19th among best-connected airports in Europe, yet with no perspectives for long-term development due to environmental and

infrastructure limitations. Warsaw will not be able to reduce this gap without substantial infrastructure investments.

Figure 1 *Hub connectivity* — 20 fastest growing airports in Europe



Source: "Airport Industry Connectivity Report ACI 2017"

None of the regional airports in Poland has the ability to provide services for the substantial transfer traffic, neither does it offer *hub connectivity* that could enhance it.

Basing on the flight network of the network carrier, Warsaw Chopin Airport acts as a transfer point between:

(1) destinations in Europe (mainly in the CEE) and North America;

(2) destinations in Poland and in Europe;

(3) destinations in Europe and in the Far East/Middle East.

As previously stated, the hub function of the airport favours the development of the flight network, because the connecting traffic allows maintaining and developing destinations, which would be otherwise unprofitable. This refers to international destinations, but also to flights to/from domestic airports (improvement of transport comprehensiveness in the country). The transit traffic produces a far greater passenger traffic and a more expanded flight network than the local market demand would allow. This is a key added value for the Chopin Airport.

Therefore, it is obvious that these objectives can only be met when there is operational reserve in capacity, also at peak hours (waves).

2. THE CHOPIN AIRPORT CAPACITY IS RUNNING OUT

No long-term vision for the Chopin Airport function. The present architecture, arrangement and capacity of the Chopin Airport results from successive decisions, which did not aim to develop a coherent, long-term vision of its function in Warsaw and in the country, e.g.:

- In the 1970's/80's, a decision about the construction of a residential estate in Ursynów was taken. At the same time, it was assumed that an airport for Warsaw shall be moved from its location, thus eliminating the use of one of the runways;
- Environmental law, as well as the decision to establish restricted use area with noise limits, impose far greater restrictions than those found in other European airports. Vicinity of a densely developed residential area practically eliminates the possibility to significantly raise the current limits;
- Construction of Warsaw's southern ring road in years 2010–2013 as well as its location in the vicinity of the airport has practically excluded the possibility of further development of runways' infrastructure, especially the construction of a parallel runway

Declared capacity is "virtual."The declared capacity (about 22 million passengers) is purely theoretical, considering the transfer traffic arrangement, and is not reflected in the operational reality. From the hub traffic perspective, it is crucial to plan schedules so that distinct inbound and outbound waves are created. Otherwise, it is almost impossible for long-haul services to be profitable. Unfortunately, such a timetable significantly overloads the airport's infrastructure and even with the current number of 12 million passengers, some of its elements become constraints.

Current capacity analysis. In 2012 a comprehensive analysis of the airport's capacity was drawn up, whose conclusions emphasised the fact that the capacity of some of the infrastructure's elements will have run out by 2020. On the basis of the analysis and considering the development of the aeronautics market in Poland, the following limitations may be enumerated:

- **Insufficient number of permitted operations despite investments.** The system of runways is limited to two intersecting runways, which means that it does not provide full capacity available for two runways, and is additionally limited by the existing taxiways layout. The level of maximum capacity for both operating runways for the summer of 2017 is estimated to be: 38 operations/hour (including the maximal number of 26 inbound and 28 outbound flights) with maximal permissible increase to 42 operations/hour in the morning peak hours. It is envisaged that the capacity for both runways can theoretically be increased to 48 operations/hour. According to the current prognosis, by 2020 over 100 slots will be needed during the two-hour peak period, which is more than the number predicted by the most optimistic analysis.
- **Effects of temporary closure of one runway.** The maximum capacity for one operating runway is barely 30 operations/hour, with permissible increase to 33 for one peak hour (21 inbound and 21 outbound flights maximum in both cases). Temporary closure of one of the runways for repairs and maintenance is normal practice. Such closures have recently lasted about one month in the peak summer period.
- **Limited availability of aircraft stands.** The number of aircraft stands will be sufficient to operate traffic only until 2020, provided that the current traffic specification does not change (mix of aircrafts). The development of B787 fleet by the LOT Polish Airlines and introduction of operations with wide-body aircrafts by other carriers, among others, trigger the demand for code E contact stands in the non-Schengen area. Even this season, some wide-body aircraft will have been operated from non-gate stands, without a jet bridge, which decreases the quality and extends the time of services. Similarly, the introduction of B737MAX aircrafts limits the free use of aircraft stands. Necessary changes in the current stands layout may decrease the overall number of stands and exhaust the stand capacity at an earlier date.

- **New control procedures.** The terminal was not designed as a transfer terminal — there are structural constraints that rule out its full readjustment. As far as document control is concerned, the increase of stands scheduled for the next two years will be offset by tightened control procedures (decrease in passenger frequency from 110–120/hour to 80–90/hour per stand).
- **Insufficient capacity of non-Schengen area.** The current airport's terminal layout reflects the 2004 plans. It is not structurally adapted to manage substantial transfer traffic. Its oblong shape produces many "narrow throats" (passport control, security control) and the time required to pass from one gate to another, which is a yardstick of traffic increase at the Warsaw Chopin Airport, continuously becomes longer. The maximal capacity of the non-Schengen arrivals area is 1,300 passengers per hour (and no more than 800 passengers within 30 minutes walking time). For the non-Schengen departures area it is a maximal number of 1,600 passengers per hour (and no more than 1,200 passengers within 30 minutes walking time). For example: 6 B787-8 aircrafts completely exhaust this capacity. Moreover, other long-haul carriers use the non-Schengen area and it operates the majority of eastbound flights. According to the timetable published for this season, the airport will serve 6 wide-body aircrafts simultaneously, which largely exhausts the current limits. The terminal layout limits further changes in the gate allocation between Schengen and non-Schengen areas.
- **Insufficient number of E code control stands.** LOT Polish Airlines declares a 15–16 wide-body aircraft fleet by 2020 and it should be expected that the remaining intercontinental carriers will also increase the number of operations with such aircrafts. The number of contact stands in the non-Schengen area is already insufficient to operate the estimated number of E code aircrafts in the peak hours. The necessity of servicing a part of these aircrafts/passengers from non-gate stands will intensify problems in transfers/document and security control and it will have a very negative effect on customer satisfaction.
- **Baggage handling capacity.** The capacity analysis indicates that the capacity of respective elements of the baggage handling will start to run out by 2020. Even today, restrictions in this area do not permit an increase of the total number of passengers served by the terminal.

Effects of capacity limitations. As the available capacity of Warsaw Chopin Airport is running out, it gradually limits the possibility of operating flights according to the timetable most advantageous for the airlines. The airport coordinator (ACL International) has to meet the coordination parameters, reflecting the maximal capacity of crucial airport areas, and this does not allow an increasing number of slots (arrival and departure times) required by airlines. There is a one-hour difference between the requested slots and those allowed by capacity available, which means that an airline cannot perform scheduled operations and does not launch new routes.

Current effects of capacity limitations. In the summer of 2017, over 20% of operations will not have been carried out according to the timetable scheduled by airlines, and in the winter season of 2017, when the traffic volume usually decreases, such operations will amount for over 12% of all commercial operations scheduled for the Warsaw Chopin Airport.

3. WARSAW CHOPIN AIRPORT IS SUBJECT TO IRREMOVABLE LIMITATIONS THAT INHIBIT ITS GROWTH.

Spatial limitations. By the end of the previous century, the Okęcie airport, which opened in 1934, had been enclosed from three sides by dense urban development of Warsaw and surrounding municipalities. The **airport area** (about 635 square kilometres inside the fence) is quite small, as compared with other European airports and does not allow a substantial expansion. In particular, there is no possibility of building a parallel runway

within existing borders. The sites in the immediate vicinity of the airport practically **rule out the infrastructure expansion** outside it existing limits. The sites include: fuel base, technical base, office building, catering facilities, Polish Air Navigation Services Agency buildings, fire station buildings, railway tracks and, above all, roads: Krakowska street and S79 and S2 expressways. Considering the costs, operational inefficiency and environmental restrictions mentioned below, the construction of a **parallel runway and terminal** further from the existing infrastructure (e.g. south of Dawidy) remains a purely theoretical concept. Moreover, this would only be a temporary solution, and a pointless one, considering the generated costs.

Environmental restrictions. Environmental restrictions result mainly from the airport's location in the immediate vicinity of significant human dwellings. The airport has negative impact on the life of tens of thousands of people living in its vicinity. The establishment of the Restricted Use Area resulted from the attempt to find balance between public interest to provide transport accessibility and the interests of people experiencing inconveniences associated with the airport's functioning. A maximal limit of **600 operationsper day** was adopted as a result. The coordinator's data indicates that the level of 460 operations per day was reached in some days of the week this year (on a yearly average basis). Predicting the increase in the number of air carriers' operations (including LOT Polish Airlines) at a market rate, the limit of 600 operations shall be reached by 2020. The number of **nighttime** operations (between 22:00–06:00 local time) is also limited by 24 quota points (about 45 operations). It should be emphasised that in the summer of 2017 no carrier will be able to acquire slots for scheduled nighttime operations. Therefore, even if the number of permitted operations is increased to 100–150 per day, it will only postpone the date when the strict requirements are faced, to 2022-23 the latest.

C. RAILWAY TRANSPORT AS THE MOST EFFECTIVE MEANS OF PUBLIC TRANSPORT

1. RAILWAY SHOULD BE THE MOST OPTIMAL MEANS OF PUBLIC TRANSPORT FOR DOMESTIC JOURNEYS IN POLAND

Railway's competitive advantage resulting from travel time. Experience at international level shows that if infrastructure is tailored to the specific country circumstances and if there is adequate technology, the railway may win the competition with alternative means of individual transport (passenger cars), as well as public transport (busses and planes). The railway's advantage may be particularly noticed at transport service on 100–400 km distances and in large urban areas, where it is difficult and time-consuming to reach the centre, due to overloaded traffic. The abovementioned advantage refers to intercity ICE class rail services, regional trains that provide transport services for larger urban areas, as well as the segment of agglomeration carriages. Rail services, if correctly provided, with the use of available technology, should provide shorter travel times than car and air transport on distances from 300 to 400 km between main urban centres. In multi-million cities and urban areas, where construction and maintenance of high speed rail (over 300 km/h) is justified by a large number of passengers and the distance between urban centres, the railway may even win the competition with air transport, including routes covering distances of 1,000 km.

Lower environmental costs. Well-organised railway transport system generates on of the lowest external costs. Railway transport has smaller spatial requirements, especially when compared with road transport. It is also far safer, less energy-consuming, it enables non-emissive transport and generates far lesser noise emissions.

Poland's favourable spatial and geographical circumstances. Poland's regular shape, the lowland nature of the area, as well as the location of urban areas within the radius of 300 km from the Central Metropolis,

understood as infrastructurally and functionally integrated Warsaw and Łódź agglomerations, predestine the railway to play an important part in the national transport system. Considering this spatial arrangement, infrastructure located in the centre of the country should from a highly-exploited hub for a dense national network, with the highest carriage capacity levels. At the same time, infrastructure investments in the Middle European Plain region are cost-effective and with few complications, due to topographic conditions.

2. DEVELOPMENT OF NATIONAL RAILWAY TRANSPORT HAS GREATER INFLUENCE ON POLAND'S ECONOMIC GROWTH THAN DEVELOPMENT OF OTHER MEANS OF TRANSPORT

Railway and road transport, the GNP growth and energetic and transport security. In Poland's economic circumstances, railway particularly stimulates the GDP growth. Poland does not have substantial resources required to produce hydrocarbon fuels that form the energetic basis of the road transport. Neither does it have its own car or internal combustion engine brands. Basing the transport system on road transport inevitably leads to a greater dependence on imported resources and technology. The railway is mostly powered by electric energy, whose production is chiefly based on national energy sources (as opposed to liquid fuels). The security of transport based on national resources is enhanced, which allows stable and independent transport operations.

Domestic industry is capable of producing a **majority of types of rolling stock**. In 2007–2015, a vast majority of the stock purchased to supply the railway transport system in Poland was produced by **domestic producers**. Owing to this procurement, the home industry of rolling stock producers has successfully expanded its potential and export capacity. The railway engineering industry encompasses a larger number of domestic companies than the road construction sector. The main companies on the rail transport market in Poland are with state or local authority share.

Considering Poland's role in Central Europe, as well as its size and location, a properly structured and organised system of railway transport of people and goods may strongly affect **regions located at the borders of neighbouring countries** and become a hub for distribution of goods carried to Europe by railway from Asia, within China's **Belt and Road Initiative**. For the abovementioned reasons, increasing the share of railway transport in the mode division of services enhances the GDP growth and increases employment rate, wages and tax income.

3. RAILWAY IS FAVOURED BY EU FUNDING

Public transport, including railways transport, is **egalitarian**. As opposed to individual road transport, it can be accessed by everyone, regardless of age or health condition. This means of transport is favoured by **horizontal policies of the EU** not only because of its nonexclusive character, but also due to its least harmful environmental impact and overall efficiency (including the smallest demand for space as compared with transport capacity). The focus of EU actions associated with transport is to create an effective domestic and international market for the transport of people and goods. One of its components is a **single, open and competitive railway market**, which decreases the share of road transport in the transport sector, thus integrating the principles of sustainable development through **reduction of greenhouse gas emissions** and allows to **meet the transport needs** of EU countries (see White Paper on transport, *Roadmap to a single*

European transport area —towards a competitive and resource-efficient transport system, Publications Office of the European Union, 2011, pp.4 and 9); for reference on greenhouse gas emissions reduction policy in relation to transport, among others (see Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a roadmap for moving to a competitive low carbon economy in 2050, http://eur-lex.europa.eu; for reference on meeting the transport demands see S. Holder, Recent Developments in Rail Infrastructure Charging in The European Union, Journal of Transport Economics and Policy (1999) Vol. 33, Part 1, p. 111). For the abovementioned reasons, EU prioritises investments in railway transport.

D. THE SHAPE OF THE RAILWAY NETWORK IS A KEY SYSTEMIC CONSTRAINT OF COMPETITIVENESS OF RAILWAY TRANSPORT IN POLAND

1. POLAND'S RAILWAY NETWORK HAS BEEN SHAPED BY HISTORIC EVENTS

Pre-1989 period. The shape and development of the railway network was significantly influenced by **Partitions of Poland**. Railway infrastructure was not constructed as a unified system serving the whole country. Poland's railway infrastructure is composed of parts of railway systems that provided services for peripheral areas of 19th century empires. These parts are, to some extent, complemented and integrated with scarce, but key for the functioning of the whole network, routes constructed **during interwar Poland** and, to a lesser extent, between 1945 and 1989. A substantial part of railway investments made in the **communist period** was not caused by internal demands, but carried out in response to military and economic dependence upon the USSR. Apart from the Central Rail Line and the Broad Gauge Metallurgy Line, these do not play an important part nowadays.

In 1989, the percentage of people travelling by rail in Poland was one of the highest in Europe, but apart from few exceptions, this resulted from a lack of alternative rather than attractive transport offer. Despite its citygenic potential in the communist period, the railway's development was detached from that of the cities. Railway areas were restricted, excluded from urban planning and development. Railway stations were not integrated with the subsystems of public transport and their location often disregarded the existing or planned centres of city development. Railway passenger systems often had a different ticketing system than the local transport. There was neither any coordination between timetables. Apart from few exceptions, the situation did not improve significantly after 1989. The development of individual car transport caused a massive passenger withdrawal from the railway transport in Poland, which has been stopped only recently.

Liquidation of railway network. After 1945, apart from network development, there were also three periods of railway liquidation in Poland. The first one affected 1.43 thousand km of railway lines, which were not rebuilt after they had been damaged in Second World War and dismantled by the USSR Army. The second period took place in the 1960's and affected about 220 km of lines. The third phase of infrastructure liquidation was started in the 1980's, with a peak phase at the turn of the 21st century. Between 1990 and 2005 the length of operating railway network in Poland was reduced from 24 thousand km to 19 thousand km. It was an unprecedented reduction on a global scale at that time, as many developed countries were already experiencing a significant revival of railway transport. In a result of liquidation of railway networks scheduled after 1946, over **107 towns** and **245 municipalities** were left without railway service (M. Falkowski, M. Pytel, *Analiza geopolityczna aktualnego stanu sieci kolejowej w Polsce*, Przegląd geopolityczny 2014, Vol. 9). After 1989, the national railway network was no longer developed and the newly constructed elements

encompassed only site investments, such us routes to airports or slip and side tracks that improved train handling.

The decision to focus on modernisation of existing network resulted from the fact that there were not enough investments, in terms of constructions as well as repair, in the first fifteen years after the fall of communism in Poland.

2. BASIC DISADVANTAGES OF THE CURRENT RAILWAY NETWORK ARRANGEMENT IN POLAND

Lack of railway infrastructure. There is no adequate infrastructure in the central hub area, in Łódź and Masovian Voivodeships, which could connect the hub with the remaining regions in Poland. This is a rare and highly unfavourable situation, as geographical characteristics naturally predispose the region to function as a hub in the national transport system. This results from the country's regular shape, as well as from the location of the Central Metropolis — the main urban area and an economic and decision-making centre ––in the central part of Poland (see above).

"**The first mile**" **issue.** Although the majority of transport and logistics systems faces a problem of "the last mile", i.e. of providing services to users at the ends of a network, Poland's railway infrastructure is characterised by the lack of "first mile" — a hub with the highest utilisation capacity — which significantly inhibits organisation of a well-functioning transport system.

Varied railway network density. Railway network in Poland has not been evenly arranged. Areas with a relatively dense railway network are accompanied by areas with almost no rail services. The railway density indicator, calculated by the length of a line per 100 square kilometres, for the Silesian Voivodeship is 17.7 km, and for the least developed, Podlaskie Voivodeship it is 3.89 (*Public transport sustainable development plan for a network of regional and international passenger carriages in railway transport Regulation of the Minister of Transport, Construction and Marine Economy of 9 October 2012 Official Journal of the Republic of Poland item 1151 as amended*). The indicator for Masovian Voivodeship, the largest, wealthiest and most populated region in Poland is 4.8.

Unsuitable arrangement of railway infrastructure. Another consequence of historic events is an unsuitable infrastructure arrangement (existing one or the one that can be recreated in historical corridors), even in areas where it once had been relatively dense. This arrangement is not optimal as a majority of central rail lines does not lead to the centre of Poland, but in directions of capitals of countries, whose demand was to be supplied by the infrastructure. Even areas with historically dense railway network are deficient in routes leading to the central part of Poland. In eastern Poland there are no routes directly connecting the main urban areas, such as Lublin, Białystok and Rzeszów. Due to above-mentioned circumstances, it is difficult to create a coherent transport system, adjusted to national demands. At the moment, efforts are undertaken to change this situation.

3. RESULTS OF UNSUITABLE ARRANGEMENT OF RAILWAY NETWORK

Non-competitiveness of railway transport. Railway transport cannot compete with road transport, whose infrastructure is continuously developed to adjust it to national transport demands. Despite a relatively dense network, as compared to other EU countries, the railway in Poland is characterised by significantly lower network utilisation indicators and lower number of travels per average inhabitant. Average yearly number or railway travels in Poland is below 7, as compared to 17 in Czech Republic, 32 in Germany, 71 in Switzerland and

in Japan it exceeds 100. This results from a low demand for transport services: in Poland the passenger rail usage (the total length of routes covered by trains), calculated per inhabitant is 3 km, as compared with 12 km in Czech Republic, 13.5 km in Germany and over 23 km in Switzerland. In many regions in Poland the carriers do not use the existing infrastructure, because the offered times of travel decrease the attractiveness of railway transport's offer. Infrastructure arrangements are **key constraints** limiting the development of a broad and universal transport system that could ensure common and defined standards for the whole country. The Government is making efforts to eliminate these constraints.

Poor railway connection with the centre of Poland. The regions with poor railway communication with central Poland include such main urban areas as Wrocław or Rzeszów.

Crucial cities without railway services. There are about one hundred cities in Poland with population exceeding 10 thousand inhabitants, amounting to a total number of 2.1 million inhabitants, that do not have access to railway services. For comparison, there is only one such city in Czech Republic, 8 in Slovakia, 6 in Hungary and 5 in Austria. The total number of inhabitants without railway services for cities in Hungary, Czech Republic, Austria and Slovakia does not exceed 290 thousand. The largest city in Poland excluded from railway service has population of 90 thousand, as compared to 31 thousand in Czech Republic , 20 thousand in Hungary and 15 thousand in Slovakia and Austria (data provided by the Centre for Sustainable Transport Foundation, data for 2014).

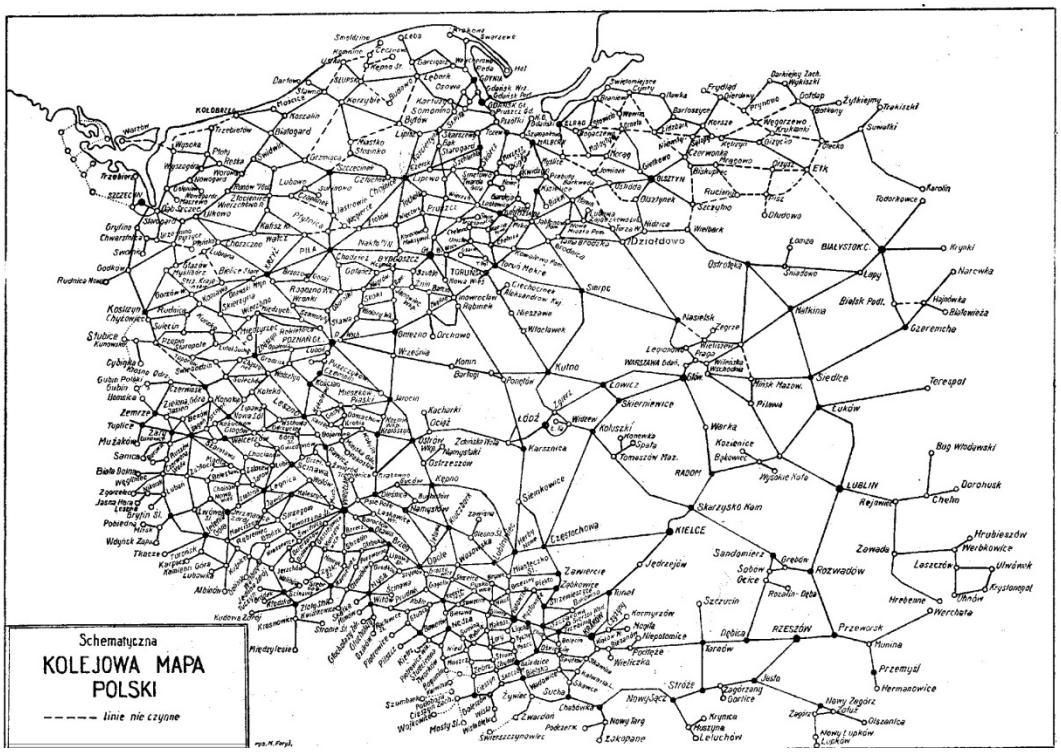
Limited integration of urban areas. Some groups of urban areas in Poland could form infrastructurally and functionally integrated agglomerations, if provided with adequate railway services, yet this potential cannot be used due to infrastructure deficits.

Limited tourism potential. It is mostly tourism areas that are excluded from railway transport. Due to the importance of transport for this economic branch, this exclusion deteriorates the regions' development perspective. Areas historically dense railway infrastructure are also frequently excluded. This infrastructure, if well-organised and with the use of optimal technology, could serve the local transport system in an economically justified manner, simultaneously composing the national transport system.

IV. RESULTS OF ANALYSIS UNDERTAKEN TO DATE FOR THE CENTRAL TRANSPORT HUB AND CHANGES IN THE RAILWAY NETWORK

A. WORKS ON THE CONCEPT OF RAILWAY NETWORK DEVELOPMENT SO FAR

Pre-1989 period and current status. After the border rearrangements that followed the Second World War and due to the character of communist Poland, investments associated with railway network development in the country were not related to internal demands. The main railway investments were carried out according to military and economic demands of the USSR.



The **Central Rail Line** was an exception. Its aim was to establish a quick connection between the largest urban areas in Poland — between Upper Silesia and Kraków agglomerations and between Warsaw and Tricity. This highly innovative project was carried out only on the southern end. The northern end, leading to Tricity, was not constructed, despite the fact that land was expropriated on some part of the route and the construction had started. The construction of the Central Rail Line, as well as the construction of the Broad Gauge Metallurgy Line were historically the last big railway investments carried out in Poland. In the 1980's, there was an attempt to develop "Regional Traffic Railway" ––an agglomeration system integrating the cities of the Upper Silesian Industrial Region and Dąbrowa Basin — yet it was abandoned few years later. After 1989, there were no formulations of a comprehensive concept of the national railway infrastructure development that would include network integration based on the established model of transport organisation and that would secure coherent transport within the country's network.

High-speed rail service. There have been a dozen or so official and feasibility studies published on the development of high-speed rail service in Poland, yet this did not result in any decisions to develop this subsystem. The most important of these studies include: "*The study of routing of rail lines of V>300 km/h (Berlin) - Kunowice - Warsaw - Terespol - (Minsk –Moscow) in Poland*" (Kolprojekt, commissioned by the General Directorate of the Polish State Railways, 1993)"*The initial feasibility study for East –West high speed rail service network*". (CNTK, commissioned by UIC, 2002), "*Passenger Traffic Study 2020 Poland and Czech Republic*" (Intraplan Consult GmbH, IMT Trans i INRETS, commissioned by UIC, 2003), „*PEGAZ Project*" (Concordia Consortium, 2003), „*High-Speed Rail Development Opportunities in Central and Eastern Europe*" (CENIT Barcelona, commissioned by UIC, 2004), „*High-Speed Rail Development Opportunities in Central and Eastern Europe - Stage 2*" (CENIT, commissioned by UIC, 2005), „*Initial Feasibility Study concerning the Construction of High-Speed Rail Wrocław/Poznań - Łódź - Warsaw*" (CNTK, commissioned by PKP PLK, 2005) , „*High-Speed-Rail Design for Poland under European Transportation System*" (Silesian University of Technology 2005), „A *Concept for Organizing Construction and Exploitation of High-Speed Rail in Poland. Stage 1 – formation of a Special Purpose Vehicle*" (CNTK commissioned by PKP S.A., 2007), „*Programme of Construction and Launch of High-Speed Rail in Poland*" (Inter-Ministerial High Speed Rail Task Force 2008), „*Analysis of*

Conditions for Construction of Cross-Town Railway Tunnel under Łódź City Centre" (SITK Łódź commissioned by Roads and Transportation Board in Łódź, 2008), „*A Concept for High-Speed Rail Route, including Location of Intermodal Hub within Kalisz-Ostrów Wielkopolski Urban Agglomeration*"(Zakład Usług Projektowych, Inwestycyjnych i Eksploatacyjnych [Design and Investment Services] in Szczecin and SITK Łódź, commissioned by Kalisz Town Commune, Ostrów Town Commune, Nowe Skalmierzyce Town Commune, 2009), „*Preparation of a Feasibility Study, Tender Documentation and Tender Materials to Accompany an Application for Funds from Cohesion Fund under Operational Programme: Infrastructure and Environment and Obtainment of Necessary Administrative Decisions for the Purpose of Modernizing Warsaw – Łódź Railway Line, Stage 2, Lot B, Łódź Widzew - Łódź Fabryczna Section*" (Sener, Kolprojekt and BPK Łódź commissioned by PKP PLK S.A., 2009), „*Feasibility study – Pre-Design Stage Documentation for «Modernization of E 65 South Railway Line » Grodzisk Mazowiecki - Kraków/Katowice - Zwardoń/Zebrzydowice – country border sections. Task No. 1. Grodzisk Mazowiecki- Zawiercie*" (Halcrow Consortium commissioned by PKP PLK S.A., 2010), „*Feasibility Study concerning Modernization and Extension of Warsaw Railway Hub constructed under TEN-T Project No. 2006-PL-92608-S. Preparation of an Undertaking «Modernization and Extension of Warsaw Railway Hub »*". *(Scott Wilson commissioned by PKP PLK S.A., 2010), „Feasibility Study concerning the Construction of High-Speed Railway „Warsaw - Łódź - Poznań/Wrocław*" (Consortium Ingenieria IDOM Internacional S.A. and Biuro Projektów Komunikacyjnych [Communication Designs Bureau] in Poznań Sp. z o.o. commissioned by PKP PLK S.A., 2012).

Central Rail Line Construction and Extension. Ideas concerning HSR construction in Poland were first voiced in 1970s. The layout of Central Rail Line, which has been constructed since 1971, is designed for maximum passenger train speed v = 250 km/h, and its basic technical parameters took account of the current state-of-the-art solutions in the scope of railway construction, such as Tokyo - Osaka, Paris - Lyon, Rome - Florence. The existing southern section of the line was opened for use in 1977 - 4 years prior to launching the first European high-speed railway line TGV Paris - Lyon, after which the construction was held, as were the other works concerning the network extension. In 1990s Central Rail Line was to have been adjusted to the velocity of 250 km/h, according the design; the line was to be extended by building the northern section, and the southern part was to have been extended to Bielsko-Biała and further to Ostrava, new railway lines Warsaw – Łódź - Poznań were to have been built, along with the connection of Wrocław with Central Rail Line new high-speed line from Idzikowice through Bełchatów to Kępno (and further along the existing line to Wrocław). That concept provided for the completion of the investment in 2030, but the works were not continued.

High-Speed Railway. "Y" Line Construction. The only project which was approved for implementation at the central level post 1989, and which involved extension of the network to include important components of new lines was the High-Speed Railway („Y" HSR) which, due to technology applied, was treated as an individual sub-system of transportation. The project involved connecting Warsaw with Łódź, Poznań and Wrocław by means of a very high speed rail V_{max} 350 km/h. On 19 December 2008 the Council of Ministers resolved to adopt a „*Supra-Regional Strategy Programme – Construction and Launch of High-Speed Railway in Poland*". In order to prepare for the project implementation, in 2010 a „High-Speed Rail Centre" was formed within PKP PLK structures and a feasibility study was commissioned, including i.a. selection and agreement of optimum routes, recommendations concerning the manner of implementation, environmental and economic studies . The estimated value of the project amounted to PLN 28 billion, of which the cost of trains (35 trains) was estimated at PLN 3.2 billion, and the annual cost of maintenance (infrastructure and trains) – PLN 300 million. Project's advocates underlined its qualitative and advanced civilization character, as well as a strong image effect for Poland. Arguments for the project included inter alia: the influence of modern and high-speed railway on regional development. It was also expected that the implementation of new technologies in railway sector will contribute to significant technological progress in that branch. Attractive offer for passengers – following the

construction of HSR – was to ease road traffic and the number of road traffic casualties and to improve the environment.

Project Criticism and Abandonment. „Y" line construction project was, however, also criticised. The criticism concerned very big cost of the undertaking, at the investment level and at the maintenance level. Further arguments against the project underlined that the expenses will be made for the task, the implementation of which would, contrary to declared objectives, not bring a radical improvement of transportation system quality from the point of view of the whole network. Its opponents held that the line will constitute a **new hermetic sub-system** dedicated to servicing a few urban centres, some of which were already well connected with Warsaw. The constructed sections of railway could only be used by super-fast trains. The use of HSR trains on other sections of the network would mean the trains moving at a **half slower speed** than the one for which the railway was designed and constructed for such a big money. The criticized aspects of the project were related with the adopted technology of constructing the railway adjusted to very high speeds (300-350 km/h), which meant significant increase of **costs related with trains** and **with maintenance of the whole infrastructure upon construction.** At the same time doubts were raised as to the correct adjustment of technology to the **country's settlement structure**. The selected technology required buying trains from **foreign suppliers**, as the know-how of domestic industry was insufficient for its involvement in the project, which assumed the train speed of 300-350 km/h. Very high-speed technology in fact forced the project implementation **without division into sections** (for example while making use of the existing fragments of railway). Finally, doubts were also raised as to **time saving** of the technology assuming the speed of more than V> 300 km/h, in relation to technology assuming the speed 200-250 km/h. For the longest section of the project, i.e. the route Warsaw-Łódź-Kalisz/Ostrów-Poznań it was only approx. 16-18 minutes. Thus, although the economic analysis from the feasibility study pointed to positive effects of the undertaking, due to excessive cost of the project, in December 2011 the Council of Ministers cancelled its implementation.

Purchase of HSR adjusted trains. In 2008 prior to adopting the governmental programme, PKP IC announced a tender for purchasing the first high-speed trains in Poland, with V_{maks}=250 km/h, as a result of which – in May 2011 a EUR 400 million worth contract for supply of twenty ED250 trains was signed. The trains were delivered in 2013-2014, but due to infrastructural reasons (abandonment of HSR project) their capabilities cannot be used to the fullest possible extent on either domestic route (and in case of implementing the HSR project option involving 350 km/h their parameters would be below the parameters of the constructed infrastructure). This purchase was criticised by the Supreme Audit Office in the report on PKP S.A. in 2016 due to lack of infrastructure adjusted for the trains capabilities. Despite failure to use their maximum capabilities, high quality brand new trains improved significantly PKP IC image and attracted numerous new clients – in particular on the routes where they are undoubtedly competitive with road transport in terms of travel time.

Abandonment of works on railway network extension. Apart from HSR and sections connecting urban agglomeration centre with local airports, the "*Masterplan for Railway Transport in Poland by 2030*" (19 December 2008) also provides, in its part dedicated to the construction of new lines, for "construction of connections which make up for significant gaps in the railway network". However, apart from that general declaration, since 2008 no relevant project has been developed or implemented. The only new railway sections constructed after 1989 by the government were those connecting with airports. A cross-city railway tunnel under Łódź for commuter trains was the most important new section under the National Railway Programme passed in 2015, and the amendment of KPK in 2016 extended the short list to include the construction of a new line Podłęże - Tymbark /Mszana Dolna.

B. HITHERTO WORKS ON THE CONCEPT OF CENTRAL AIRPORT FOR THE REPUBLIC OF POLAND

1. A REPORT OF INTER-MINISTERIAL, INTERDISCIPLINARY TEAM FOR SELECTING THE LOCATION FOR CENTRAL AIRPORT FOR POLAND (2003)

Background. Work on a construction of an airport to substitute the Warsaw Okęcie Airport were conducted as early as in the communist times (see: Annex to a Report of Inter-Ministerial Interdisciplinary Team for Selecting the Location for Central Airport for Poland of 2003, hereinafter: The 2003 Report „Description of a selection of new airport location for Warsaw – a project implemented in the period 1971-74"). However, it was the works conducted in **2003-2013** which were the most important. The first document produced as a result of the work was a *Report of Inter-Ministerial Interdisciplinary Team for Selecting the Location for Central Airport for Poland* (hereinafter: The 2003 Report). This document focused on the location of the central airport. The analyses were based on earlier findings (see i.a. Description of the location of a new airport for Warsaw – a project implemented in the period 1971-74, attached to the 2003 Report). The work engaged a broad range of experts and representatives of central institutions (i.a. Minister of Finance, Minister of Home Affairs and Administration, Minister of National Defence, Minister of Environment, the Sejm Infrastructure Committee, Civil Aviation Board President, Mazowiecki Voivod, The Mayor of Warsaw, the President of the Management Board of Polish State Railways, Director General of the State Enterprise "Porty Lotnicze", Warsaw University of Technology, Interdisciplinary Centre for Mathematical And Computer Modelling of the University of Warsaw). Reference was made to domestic as well as international solutions. One has to underline that the Report was developed in the pre-accession period, when the Polish transportation system was only preparing for integration with the EU transportation system.

Assumptions concerning the future airport. The aim of the Report was to make a short-list of the most favourable locations for the new Central Airport. In order to do this, some concrete assumptions had to be made concerning the construction of the future airport. The Report was based on the following assumptions:

- The airport was to be designed as low-budget and environmentally friendly (i.e. fully accessible for users and minimizing environmental pollution);
- The concept provided for modular development of the airport in stages, depending on the needs and weather conditions;
- The airport was to be an intermodal hub adjusted to the transport of passengers, cargo, mail, transport of medical patients, and to *"general aviation" purposes*, operating 24/7, and connected with direct railway with Polish cities and European airports, as well as with a highway;
- The surface area of the airport, including the restricted use area, was to be **7,300 hectares** (of which: the airport area **1.300 ha**);
- The airport was to be ready for adjustments, depending on the needs, to service big and small planes;
- There should be a possibility to service transit flights in a H&S model, with MCT = 15-20 min.;
- The travel time to the centre of Warsaw by public transport was not to exceed 15 minutes;
- There should be a possibility to build two parallel runways of 4000/60 m in east-west direction with a separation of 2000 m;
- The maximum capacity of the airport was to reach **500 thousand** operations per year and **70 million** passengers per year, in the first stage the airport was to serve only approx. 12 million passengers.
- The airport was to fulfil the reference code requirements and landing CAT 4E (F), III A or higher.

Selection of location – initial requirement. Selection made in the Report was based on locations named by local government units. Having treated the local government's initiative in naming the location as initial requirement, seven potential locations were chosen, namely: Wołomin (approx. 25 km away from Warsaw), Modlin (approx. 40 km away from Warsaw), Radom (approx. 100 km away from Warsaw), Nowe Miasto n. Pilicą (approx. 90 km away from Warsaw), Babsk (approx. 70 km away from Warsaw), Mszczonów (approx. 55 km away from Warsaw), Sochaczew (approx. 45 km away from Warsaw).

Criteria for selecting location. When selecting the locations from among those named by local government units, the Team considered the following criteria:

- **local factors**, i.e. national communication accessibility (existing and planned roads and railways), communication access to Warsaw and other urban agglomerations; availability of land for building the airport (ownership structure and land purchase mechanisms); catchment area and air traffic forecast; possibility to operate cargo flights; operational conditions (availability of air space, freedom of conducting flight operations 24/7/365, lack of collision with other airports, flight obstructions, weather conditions, etc.); possibilities in the scope of accompanied services (logistic base, hotels, leisure area, emergency medical services, police services, etc.), purpose defined in the Zoning Plan; trans-European road and railway connections; existence of airports;

- **environmental factors** , i.e. the lowest possible environmental costs of airport construction and operation;

- **economic and financial factors**, i.e. impact upon regional and national development, cost and date of airport launch, capex, profitability and return on investment, development possibilities of the new airport, technical requirements for construction, availability of human resources to work at the airport and approval of local authorities.

Selection of location. Modlin and Mszczonów were assessed as the best locations.

Scope of further analyses. The team assumed that further analyses should include the development of a model of division of functions which are to handle particular traffic segments (timetable flights: domestic, middle-range international, long-range international, chartered flights, all-cargo flights, General Aviation, LCC, sports aviation, aviation training, etc.) and a model of distribution in time and taking over by the new airport of particular traffic segments and the related development of airport infrastructure and surrendering infrastructure.

2. Feasibility Study of a project „Central Airport in Poland" (2006 r.)

Background. On 12 May 2005, a contract was signed by the President of Civil Aviation Board and Director General of INECO-SENER consortium for conducting a feasibility study concerning the project „Central Airport in Poland" (hereinafter: The 2006 Study). The Government of the Kingdom of Spain in collaboration with the Government of the Republic of Poland allocated EUR **532 thousand** for the document development. The funds originated from FAD – Spanish Development Aid. According to the document INECO and SENER, as a part of the project team of engineers and designers, were assigned by the Polish Ministry of Infrastructure with a task to prepare a number of studies, concepts and proposals concerning the new planned Central Airport. *„Strategic goal of the project results from a need to guarantee a feasibility of the new Warsaw Airport in a definite*

location near the towns of Babsk and Mszczonów when Fryderyk Chopin International Airport achieves its maximum development".

Passenger traffic forecasts. The Report assumed a forecast by 2050 only for Central Airport. The assumption from the 2003 Report, according to which the airport target was 70 million passengers, was sustained. Moreover, the Report included forecasts concerning regional airports. The forecasts were done in three variants: optimistic one, baseline scenario, and pessimistic one. According to baseline scenario, the forecast for the Central Airport assumed **32.8 million** passengers in 2035 and **50 million** passengers in 2050. The forecasts took account of domestic and international traffic, number of O&D passengers, number of transit passengers, cargo, various types of planes, number of passengers in peak hours.

Methodology of demand analyses. The Report generally analysed economic demand situation in the context of the Central Airport. GNP forecast in pessimistic (2.5%), baseline (3.5%) and optimistic (4.5%) variants was a key indicator when constructing forecasts. No other economic and social conditions in Poland or abroad were took account of for the Central Airport construction. The Report included an analysis of aviation market targeted at airlines and airports (account taken of direct international competitors of the Central Airport).

Methodology of analysing infrastructure and limitations for WAW and particular other airports. The Report does not provide for an analysis of infrastructure and infrastructure capacity of the Warsaw airport. Neither did the Report include information on WAW capacity at forecast traffic indicators, however, the authors of the Report indicated that in 2012 WAW airport's capacity will have been exhausted. An analysis of infrastructure and capacity of regional airports was not provided, either.

Assumptions adopted as to the future airport. A number of concrete assumptions were provided in the Report as to the new airport. Some of them modified the assumptions adopted in the 2003 Report. In particular, due to a need to ensure the development of the Central Airport, the surface area was increased from 1300 to 2000 ha.

Proposed location of the new airport. The Spanish consortium presented a few possible locations, assuming the locations analysed in the 2003 Report as a starting point. It was underlined, however, that the method of selecting location for Central Airport was problematic, namely the selection of locations named by the interested local governments instead of locations deemed optimal by Civil Aviation Board or by "Porty Lotnicze" Enterprise". During the Consortium works it turned out that the location in Mszczonów, which was analysed in the 2003 Report, offered only 700 ha instead of the required 2000 ha of surface area. Due to this fact the Consortium suggested an analysis of two new locations – a new location in **Mszczonów** (half of which belonged to the town of Mszczonów, and the other half to the Mariańska Primeval Forrest) and another location in Baranów (39 km away from Warsaw). The new location in Mszczonów was deemed the most favourable from all the locations considered.

With reference to **Baranów,** the Consortium concluded that it is only 36 km away from Warsaw, near a junction of two main railway routes of Easter Europe and only two miles away from the planned A2 motorway. The size of the analysed land lot enabled the construction of two 4000 m long airstrips located on the east-west axis. At the same time it was said that the location of the airport in Baranów is based on uncertain development of infrastructure (in particular high-speed rail) and would require investment to be made on the land, the ownership structure of which is quite fragmented, and moreover – according to the consortium's findings – the Baranów location has not hitherto been supported by administration and has not been defined precisely. Hence, the Consortium indicated that further studies are necessary to establish if the Baranów location may be the location of the Central Airport (see: the 2006 Study, *Assessment of Interministerial and Interdisciplinary Report of the location for the Central Airport in Poland*, p. 42).

The Consortium also made a reference to Modlin. Although the location was accepted for further deliberations, together with the other locations in Mszczonów and Babsk, one noticed, however, its distant location from regions which featured the highest economic development (and the consequential lack of a possibility to develop intermodal logistics), as well as potential environmental problems which hinder the development of an airport in this location. In the light of those findings the Consortium concluded that only Babsk and Mszczonów fulfil the requirements for development of modern multimodal and efficient airport, due to their proximity to the main communication and economic centres as well as investments made in the neighbouring area.

Opinions of the Report's authors concerning the maintenance of WAW and the Central Airport simultaneously. The authors excluded simultaneous operations of the CPL and WAW. Moreover, the authors of the Report did not analyse the construction of a network of airports in Mazovia in case of closing WAW airport.

Costs and benefits resulting from CPL construction or WAW extension. The authors of the Report calculated that the cost of CPL construction will amount to EUR 1.362 billion on assumption that it will start operation in 2012, with initial capacity of 25 million passengers. The total value of capex by 2050, i.e. by the achievement of the capacity of 50 million passengers was to amount to EUR 2.2 billion. It was indicated in the Report that in 2004-2005 WAW generated EUR 1.6 billion worth of direct, indirect, induced and catalytic effects for the economy. At the same time the authors of the Report presented an analysis of planned economic advantages to be generated by CPL. According to the Report, should the airport start operation in 2012, it would generate EUR 5.4 billion, and in 2035 it was to generate EUR 19 billion. The authors did not, however, compare the benefits and costs for the airport and for the economy between the extended WAW and the constructed CPL. The Report included a financial analysis of the investment in two variants – with public funding and with public-private funding. According to the Report, funding with external capital would be more effective, the NPV (net present value) ranging from EUR 279.3 million to EUR 756.1 million.

The question of airport attractiveness for passengers and airlines. The authors of the Report did not analyse the airport attractiveness for passengers and airlines.

Technical analysis of the airport construction. The Report provided for a detailed technical analysis of the planned CPL. The analysis took account of the airport infrastructure as well as its location, communication with particular means of transport, weather conditions, topography and possibility of the airport further development. The authors also defined stages of the airport development account taken of assumed forecast demand of 50 million passengers in 2050 and in further period - 70 million PAX. The initial capacity at opening was to amount to 12.5 million PAX. The Report also provided for an analysis of transfer of traffic from WAW to CPL.

Possible extension of WAW. The Report did not include an analysis of a possibility to extend WAW.

Assessment of the airport competitiveness from international perspective. The Report included CBA analysis which assessed the impact on economic benefits of passengers, carriers and the airport, both including the variant with CPL as well as without it - NPV was estimated at EUR 2.293 billion.

Expected deadlines concerning preparation and implementation of the project. The authors assumed that CPL will start operation in 2012.

3. THE CONCEPT OF A CENTRAL AIRPORT FOR POLAND – ANALYSIS (2010)

Background. In 2008 a tender procedure was announced for the subsequent analysis of central airport location

in Poland. The contract was awarded in 2009 to PricewaterhouseCoopers (PwC), which prepared a analysis entitled. *„The Concept of a Central Airport for Poland, Analysis"*. The cost of the analysis exceeded PLN **11 million**, of which more than PLN 7 million intended for that purpose originated from the EU funds. The analysts identified the hitherto situation of the Polish air transportation market and the most important trends in the market development. The analysis took account of the impact of a new central airport on Polish regional airports. Also, possibilities were analysed concerning the development of cargo transport by air. The analysis took account of the development of modern infrastructure of other branches of transport, as well as costs and benefits concerning possible scenarios of CPL development. The analysts concluded that the construction of a new central airport in Poland is beneficial for the development of Polish air transportation sector. Moreover, the construction project was assessed as more attractive financially than the extension of WAW. It was also indicated that the development of air transportation market, which is under way in Poland and in Europe, justifies the construction of a new airport hub in Poland.

Passenger traffic forecast. The Report assumed a 2035 forecast (with interperiodical forecast for 2015 for WAW and 2025 for CPL) in three variants (pessimistic, baseline and optimistic ones) with strong and weak carrier. The total of 18 variants were presented in the Report. Finally, reference variants with existing WAW and CPL in 2035 were chosen for comparison, with the assumption of a strong carrier. The forecast related to the whole system of airports in Poland as well as to each individual airport, including CPL and WAW in the particular scenarios. The Report also included demand forecast and catchment areas for other airports in Poland, including the then non-existing PL Olsztyn - Mazury. The forecast separated traffic into categories according to distance, destinations, type of flight (freight, LCC, chartered, traditional), type of traffic, O&D and transit.

The forecast was as follows:

- for Poland: 78.2 million passengers in the scenario including CPL; 75.1 million in the scenario with WAW;
- for airports: 35.0 million passengers for CPL; 31.7 million for WAW.

Domestic traffic was to account for 5.5% of the whole traffic in the airport. According to PwC, the forecast volume of traffic for CPL was to be an argument for CPL construction. According to the forecast, CPL was to generate 3.3 million more passengers, including 2.8 million more transit passengers.

Methodology of demand analyses. The Report also provided for analyses of conditions for generating demand which was necessary for CPL to exist. The authors took account of the state economy, its development forecast as well as world economic trends. The forecast was prepared for pessimistic, baseline and optimistic variants. The key indicator for the authors was the GNP forecast in pessimistic (2.5%), baseline (3.5%) and optimistic (4.5%) variants. A full analysis of aviation market was made (passengers, airports, airlines, ANSP), including the analysis of preferences of Polish passengers in Polish and international airports. The Report included mobility of Polish and international air passengers as at the date of the Report, as well as forecasts for 2015, 2025 and 2035 in optimistic, baseline and pessimistic variants. The Report defined economic and demographic potential of particular regions in 2035, with Mazovia and Lesser Poland being identified as having the biggest potential. Also, the impact of a domestic network carrier on operations in the airport was described in the Report. According to the assumptions, it should cause increase in the number of transit passengers by approx. **2.7 million per annum**.

Methodology of infrastructure analysis and limitations for WAW and particular other airports. The authors analysed the capacities of all Polish airports. Current and future infrastructural limitations (airside, landside, cargo, navigation infrastructure) were analysed for all the existing Polish airports, account taken also of the planned investments in those airports. Capacity limitations were analysed in all 18 variants of the forecast

demand for air services in those airports, account taken of WAW and CPL variants with strong/weak carrier and in pessimistic, baseline and optimistic variants. The analysts defined periods when expected capacity limitations would occur in particular scenarios, as well as where those limitations would occur in the airports. They also described necessary extension in case of WAW, so that it is able to handle the expected number of passengers in 2035, the impact of this number on external surroundings, as well as external limitations for the investment projects. The Report also included a forecast concerning the impact of WAW extension on the capacity of other airports. Moreover, an analysis was included of CPL impact on airport infrastructure in other airports and future limitations thereof.

Conclusions of the Report concerning this issue were as follows:

- the majority of airports is going to suffer from limited capacity in the next dozen or so years; the most serious limitations were to affect WAW, KRK, SZZ and BZG. The authors of the Report foresaw that WAW will have the biggest problem with capacity;
- the first limitations in capacity were expected in 2012. The capacity was to be exhausted in 2020. The authors of the Report recommended a launch of the new airport in 2020; a relevant decision to build the airport should be made in 2013 and the construction works should start in 2013;
- according to the Report, the influence of WAW extension on the capacities of other airports should not be big;
- the influence of CPL construction on the capacities of other airports should also be small.

The report provided for an alternative of extending the Okęcie airport. However, the costs as well as external limitations (required land surface, environmental and operational requirements) could frustrate the extension plans.

Proposed location of a new airport. The Report did not point to a specific location of CPL. However, all the analysis made for the purposes of the Report relied on the location between Warsaw and Łódź in the direct proximity of the A1 and A2 interchange and the high-speed railway line planned for the future.

Opinion of the Report authors on the maintenance of WAW and CPL simultaneously. The authors of the Report excluded simultaneous operation of CPL and WAW. According to the authors of the Report, CPL, following its full launch, will not have attracted sufficiently big number of passengers in 2035 if Okęcie and the other airports function simultaneously. With the Okęcie configuration as at the date of the Report, the airport was unable to handle the expected number of passengers by 2035, as a result a need arose to build another airport for servicing the Warsaw urban agglomeration.

Costs and benefits resulting from CPL construction or WAW extension. The Report included costs and benefits resulting from CPL construction and from WAW extension. The analysis prepared in three variants (pessimistic, baseline and optimistic ones) presented the cost of WAW extension (respectively EUR 3.055 billion, EUR 3.680 billion and EUR 4.3 billion before engaging the EU funds) and CPL construction (EUR 3.865 billion, EUR 4.340 billion and EUR 4.810 billion) – cost analysis included not only the construction itself, but also the cost of environmental impact, extension/creation of restricted use area, the cost of extending the Łódź airport, the costs of extending transport infrastructure. The analysis also showed potential benefits related with CPL construction – they were assessed at EUR 1.739 billion, EUR 2.297 billion and EUR 2.851 billion in pessimistic, baseline and optimistic scenarios respectively. Focus was made on benefits for the project (capex), for economy (taxes, jobs, income from land title transfer) and for other airports (limitation of PL Łódź airport extension). The Report also showed a qualitative comparison of variants as regards the distance to the city centre, environment (noise, emissions), safety, development and location potential, quality of services rendered by the airport. Based on the above mentioned analyses the authors of the Report unequivocally

assessed that the construction of CPL is more beneficial from the point of view of the project and the economy. The cost of the airport construction was to be by EUR 0.7 billion smaller than WAW extension.

Attractiveness of the airport for passengers and airlines. Differences in quality and attractiveness of services offered by CPL and WAW were analysed in reference variants. The analysts considered the distance of the airports from the city centre, transport connections with the centre, airport infrastructure, quality and quantity of services offered in both airports and impact of capacity limitation on the service supply, airport competitiveness and ability to attract air traffic, possible impact on WAW of the airport network in Mazovia and economies of scale concerning CPL operation. Considering all the above, the authors unequivocally assessed that CPL is more attractive than WAW. According to the analysts, CPL was to ensure higher quality of services to passengers and to airlines as well, and better intermodality perspectives, which was to influence the volume of passenger traffic at the airport and the decisions of carriers to open new connections from CPL.

Technical analysis of airport construction. The Report presented a basic comparative analysis (based on similar projects in other countries), concerning technical specification of the airport for the purpose of calculating basic financial figures. According to the analysts' assumptions, in 2035 CPL was to handle **35 million** passengers per annum.

Possible extension of WAW. According to the analysts, CPL has better possibilities for infrastructure development than WAW. WAW was to exhaust its capacity post 2035 even if it was possible to extend the airport. CPL, on the other hand, could operate for several decades since the opening.

Assessment of the airport competitiveness from international perspective. The Report provided for the analysis of CPL and WAW competitiveness in relation to foreign airports, especially Berlin-Brandenburg (still under construction) and PRG. The analysis included catchment areas of the foreign airports and their impact on competitive potential of WAW and CPL and passenger traffic volume which the airports are going to attract in two variants. Factors analysed included also the impact of means of transport on CPL and WAW competitiveness and increase of catchment areas of WAW and CPL. According to the analysts, the new airport's competitive potential was to be greater than that of WAW. Thanks to better quality of services offered by CPL, in case of construction thereof, was to be more competitive against foreign airports than WAW could be. Moreover, better connections and better location of the airport was to ensure broader catchment area (105 for CPL and 75 for WAW).

Impact of the airport on other participants of transport service chain. The analysts checked the impact of services provided on airlines and their abilities to operate and compete from this airport. The analysis showed that CPL, if built, was to clearly positively influence the competitiveness of airlines operating from this airport.

Expected deadlines for project development and implementation. Considering WAW development constraints expected in the future, the authors of the Report assumed that a decision to build CPL should be made in 2010. The construction should start in 2013 and CPL should start operation in 2020-2021.

Withholding of works. In January 2012 the Ministry of Infrastructure (MI) confirmed that it plans to construct the Central Airport, but 3 months afterwards the ministry executives denied it, their decision being justified i.a. with problems with possible funding of the project. Since that time the work on Central Airport has been suspended at the central level.

4. INTEGRATION OF THE CENTRAL AIRPORT WITH RAILWAY NETWORK

Government documents. Combining airports with railway transport as auxiliary and preferential means of transport for various sections of travel is commonly regarded as a desirable standard. It also goes without

discussion that mere local connections of an airport with a city (or with a railway station) do not fulfil this requirement (see: Guidelines of Airport Council International cited in the 2003 Report).

Thus, integration of the Central Airport with railway network was regarded as one of key factors when looking for location already in the **2003Report**. Its authors indicated that the future Central Airport must be an „intermodal transportation hub […] directly connected with a railway line with Polish cities and European airports, and having access to a highway". Other selection criteria included „existing and planned road and rail connection, communicative availability of Warsaw and other urban agglomerations", as well as „trans-European connections by road and by rail". As a consequence, the possibility of the Central Airport becoming an element of the system of PKP railway traffic was one of the main points of analyses conducted by the team of experts, who recommended Mszczów and Sochaczew locations. Advantageous connection with railway (direct access to Central Rail Line, on Berlin-Moscow railway crossroads and Central Rail Line – the need to construct short sections) were very strong advantages of the Mszczonów location.

The authors of the **2006 Study** were more conservative as their basic requirement was for the Central Airport to be connected with a railway line. The authors reserved that the solution to integrate railway with airport required further analyses, which would finally show whether one should choose a model of a HSR station at the airport (as at the Charles de Gaulle in Paris), or whether the HSR station in Warsaw should be connected with the airport by means of a shuttle train (as in case of Rome airport) (Feasibility Study for the Project „Central Airport in Poland", Doc. D Basic Airports Requirements, p. 74).

Again, more unequivocal and firm opinion was voiced by the authors of the **2010 Concept**, who indicated that the new airport should be constructed in a direct proximity of A1 and A2 intersection and the planned high speed railroad. „Since the Polish government accepts CPL to be one of the main tools of Poland's economic development by 2035, the airport will not be discriminated and will be developing in the same conditions of market competitiveness as other airports. This airport is also planned from scratch, so the design adopted is optimal for the achievement of intermodality (high-speed rail, motorways leading in all directions) […]". For the purposes of the analysis, an optimum configuration and connection of CPL with other means of transportation was assumed. The layout of CPL infrastructure was optimised so that contemporary safety precautions, passenger traffic and architecture enable travel time to be shorter and transport to be faster. In order to picture intermodality, the example of Frankfurt am Main was used.

Non-governmental contributions. The late **Bogusław Jankowski** and **Henryk Panusz, Ph.D.** were the first ones who thought about integrating CPL with railway network. In his article dated 15 March 1978, which was never published, B. Jankowski argued for extending Central Rail Line to the north and constructing an airport with an underground railway station for high-speed trains from Central Rail Line. The solution was to ensure that passengers could reach CPL within two hours. The concept was presented to PKP Director General in a document titled *„An outline of airport design within the Central Rail Line and Berlin-Warsaw motorway axis*". The concepts presented by B. Jankowski, and subsequently by Transport Integration Association (an organization founded by H. Panusz and B. Jankowski), were not, however, broadly discussed although the assumptions, on which they were based, were quite accurate.

The first design of an Intercontinental central airport located between Warsaw and Łódź, to be integrated with high-speed rail to connect the two cities, which was presented to public, was the concept of Warsaw-Łódź Binary City which was developed by a team led by **prof. Jacek Damięcki**. The concept, which was commissioned by the Warsaw Central Commune in 1996, assumed that the new airport will be located near Skierniewice and it will be the chief element to integrate Warsaw and Łódź cities into a major metropolis of Central and Eastern Europe. A polycentric metropolis of Warsaw and Łódź connected by common infrastructure was to be the main determinant of intensive development of central Poland, and was to prevent marginalization of Poland. A

location of the airport in Nowe Miasto n. Pilicą, pointed in a later period by J. Damięcki was analysed in the 2003 Report and was not approved.

In 2012 in an article on "*The Development of a State Transporation System*" (Rynek Kolejowy, 15.09.2012 r.) **Patryk Wild** and **Wojciech Zdanowski** (currently members of a Think Tank by the Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland) presented a concept of constructing an integrated aviation and railway hub called Central Transfer Point which, apart from being an airport would also be the main railway station within the domestic system of transportation, and which – thanks to its being connected by a network of new auxiliary transportation services to make up for gaps in the existing railway infrastructure – could ensure interconnectivity of all areas of Poland. According to this concept, Central Transfer Point would not only be an airport combined with a railway station. It would be the basic hub of the domestic system of passenger transportation, which was to be developed according to Hub&Spoke model. This concept was then presented at the 2015 Railway Congress, at the L. Kaczyński Institute and was presented (initially without pointing to its authors) in a Warsaw Enterprise Institute Report published on 29.03.2017 (http://wei.org.pl/files/manager/file-9fa1fcce51820b4fa2d6798a88030ce6.pdf).

On 14 March 2017 the Council of Minister's Economic Committee approved a recommendation for a development of Central Transport Hub to integrate aviation and railway traffic.

V. MISSION, VISION AND GOALS OF THE PROJECT

A. MISSION AND GOALS

The Project's mission is to develop an universal system of passenger transportation by means of constructing and operating a **profitable innovative transportation hub** which will become one of ten best airports in the world on the one hand, and which will cause redevelopment of the domestic **railway transportation system** to become an attractive alternative for road transport and to cover all the areas of Poland, while ensuring development and stable integration of the Warsaw-Łódź urban agglomeration.

1. GENERAL ASSUMPTIONS

Transportation hub. As provided for above, this document has been developed in connection with the intension to construct a transportation hub to combine aviation hub and railway hub. According to the information presented above, the CEE region must, due to its population, size and GNP level, have at least one aviation hub of global importance. The Republic of Poland is the one country in Central Europe which is best predisposed to have such an airport. Aviation market of Central and Eastern Europe has not been effectively consolidated yet, and the consolidation process will be following dynamically in the years to come. The economic interest of Poland and other countries of the region calls for a consolidation scenario which assumes a construction of a strong aviation centre in the form of a hub, which would aggregate significant portion of traffic from/to the region, including first of all intercontinental traffic. Solidarity Airport is not only an airport; it is also to be the main railway hub for Poland. The hub construction must assume the emergence of new means of transportation as well as full integration with domestic transportation system.

The pursuit of the above mentioned mission leads to redevelopment of the domestic passenger transport system as a system which is integrated with international transportation system, which is reliable and fast and which is accessible from all parts of Poland, as a system which lowers operating expenses, improves life quality, supports electrification of transport and as a system which is independent of imported raw materials and technologies.

An independent goal of the project concerned is to integrate the Warsaw-Łódź urban agglomeration, resulting in the formation of Central Metropolis – a strong economic centre on a global scale which, following infrastructural integration with the Southern Metropolis, is going to form one coherent functional Megalopolis with 20 million population (MegaRegion) – the area which may become an economic powerhouse of the Central Europe.

2. IN THE SCOPE OF AVIATION SECTOR

General requirements. As mentioned above, the mission of this project assumes a construction and operation of a profitable, intercontinental aviation hub to become one of ten best airports in the world. In order to achieve the goal, one has to take a number of actions related with the strategy of aviation market development and with the operation of the Chopin Airport in Warsaw, and with the construction and operation of the new airport. More detailed objectives originate from the above mentioned principal objective.

Aviation hub's profitability requirement. Profitability is the basic assumption on which the works concerning the hub's development are based. This prompts concrete conclusions to be drawn not only as to the strategy of

development of aviation market in Poland, but also as to further operation of WAW and the project development and implementation.

Among **strategic objectives** to ensure profitability of the future transportation hub one may list the following:

- **Ensuring a necessary development of transfer traffic by air until the opening of the Central Transport Hub.** The fulfilment of this requirement is necessary to ensure profitability of the planned undertaking. Thus, the state's strategic political goal in the scope of aviation market should be to ensure that transfer traffic in Poland keeps increasing. The above mentioned analyses indicate that the development of transfer traffic has a very positive impact on economy. Transfer traffic results from a number of long-distance connections available from the transfer centre (communication hub) and requires investment in network, by creating new connections to be correlated with the network of transport to the hub (local domestic and regional connections, in case of Poland chiefly CEE), and relevant connections within the catchment area of the hub.

- **Development of Intercontinental air connections to certain destinations.** Profitability of the hub is conditional on the development of connections to those destinations where Poland has major competitive advantage resulting from geographical, economic or political reasons. In case of Poland one can talk about such advantages i.a. in case of trans-Atlantic and eastern destinations.

  In case of trans-Atlantic destinations Poland's competitive advantage (which justifies intensive development of air travels to/from the USA) includes:

  - significant ethnic traffic, which is a natural basis for connections from Poland to the USA and Canada (Chicago as the second biggest Polish city in the world – a huge centre of Polish immigrants in the USA);
  - economic interests - USA as one of the biggest foreign investors in Poland and the whole CEE region;
  - making use of Poland's geographical location in the place which enables the shortest connections from CEE to the USA (great circle);
  - cultural community of CEEs – a hub carrier located in that part of the continent is able to prepare an interesting offer for communities of the same culture;
  - higher quality product – modern infrastructure + modern fleet of the transfer carrier, ensuring fast and comfortable journey and enabling to take over the traffic from the „old" hubs (a possibility of introducing preclearance procedure – all immigration procedure is done in departure airport, the flight is then treated as a domestic flight from the point of view of the USA).

  In case of eastern destinations, Polish competitive advantage is ensured by a very good geographical location from the point of view of connections with Western Europe, China, Central Asia and Kazakhstan. The One Belt One Road Initiative, manifested in the development of connections between the EU and China is worth particular analysis. Geographical location of Poland makes it possible to significantly shorten travel time, and to consequentially lower its cost for travellers to and/or from CEE.

- **Ensuring appropriate capacity of the Chopin Airport.** Unavoidable limitations faced by the Chopin Airport are one of the causes for starting discussions on Central Transport Hub. Those limitations include serious environmental constraints, which result from the airport being located next to the city centre (densely populated residential areas) and infrastructural constraints, e.g. Warsaw bypass being situated next to the airport, which makes it impossible to build an additional runway. Due to the

above, and especially due to environmental constraints (noise), even in case of building a new runway, the limitations concerning the maximum number of flights (at night) make it impossible to increase the capacity to the extent which is necessary for the achievement of hub-like operability. Actions to this end may only enable to keep the Chopin Airport operable (in view of increasing traffic which must be handled there) until the opening of CTH and until the whole civil traffic is transferred from WAW to the new airport.

The goals related with **project preparation and implementation** include as follows:

- **Ensuring market character of the investment process.** Project profitability must be based on well-established market procedures concerning investments of that kind. Although the most important data has already been collected and analysed during works to-date, it is necessary to finally confirm all this by conducting a professional study of investment parameters such as: transit traffic forecast, first module capacity (35-50 million), surface area to be reserved for the project (3000-4000 hectares). **By the time the hitherto analyses are verified, maximum indicators from the hitherto assumed should be considered** .

- **Completion of the project within 9-10 years.** Efficient implementation of the CTH project according to the design should be correlated with sustaining WAW capacity at a level which enables effective operations of carriers, in particular the main (core) carrier. Within that time WAW capacity, which is exhausted by now, will make it impossible for the airport to develop further. Thus, the capacities of WAW should be used to the maximum while finalizing CTH project, **so that at its opening, CTH can take over passenger and cargo traffic from WAW; the traffic concerned will constitute a** critical base mass (as far as the number of flights and the number of passengers), which will be a starting point for further operation of CTH.

- **Ensuring unlimited development of CTH.** The ability of CTH to develop freely in the future is of key importance for its future development and for the development of the whole aviation sector in Poland. This need must be taken account of, while considering such factors as the dynamically developing market of air transfers, increase in the number of flights in CEE regions and the increase of mobility of the region's citizens. Equally important are the future needs for increasing operational capabilities of CTH in the scope of cargo handling or the base carrier development plans. Ensuring such a possibility is also related with possible future need to introduce new technological solutions dedicated to aviation and airport infrastructure. The example of WAW constraints shows that lack of such possibilities can mean huge problems not only to the airport itself, but also to the residents of areas which border CTH (environmental constraints). It will also hinder the development of the carriers operating at the airport. Such barriers will also constitute a major problem for the development of the trade and manufacturing base situated around the CTH.
- **Ensuring that the CTH can operate 24/7/365.** Ensuring the highest possible profitability of the airport depends on building an adequate network of connections for the carriers operating to/from the airport. Therefore, it is necessary to locate the CTH in a region free from restrictions to its operation, which will allow the port to operate 24/7/365. This necessity results not only from the need to maximise the profitability of the port, but also of the entities that use its services (e.g. those operating on the cargo market). First and foremost, it is connected with the interests of the carriers from the point of view of whom it is the most profitable to make maximum possible use of owned or leased aircraft (maximisation of operating revenue). Operation 24/7/365 suits not only transfer (long-distance) carriers who, due to time zones and time shifts, operate (take-offs and landings) at various times of day and night, but also to charter carriers whose flights take place mostly at night.

- **CTH meeting the highest airport standards.** The new airport must meet the highest service standards, in particular, when it comes to the terms of new infrastructure operation, its availability and reference codes (codes for 4E and 4F aircraft), the port must meet the ICAO requirements concerning the dimensions of runways for 4F planes (width of at least 60 m), and hold the adequate certificates (in compliance with EU and international regulations). The airport must meet the minimum connecting time (MCT) requirements: 35-45 minutes for national flights and 45-60 minutes for international flights according to IATA requirements.

- **Effective servicing of Warsaw agglomeration by CTH.** The CTH should be situated less than 50 km from Warsaw, in a place where passengers could get by train in about 20-30 minutes. The CTH location, i.e. a change in the location of the airport dedicated to Warsaw residents, cannot deteriorate the availability of the airport to Warsaw agglomeration. This requirement must be reconciled with the need to situate the CTH outside city limits and outside highly urbanised areas. The airport's availability to the Lodz agglomeration should also be taken into account.

- **CTH meeting the highest organisational standards.** Whether an airport makes it into the first ten of the world's best airports also depends on adoption of the highest standards for finishing and design of the terminals, as well as the organisation standards of the airport's operation and its transport system. The airport must have not only the highest accessibility by car for all the people using its services, but it is also necessary to ensure accessibility by public transport (taking into account the fares) and by taxis. The airport's organisation must ensure optimisation of processes such as ensuring luggage carts, cleanliness, and comfort of terminal use. Equally important are: the standard and speed of passport control and passenger checks, as well as the standards of security and availability of hotels, shops, or Wi-Fi.

- **"Universal design" implemented when designing the CTH.** The planned project should be available to all passengers to the greatest possible extent, and its operation's organisation must provide for facilitations, as well as availability of services for passengers with disabilities and limited mobility. Hence, when developing the concept assumptions for the project the concept of "universal design" must be taken into account that has been defined in the Convention on the Rights of Persons with Disabilities done at New York on 13 December 2006 (Journal of Laws of 2012, item 1169).

3. THE RAILWAY SECTOR

General assumptions. The Central Transport Hub is not only an aviation hub. The transport hub will also comprise a multimodal railway station integrated with the national railway transport system, which will constitute an attractive alternative to road transport. To arrive at such a result it is necessary to meet infrastructural, organisational, and fleet-related requirements. Objectives in this respect can be presented as follows:

The largest cities 2-2.5 h away from the hub. To enhance the cohesion of the country, it is a desired standard to ensure that passengers can travel reach each of Poland's major agglomerations from the CTH within 2.5 hours (during the launch period) and later in 2 hours, at travelling speed of at least 140 km/h. When technology is concerned, even without application of the high-speed rail (above 250 km/h) technology the railway system

is able to meet such a standard for all Polish agglomerations except for Szczecin, in the case of which the primary role will be played by national flights.

Improvement of Warsaw and Lodz connections. To achieve travel time from the CTH to Warsaw Central Station of 15 minutes and Lodz Fabryczna of 25 minutes on a high-speed railway, and to link the CTH with these cities with suburban and regional railway lines.

Organisational standards and security. To achieve punctuality of connections to and from the CTH above 95% (for delays of above 3 minutes). To achieve the total daily duration of delays of all 500 inter-regional trains servicing the CTH below 100 minutes. To eliminate accidents with fatalities at the CTH hub and "spokes" (excluding intentional acts).

Accessibility to passengers with disabilities and limited mobility. Also when developing the concept assumptions for the project in the area of the railway sector, the concept of "universal design" must be taken into account that has been defined in the Convention on the Rights of Persons with Disabilities done at New York on 13 December 2006.

4. THE ECONOMIC DEVELOPMENT OF POLAND

Direct impact on increased employment. Research conducted in Europe shows that direct employment generated by an increase in passenger traffic by 1 million at airports handling over 10 million passengers a year results in an increase of 0.85 job per 1,000 passengers (*ATAG: Aviation Benefits Beyond Borders 2016* in: *ACI Europe and Intervistas, Economic Impact of European Airports, 2015*).In 2013, the employment level at Polish airports was estimated at 23,100, while the total number of jobs (direct, indirect, induced, and catalysed) connected with air transport was estimated at about 440,000. In the same year, the number of passengers handled by Polish airports amounted to nearly 25 million. Hence, Polish data do not considerably diverge from European data (*ACI Europe Economic Impact of European airports report* and statistical reports of the Office of Civil Aviation).

Considering the above, it seems that the construction of the CTH would generate by 2030, for western Mazovia and Lodz Territory, the following numbers of additional new jobs (considering only the expected increase in the number of passengers in the CTH compared to PL WAW in 2016 by about 17 million): increase in direct employment by about **14,500**; in direct employment by approximately **16,000**; and in induced employment by around **6,500**. In total for the region, not taking into account jobs created as a result of the catalytic effect, the number would be at least 37,000 completely new jobs which would be connected with the new airport. The total number of jobs directly and indirectly connected with the Central Transport Hub will nonetheless be significantly higher in view of the projects accompanying the CTH, including the EXPO, the possible High Tech City, and the nature of the airport as the hub for the global Warsaw-Lodz metropolis and for the national transport system.

In addition, a part of the employees currently handling traffic at Okecie Airport in the direct and indirect area would be "transferred" to the new location, and in the period before CTH launch there will be increased employment due to investment and construction works in the new airport and accompanying infrastructure. Also non-investment activities preceding the launch of the CTH will result in increased employment, such as the need to ensure qualified staff for airport servicing most probably several years before its launch, which will result in an increase in employment in vocational and general secondary schools.

Considering that one job in the aviation sector generates on average three jobs in other sectors, we should expect an increase in employment by additional **ca. 110,000** jobs.

5. COMPLEMENTARY TRANSPORT PROJECTS

Vision of complementary projects. The CTH concerns the hub part of the national and international passenger transport system. The CTH's impact on the quality of the transport system in Poland will be the greater, the higher its integration with regional and local transport systems which, thanks to the CTH, would achieve a considerable improvement in the national and international transport accessibility. Hence, creation of **mechanisms to inspire and support complementary projects implemented by local governments or by organisational units subordinate to the central administration in cooperation with local government** constitutes a separate objective. A tool to support implementation of these projects will be funds earmarked for such projects in the framework of territorial contracts, EU aid funds, including funds intended for own railway investments of local government units. In addition, complementary projects approved at the central level, implemented by local governments and mentioned in a relevant normative act, should enjoy facilitations that would allow more effective project implementation and draw on the solutions adopted for the Central Transport Hub. The main types of complementary projects should concern the following:

1. Expansion of **local and regional transport systems** that integrate neighbouring cities into coherent functional areas and allow linking the centres of the cities at travel times acceptable for everyday commute to work, school, etc.;
2. Integration and **enhancement of transport cohesion of major tourism areas**;
3. Pilot application of new technologies, such as **autonomous transport** or **light railway systems** (LRT) for building and expanding local transport subsystems integrated with the national transport system built on the basis of the CTH.

A project situated between complementary and integral projects (directly linked with the implementation of this CTH concept) would consist in integration of the agglomeration and regional airport for Szczecin with railway transport systems, which would ensure a direct link between Szczecin and the CTH in less than 2 hours.

As to regional complementary projects, the principle of open coordination should be applied through making it possible for local government partners to submit proposals of their own projects complementary to the CTH. Examples of plausible complementary projects are provided in Attachment 5.

B. SWOT ANALYSIS

1. THE AVIATION COMPONENT

Strengths	Weaknesses
1. Geographical location; 2. Economic situation of Poland; 3. Possibility to design the CTH from scratch, according to most recent standards; 4. Favourable situation on financial markets; 5. Dynamic increase in air traffic;	1. No experience in such projects; 2. Complex environmental regulations; 3. Lacks in legal regulations and government strategy; 4. Recommendations from most recent feasibility studies possibly outdated; 5. Long project implementation time; 6. Vast competition on the market;

Opportunities	Threats
1. Increase in Poland's transport availability; 2. Consolidation of increasing air traffic in Central and Eastern Europe; 3. Achievement of competitive advantage towards Western Europe hubs; 4. Creation of a large hub connecting the EU with the Far East; 5. Increasing the aviation potential; 6. Creation of a base airport for the national carrier; 7. Increased investment appeal of Poland and Central and Eastern Europe;	1. Domination of the aviation market by the LCC sector; 2. Risks and design errors in the area of project management and implementation; 3. Public opposition; 4. Delays in construction; 5. Absence of a sufficiently large base carrier at CTH launch; 6. Difficulties with attracting 100,000 new employees, significant increase in labour costs; 7. Changes in financial markets resulting in difficulties with obtaining financing.

2. THE RAILWAY COMPONENT

Strengths	Weaknesses
1. Poland's spatial arrangement; 2. Relatively dense railway network; 3. High share of Polish companies in the transport market; 4. High financing amounts planned in strategic documents of the national and EU level to support the development of railway infrastructure;	1. Competitive advantage of individual car transport; 2. The quality of organisation and management of railway infrastructure requires improvement; 3. Unsatisfactory technical condition of infrastructure; 4. Use of a significant part of public funding in a way that fails to take the objectives of this Concept into account; 5. Long-term underinvestment of railways; 6. The obligation to restrict fees for access to infrastructure, as a rule, to costs directly resulting from train passage;
Opportunities	**Threats**
1. Reduction of transport exclusion in the area of railway transport; 2. Reduction of road congestion that results from an increase in the number of vehicles as the road network expands (cf. the Lewis-Modgridge law); 3. Development of new competencies and technologies in the area of building and exploitation of new fast railway routes; 4. Increased energy independence of Poland in the area of transport; 5. Reduction of transport emissions.	1. Maintained preference for individual car transport; 2. Risks and design errors in the area of project management and implementation; 3. Social and political factor; 4. Inflation impulse in investments caused by a sudden increase in demand for railway construction works; 5. Difficulties with obtaining public financing.

3. INTEGRATION OF THE AVIATION AND RAILWAY COMPONENT

Strengths	Weaknesses
1. Possibility to optimise costs; 2. System approach to Poland's collective transport;	1. Project uniqueness – no global experience; 2. It is impossible to create a single model of financing aviation, railway, and road projects; 3. No significant intermodal experience, no staff or

	proven operation methods; 4. Road transport cannot be fully replaced by railway transport;
Opportunities	**Threats**
1. Expanded catchment area of the Port and flight availability for passengers travelling to/from Poland; 2. Railway transport supplemented by air transport (e.g. Szczecin-CTH, Rzeszow-CTH).	1. The need to conduct synchronised parallel works in many areas; 2. Delay in the launch of the entire system in case of a delay of one component; 3. Failure to achieve the target integration of the components; 4. Exposure of the entire system to risks inherent in one of the components.

VI. PROJECT VISION

A. THE CTH AS THE MAJOR AVIATION HUB IN CENTRAL AND EASTERN EUROPE

1. BASIC ASSUMPTIONS

High opinion of Asian projects. The majority of Western European hub airports is based on plans from the 1960s and 1970s, later modernised and extended multiple times. It results in non-optimal solutions in space use, poor links with cities, restricted capacity and, most importantly, extended minimum connecting times (MCT); for example at the CDG airport the MCT is frequently more than 3 hours. The European airports most appreciated by the passengers include projects relatively young for Europe: the **Munich** airport (launched in 1992; ranked 4th in 2017 and 3rd in 2016) and the **Zurich** airport (extensive rebuilding/expansion in 2003 and in 2011; ranked 8th in 2017 and 7th in 2016). The best practices in planning, design, construction, and management of modern airports can be currently found in Asia. Airports from that continent rank the highest in airport listings. The highest-ranking airports are: **Changi** in Singapore (the top one at present and many times in the past), Tokyo's **Haneda** (ranked 2nd in 2017; 4th in 2016), Seoul's **Incheon** (ranked 3rd in 2017, 2nd in 2016), the **Hong Kong** airport(ranked 5th in 2017 and in 2016), Qatar's **Hamad** (ranked 6th in 2017, 10th in 2016), and **Chūbu** near Nagoya (ranked 7th in 2017, 6th in 2016). Also in Asia, the most modern airports are built, such as the new airport for Beijing in **Daxing** (planned launch date: 2019; target capacity > 100 million passengers a year) and the new **Istanbul** airport (planned launch date: October 2018; target capacity: 150 million passengers). It should be noted here that the Asian aviation market resembles the Central and Eastern European market in many aspects (high growth dynamics, similar level of aviation services penetration, high share of low-cost airlines). Organisational experience in building airports of this kind seem difficult to be overestimated and need to be **used when building the CTH**.

2. MASTER PLAN TO CONSIST OF MODULES

Construction of the Central Transport Hub must involve a concept of airport development and equipment in modules and stages. An obvious necessary condition is also the possibility to operate 24/7/365, flexibility of booth reconfiguration, smooth servicing of transit traffic, and achievement of high reference codes by the airport.

Expansion of the CTH's capacity in modules cannot jeopardise the continuity of current operations. It concerns both the infrastructure of slabs and runways and terminal buildings. An example of such a project (although at a much lesser scale) is the Lisbon airport where the first stage of construction consisted in building a terminal and one runway. At the second stage, another runway was built, which doubled the airport's capacity. Thus, when building the airport a possibility should be taken into account that individual terminals (or terminal piers) could be built and commissioned gradually, which would increase the port's capacity successively until the desired capacity is finally reached.

3. TARGET AIRPORT CAPACITY

Nature of the plans. The plans described below have been made on the basis of current analyses and reports, publically available data, and detailed studies commissioned by the Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland. If, as a result of subsequent analyses (for instance environmental analyses), solutions that are more favourable from the point of view of Project objectives than the solutions presented below are developed, their adoption does not require amending this document. Such amendments and specifications can concern the target capacity of the CTH airport, specific area needs, and even designation of location that is ideal from the point of view of the objectives. The specified proceeding method should be considered optimal from the point of view that consists in timely implementation of the Concept assumptions, which is of key importance to profitability of the CTH project.

Determination of the first module's capacity on the basis of current analyses. From the point of view of CTH's size, it is key to determine traffic projections in the period of 8-10 years after the Airport is commissioned. Such projections have already been prepared. The **2003 Report** assumed the airport's target capacity at 70 million passengers, yet without any in-depth rationale. The analyses employed in the **2006 Study** defined the necessary CA capacity in 2037 at **35 million**, and in 2050 at **50 million** passengers a year. At the same time it should be noted that the analyses employed in the 2006 Study defined CTH capacity based solely on GDP, which is an unreliable method. The multi-aspect analyses presented in the **2010 Concept** are the most up-to-date.They assumed that the Central Airport would play the major role in the air transport system handling 40-45% of the passenger transport services market in 2035. In the baseline scenario, Poland's traffic would amount to 78.2 million passengers a year, of which **35 million** passengers handled by the Central Airport. It should be emphasised that the differences in projections of the number of passengers between the optimistic and the pessimistic scenario in the 2010 Concept were as high as one half (optimistic: 100 million; pessimistic: 50 million). Hence, the optimistic scenario assumed a figure that reached **40-45 million** CA users a year. So far, the projections for 2015 presented in the 2010 Concept were almost 100% correct (assumed: 30.395 million, actual traffic: 30.392 million passengers). The projections did not assume such a significant increase in the offers of PLL LOT S.A. The above leads to a conclusion that, on the basis of current analyses, in 2035 the CTH should be able to handle **35-45 million** passengers a year. Summing up, as the advisors to-date are of a single mind, it should be assumed that around 2035 the airport should be able to handle not less than **35 million** passengers a year. **As long as there are no other conclusions from updated demand projections**, the maximum scenario should be assumed, i.e. the maximum airport capacity at the level of **45 million** passengers a year. Such a capacity should be assumed **for the needs of the first module** of the Central Transport Hub, with a stipulation that the final capacity of the first designed module would be defined on the basis of currently conducted specialist simulations of changes in the aviation market until 2035. At present, there are no grounds to dismiss the maximum assumptions presented in the 2010 Concept of capacity at the level of **45 million passengers a year**.

In view of the potential for further intensive air traffic increase, it seems purposeful to ensure the possibility of extending the Central Transport Hub to a size that would allow achievement of capacity even in excess of 100 million passengers a year if need be. The first stage of CTH extension should ensure the airport an increase in

capacity to about 60 million passengers in about 10 years from its launch. It should secure the traffic needs at the assumption of annual average growth rate at ca. 5-6%, which is a very realistic assumption. The Central Transport Hub should have a secured site and a general vision of development even to the level of 100-120 million passengers, which would secure the project in case of a more aggressive than assumed market development rate, as well as structural needs in he 2050+ perspective.

4. DETERMINATION OF AREA NEEDS

Determination of area needs for the first module and subsequent modules. Without any specific rationale, based on internal analyses by team members, the 2003 Report assumed area needs at the level of 1,300 ha (airport alone) and about 6,000 ha of limited use area. In turn the 2006 Study assumed the necessary site to be **2,000 ha** large, assuming the maximum capacity at 50 million passengers a year. It should be noted that such airport size is sufficient for the first stage of construction, i.e. an airport with capacity of 45 million passengers a year. Yet considering the possible extension of the airport to handle 100-120 million passengers a year, area needs must be assumed at a much higher level.

Other area needs connected with airport operation. For the airport to be able to ensure an adequate service standard, its plans should envisage additional elements of infrastructure that are inextricably connected with operation of an aviation hub, in particular a technical base suited to handle hub carriers, a hotel base for the crews and transit passengers, a cargo terminal matching the passenger ambitions (the Central Transport Hub with the postulated location perfectly matches the Chinese “Belt and Road” initiative, which may help create a regional logistics centre), long-term car parks, a fuel base, and an on-site sewage treatment plant. The shape of the passenger terminal should contribute to shortening and facilitating the movement of transit passengers. It is also key to ensure adequate space for airport **shops at the highest European level**. It is particularly important in the context of development of one of the major exchange hubs between Europe and Asia in Warsaw. For passengers from countries such as China, Japan, and Korea shopping opportunities (in particular luxury brands) are among the main criteria for route choices, which is why this should be the characteristic of the Central Transport Hub compared to other airports in the region and in entire Europe. Already at the planning stage, measures should be foreseen to ensure the area necessary for logistics and handling centres next to the airport, operating freely in the limited use area that will surely be set up.

Summing up, to implement the vision of the Central Transport Hub it is recommended to secure a site with surface area of at least **3,000 ha**. Referring to the findings of the 2003 Report, it should be assumed that the limited use area should have a surface area of at least 6,000 ha.

Other area needs connected with integration of Warsaw and Lodz agglomerations. Analysing the area needs, also the availability of sites that are not directly connected with airport location should be taken into account. In addition to the area of the airport, it is also necessary to ensure availability of the Airport City site and sites for facilities such as a fair and exhibition centre with surface area of 800-1,200 ha and a logistics centre for the new Warsaw-Lodz megapolis of 100 ha. These sites would be within the limited use area. The CTH’s location should be determined in such as way as to enable locating the above-mentioned facilities in its vicinity.

5. CTH AND THE DEVELOPMENT OF REGIONAL AIRPORTS

The existing regional airports would remain the bases of the carriers offering point-to-point flights, including low-cost airlines, as well as network carriers that transport passengers to the major hubs. Creation of the CTH

as an airport dedicated to network carriers is not a threat to the majority of these airports, and in some cases it may result in higher air traffic.

National flights will be maintained between the CTH and the cities whose servicing by railways or roads would lose in competition with air transport. In particular, it will concern Szczecin and Rzeszów (in the initial period of CTH operation), in the case of which railway transport will not be able to ensure a two-hour travel time to the CTH. The decision to maintain a regular connection with Szczecin as the final destination should be preceded by an analysis of maintenance of the airport location for this agglomeration as the current location of the SZZ significantly deteriorates its development perspectives. Also flights between the CTH and regional ports, where there will be demand for flights in spite of the existence of convenient railway connections with the CTH, will be maintained on a commercial basis, in particular in the case of transfer connections.

Direct connections. It should not be expected that the Central Transport Hub would reduce the chances of regional ports to maintain or offer new direct connections. First of all, a convenient schedule and travel time are the most important criteria for choosing flights by passengers. The possibility to take a direct flight is always rewarded by a high market share of the flight. Therefore everywhere with sufficient point-to-point transport potential it will be firstly employed by direct flights. Secondly, network operators from competitive aviation hubs (such as Lufthansa, Air France, KLM, British Airways) will still be interested in developing flights to Polish regional ports, competing with the CTH base carrier(s) for transit traffic. Thirdly, the main advantage of the Solidarity Airport will be the possibility of offering flights that would not have a chance to be maintained from individual regional ports. It concerns primarily all intercontinental flights and the so-called long tail of markets with lower passenger traffic.

Absence of an airport in north-eastern Poland in the vicinity of Bialystok should be balanced with very good parameters of a railway connection of Bialystok-Warsaw-CTH (which, in the future, could become an element of the international Warsaw-Minsk corridor).

B. LOCATION SELECTION

1. GENERAL REMARKS. LOCATION OPTIMAL FROM THE POINT OF VIEW OF POLAND'S INTERESTS, NOT ONLY FROM THE POINT OF VIEW OF INTERESTS OF LOCAL GOVERNMENT UNITS

As accurately pointed out in the 2006 Study, the problems with evaluation of the locations to-date resulted from the fact that the selection was not made from among the sites considered optimal by the Civil Aviation Authority or by the 'Polish Airports' State Enterprise, but from among the sites suggested by the interested local government units. This method of proceeding could not lead to selection of a location that would be optimal from the geographical, economic, or environmental point of view.

Hence, as the shortcomings of the recommendations of certain locations that were analysed in the report are still valid (like in the case of Modlin, which was excluded in the 2006 Study *inter alia* due to environmental restrictions), the recommendations made to-date can be considered current only if they meet the strategic assumptions for the Central Transport Hub project. Also criteria such as fragmentation of ownership structure or the current position of state or local government bodies on the project are not decisive from the point of view of this document. On this assumption, in particular the assumptions adopted in the most recent 2010 Concept should be upheld and updated to the extent resulting from the analyses carried out later, such as the *Feasibility Study on the construction of a high-speed railway line Warsaw – Łódź – Poznań/Wrocław* from

December 2012. Using the analyses conducted for the above-mentioned document allows better definition of potential CTH locations if possible CTH integration with the high-speed railway network is assumed. As a consequence, locations between Warsaw and Lodz, in direct vicinity of the A1 and A2 motorways junction and the planned high-speed railways, should be considered a priority.

2. PRELIMINARY CONDITION: INTEGRATION OF AIR AND RAILWAY TRAFFIC IN A SINGLE HUB

General assumptions. The Central Transport Hub should be an element bonding the transport network of the entire country. Developed intermodality (the possibility to connect legs of air travel with legs of travel by railways or by roads) considerably increases operating and economic efficiency of an airport. It is also an essential element of creating an important cargo hub. In this context, intermodality stands not only for leading a road or a railway line to airport terminals in any way, but for selecting a location of the airport and linking it with a transport network in such a way that it would form the network's 'natural' element. One of the strategic objectives assumed in this document is to integrate railway and air traffic in one place. This manner of proceeding was already approved in the 2003 Report. The document referred to the guidelines on the partnership of airports with high-speed railways of the ACI (Airport Council International) that recommends merging airports with railway stations as supplementary preferential means of transport for various sections of distance. It was emphasised at the same time that regular connections of the airport with the city (possibly with a railway station) do not meet this standard. Considering the above criterion, the list of potential locations should be limited to those which allow the integration of a railway and aviation hub in one place. Both the existing lines and the railway lines and hubs to be built must be taken into account here.

Studies carried out so far. Driven by the perspective presented above, the authors of the **2003 Report** expressed a positive opinion on the location in **Mszczonów**, stating that it is situated in the vicinity of the Central Rail Line and the Skierniewice-Łuków line junction, i.e. the so-called Warsaw's commodity ring road, and it would only require short sidings to directly link the airport with both lines. Similarly, from the point of view of integrating railway and air traffic, it was stated that the location in **Sochaczew** can be interesting in the case of establishing direct railway access to the airport from both Warsaw and Sochaczew (Lodz). Referring to the location in **Babsk-Skierniewice**, the authors of the report claimed that this location has limited access to the railway network, it is not linked with Lodz or Skierniewice, and would require construction of a railway line between the Central Rail Line and the Skierniewice-Koluszki line (about 30 km).

A partially different view was presented in the **2006 Study**, which emphasised primarily very good connection of **Mszczonów** with the railway network. Analysing the location in **Babsk-Skierniewice**, it was noted that one of the earlier projects to build high-speed railway assumed a route that allowed the integration of the airport with a high-speed railway station. The criteria that should be taken into account according to the 2006 Study are, firstly, minimisation of impact on the existing infrastructure, protected facilities and similar facilities, secondly, aiming to create as short 'links' as possible, and thirdly, maximum simplification of construction processes (avoiding the necessity to build bridges, tunnels, etc.). On the basis of topographic data the authors of the 2006 Study concluded that both the locations, in Babsk-Skierniewice and in Mszczonów, do not meet these criteria to a certain extent.

Update of current assumptions. The assumption that the Central Transport Hub would be an aviation and railway hub at the same time significantly limits the number of potential locations. The assumption of the Concept is even further-reaching than that adopted by the authors of the 2003 Report or the 2006 Study. The mission of the project requires from than mere integration of an airport with a railway station as it assumes creation and integration of two transport hubs: a railway hub and an aviation hub. In the area between

Warsaw and Lodz the number of potential locations for such ventures is very limited. As to existing railway routes, crossings (potential junctions) of such routes can be found in the vicinity of **Międzyborów-Jaktorów**, **Skierniewice**, **Koluszki** and **Łowicz.** If the field of analysis is extended to include the 2012 multi-layer *Feasibility Study on the construction of a high-speed railway line Warsaw – Łódź – Poznań/Wrocław*, additionally the location in the vicinity of **Stanisławów** (Baranów commune) should be taken into account, where the extended Central Rail Line connects with the new high-speed railway route Warsaw-Lodz.

Conditions of railway hub functionality. In order for the hub to be an actual central point of Poland's railway transport, it must meet certain special requirements. An obvious condition is the requirement of closeness of major national transport routes, both on the north-south axis and the east-west axis, so that travel to the airport would not be a roundabout route. Yet this is not enough. The hub in question must allow building a **junction of railway longitudinal and latitudinal relations** for the purpose of mutual linking of major cities and agglomerations of the country as well as all geographical areas of the country, and to allow direct access from the CTH to each major centres of basic settlement network and to each Polish region. In practice, it means the access to the Central Rail Line, its potential extension and latitudinal lines that already exist or may be built during the construction of the CTH. Another important determinant of the rail hub's functionality is the **possibility to change the direction of traffic at the CTH hub** to each connection to the hub into a transverse connection without changing the direction of movement of the train head. The doubt expressed in the Study 2006 on whether the HSR station should be located directly at the airport (the model used in the Charles de Gaulle airport in Paris) or just connected to the airport by shuttle train service (the model used in Rome) is decided *a priori* in this Concept. The integration of the airport and railway hub assumes the compliance with the above ACI guidelines, i.e. departure from the 19th century concept of terminus stations for the benefit of pass-through stations. Another requirement linked with the conditions defined in the Study 2006 is the possible limitation of intervention into the railway network as a result of rerouting of the majority of connections through CTH, so that the rerouting would not entail a significant increase of the routes' length. As called for in the Study 2006, the Concept assumes **the maximum use of the existing infrastructure** and optimisation of the existing connections to shorten their length as much as possible.

The analysis of individual locations using the above criteria shows that the airport may potentially be located directly at the crossing of railway routes in **Stanisławów** and **Międzyborów-Jaktorów**. Locations near Skierniewice would require the creation of additional connecting lines from the airport to the railway network. The identified locations also do not include any constraints with respect to such traffic organisation that would allow to change the direction at the hub, without changing the head of the train. However, in Międzyborów-Jaktorów the change of traffic direction at the hub could be difficult due to limited space in the hub's direct vicinity. In the case of both locations, the rerouting of the majority of connections through CTH would entail a similar extension of the routes' length. The location in Międzyborów-Jaktorów would ensure the use of the existing infrastructure to a greater extent than the location in Stanisławów. One of the earlier concepts of routing the High-Speed Rail assumed that its route will go through this very area. The adoption of this variant would mean the resignation from the construction of the Warsaw–Łódź railway route described in the *Feasibility Study on the construction of a high-speed railway line Warsaw – Łódź – Poznań/Wrocław* from 2010.

3. PRELIMINARY CONDITION: FULFILMENT OF AREA NEEDS

Area requirements The location of the new airport should first of all provide the possibility for its uninterrupted development for at least several dozen years Based on earlier finding, it may be concluded that the area of approx. 3000 ha should be secured for the Central Transport Hub. The minimum requirements for the airport were defined in the Report 2003 and included the possibility to build two parallel 4000/60 m

runways on the east-west line, with 2000 m separation; accessibility of airspace, possibility to carry out air operations 24/7/365, no collisions with high obstacles, etc. Apart from the area of the airport itself, it is necessary to ensure the accessibility of the area of approximately 1300 ha (Airport City and fair and exhibition centre) and the area of 100 ha for the logistics centre for the Central Metropolis Warsaw-Łódź. The restricted use area of at least 6000 ha must also be included.

The location must also take into account the minimisation of the environmental impact, including the impact on nearby human settlements. From this perspective the location in **Międzyborów-Jaktorów** must be evaluated negatively. The railway hub itself is located in direct vicinity of dense human settlements (1.5 km from Międzyborów and the same distance from Jaktorów), which undermines the possibility to fulfil the area needs related to the railway hub itself (cf. above). The only possible location of CTH is thus the area north of the railway hub. Only there can two parallel runways, 4000 m long, may be located. The proximity of large human settlements (direct vicinity of Międzyborów, Żyrardów, Jaktorów and Grodzisk Mazowiecki) puts into doubt the possibility to perform free airport operations in the 24/7/365 format and would have to entail significant costs related to the existence of the restricted use area. It should be added that human settlements are located along the East-West axis, i.e. the direction of the possible location of runways.

The location in **Stanisławów** must be considered potentially very attractive from the point of view of area needs. The potential railway hub is located north of the A2 motorway, in its direct vicinity. It is surrounded with agricultural areas with low population density, which makes this location definitely more attractive due to social costs. The space around the hub allows for unrestricted expansion of the railway hub and for locating two (or more) runways along the East-West axis, as well as for uninterrupted airport operations in the 24/7/365 format. Around the hub there are no potential height obstacles and the space allows for unrestricted development of the Airport City. Delimitation of the restricted use area should not entail the costs comparable to the Międzyborów-Jaktorów hub. Since the location in Międzyborów-Jaktorów does not meet the necessary requirements for the airport location, the location in Stanisławów seems to fully meet the standards.

4. Evaluation criterion: Appropriate location with respect to Warsaw and Łódź

General assumptions. The position presented in the Report 2003 on the necessity to adjust the transport infrastructure to mobility generator distribution must be upheld. The adoption of this assumption should contribute to adjustment of potential locations to the gravity centre of Warsaw and Łódź agglomeration.

Proximity of Warsaw. Warsaw, as the largest aviation market in Poland, should remain the main supply area for the Central Transport Hub. To ensure attractiveness of the hub for traffic to/from the capital, the mean time of travel between the city centre and the airport should not exceed 20-25 minutes (by train) and 30-35 minutes (by car). Modern transport solutions allow to obtain such times, even if the location is at a distance of approx. 40 km from the city centre. This means that the locations ensuring the shortest times of travel to the Warsaw centre should be given clear preference. One of the project's objectives is to keep to the maximum the transport accessibility of the current Chopin Airport.

Therefore, location near Łowicz and Koluszki must be excluded once again, since they are located too far from Warsaw. The locations near **Skierniewice**, **Międzyborów-Jaktorów** and **Stanisławów** would be left for consideration, but the location near Skierniewice (Skierniewice-Babsk) has already been rightly criticised in the Study 2006 due to its excessive distance from the Warsaw agglomeration. The analysis from the point of view of road transport leads to similar conclusions. **Skierniewice** is located around 80 km from Warsaw, and the travel to Warsaw takes around one hour in good road conditions. A better, but still insufficiently good location

is **Międzyborów-Jaktorów** whish is much closer to Warsaw (50 km, 50 minute travel). However, both those locations are significantly inferior to **Stanisławów**, located 40 km from Warsaw (approx. 30 minutes). Another argument for the latter location is direct vicinity of A2 motorway. Therefore, **Stanisławów** is the optimum location in terms of transport accessibility for Warsaw.

5. EVALUATION CRITERION: ENVIRONMENTAL CONDITIONS

Lack of spatial and environmental constraints. The location of the new airport should first of all provide an opportunity for its unrestricted development for at least several dozen years. It is not only about the lack of substantial space constraints, but also the lack of environmental constraints (e.g. related to noise or Natura 2000), so that the airport could operate 24/7 without any restrictions. The very fact of operating 24/7 would be an important competitive advantage over numerous large hub in Western Europe.

As stated above, the Report 2003 was drawn up before the accession, when the Polish transport system prepared for integration with the EU transport system. The impact of accession to the European Union on location decisions is visible not only in the intensive growth of aviation operations, but also in environmental decisions. The reduction of the airport's environmental impact to the minimum must also be considered in European terms. It is necessary to reduce to the minimum the impact of investment on the areas that are Natura 2000 sites, due to both environmental considerations, but also due to inevitable slowdown of the investment process as a result of such impact. Another important aspect is population density. The projects of such scale as the CTH should be located in areas that are not densely populated in order to reduce the inconveniences related to operation of the airport to the smallest possible number of people. The lower population density means the lower number of potential expropriations and lower operating costs of the airport. The restricted use area, i.e. the area subject to a particularly strong impact of the airport, is smaller than 6000 ha.

On 16 August 2017, The Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland asked the Minister of the Environment to present the potential aviation obstacles, windrose, number of foggy days a year, other weather data (cloud basis, precipitation, etc.), protected zones of water sources and their depth, flood plains, rivers and larger water bodies (including underground water bodies), air pollution (including annual average concentrations of carbon oxide, sulphur dioxide, nitrogen dioxide, benzene, particulate matter PM10), nesting areas and directions of birds' flight routes, soils and cultivation culture, urbanisation level, trends in this regard and the types of the existing buildings, forest areas and agricultural areas, potential plans of afforestation, around the two considered locations, i.e. Stanisławów and the area near Międzyborów-Jaktorów railway hub, as well as the locations recommended in the Study 2006, i.e. Bednary and Nowy Dworek near Mszczonów and the area around Raducz Chrzczonowice near Babsk. The position of the Ministry of the Environment confirms that from the environmental points of view Stanisławów is the best location for the Solidarity Airport.

6. INVESTOR'S ANALYSIS

A fully independent analysis was performed by *Ove Arup & Partners International Ltd Sp. z o. o.*, to which Polski Fundusz Rozwoju S.A., acting as a potential investor, commissioned the performance of a location study for an intercontinental airport at a distance of up to 50 km from Warsaw. It should be noted that the consultant did not conduct the analysis from the perspective of strategic assumptions adopted in this document, i.e. did not considered the combination of the air and rail hubs or integration of Warsaw and Łódź agglomerations. In the

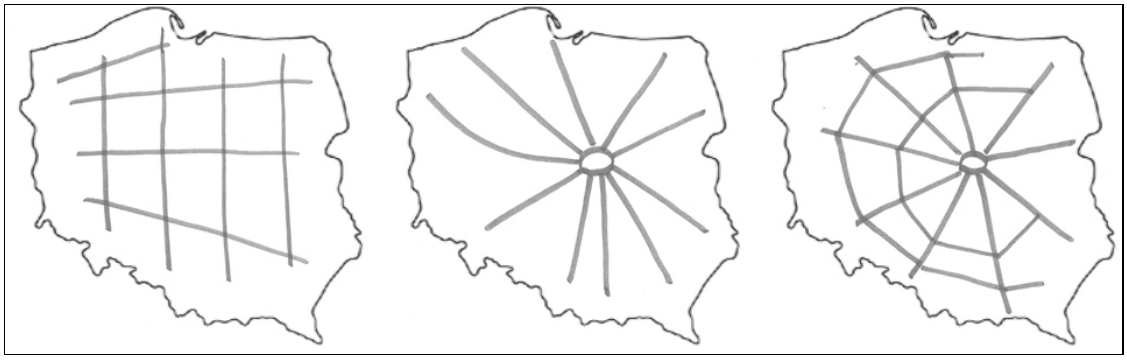
course of analytical work, the contractor identified two potential locations for a new airport with the capacity of serving up to 100 million passengers. One of the two locations selected by the consultant is the area of potentially approximately 11340 ha, located between the national road No 50, Freedom Motorway A2 and the railway line No 3 in the north. It is the area including **Stanisławów (Baranów commune)**. The other of the above-considered locations, including those identified in the Report 2003 and the Study 2006, were rejected by the consultant due to their failure to meet the requirements. The consultant concluded that the location in Stanisławów (Baranów commune) did not raise substantial objections from the point of view of the possibility to design new procedures in air space. The technical memo of the consultant along with maps constitutes Attachment 2.

C. CTH AS A PASSENGER RAILWAY TRANSPORT HUB IN THE REPUBLIC OF POLAND

1. ADAPTATION OF THE H&S SYSTEM TO THE CONDITIONS IN POLAND

Modified H&S system. The CTH, along with its accompanying investments, will act as the national hub of the interregional system of the public collective transport, built using the H&S model.

The regular shape of Poland, the central location of the Central Metropolis (Warsaw and Łódź may be integrated into a single functional system) in the area of key importance for intracountry transport are important determinants of the transport system model. The common model for connecting the systems with strong centres is the hub-and-spoke model. At the same time, Poland (as well as Italy and Germany) is among the European countries with the most polycentric population distribution system and the smallest share of the capital city population to overall population, and has one of the EU largest (following Spain) numbers of medium-sized cities per population. The more suitable system for such areas is a relatively evenly spatially distributed network of connections. Taking into account those somewhat contradictory spatial conditions, the concentric hub-and-spoke model must be supplemented with circumferential connections and direct connections to link the neighbouring regions. The optimal transport system for Poland seems to be the web system with the central point inside the Central Metropolis and stellate lines connecting the centre with main cities and areas of the country and with the circumferential line or lines connecting the main centres located like satellites with respect to the centre.



The system should be supplemented with, strongly developed, based on the existing dense infrastructure, railway regional connections in northern, western and southern Poland and with local bus connections (where

there is no railway infrastructure). Such transport network model is conducive to polycentric development and transport accessibility of the entire country and will allow to cover all its areas with mutual transport accessibility with high parameters. The capital cities of 14 out of 16 voivodeships of Poland, including all metropolitan centres of the country except Szczecin, as well as important urban centres of Poland's neighbouring countries in the north, east and south, are located within 300 km from the gravity centre of the Central Metropolis. The distances up to 300 km allow to travel from the majority of the country's cities to the main hub within up to 2 hours, using trains running at speeds of 200-250 km, and to obtain mutual accessibility of those cities and main areas of the country via the central hub. The impact of such transport system will go beyond the borders of Poland will extend to **border areas and cities** of Kaliningrad District, Lithuania, Belarus, Ukraine, Slovakia and the Czech Republic. Some of those areas have strong links to Poland or are inhabited by a large Polish minority.

The hub will become the means to integrate the central agglomeration of the country (Warsaw-Łódź) which is both a global metropolis and a national decision-making centre, the leading political, administrative, economic and scientific centre, the destination of a major part of official, business or private travels.

International dimension The use of the parameters of the existing infrastructure to the maximum and its modernisation and extension to include new sections of the network will allow to create, based on the Central Transport Hub, the urban area of the "Polish MEGALOPOLIS", integrated in terms of infrastructure and functionally, going beyond the borders, with an area of (depending on delimitation) 90,000-100,000 km^2 and the population of 17-20 million. The core of the Megaregion will consist of the Central Metropolis (Warsaw-Łódź) and the Southern Metropolis (Małopolskie-Śląskie voivodeship and the Moravian-Silesian Region). The area may become the main economic driver of Central Europe. The area of Megalopolis may reach further and may be further expanded south through infrastructural integration with such cities as Brno, Vienna, Bratislava, Budapest, Zagreb, Ljubljana, etc., within the framework of the concept of the so-called European macroregion (cf. R. Florida T. Gulden, C. Mellander "The Rise of Mega - Region". Cambridge J Regions Econ Soc (2008) 1 (3): 459-476. https://academic.oup.com/cjres/article-abstract/1/3/459/389752/The-rise-of-the-mega-region?redirectedFrom=fulltext).

2. DESIRABLE RULES OF THE RAILWAY NETWORK EXTENSION

Railway network extension system. Railway investments consisting in building new lines should act as necessary supplements to the railway network, connecting it into a system fulfilling the transport needs. First, the lacking parts of the network should be built to enable launching the connections with a geometrically correct layout and using the existing infrastructure, which would allow to substantially improve the transport times. Where possible, new sections of the line will be built in the trucks prepared at earlier periods of the railway network development projects, such as HSR Y and Central Rail Line North, and connected to the existing network.

Technical standards of newly built lines. The assumed starting standard of the newly built lines constructed in the tracks of earlier projects of high-speed rail will be their adaptation to the speed of 250 km/h with geometric parameters allowing to increase the speed (to 300-350 km/h) later on. The selection of the 250 km/h technology will allow to fully use the traction potential of the existing railway stock, and to use the national train manufacturers in the case of purchase of new trains. At the same time, it allows to build the project in stages, first by connecting the rails by new sections of tracks acting as "connectors" with the existing network, along with its modernisation. The new sections that are under construction will be used both by Inter City trains with the design speed of 250 kms/h as well as by fast interregional and regional trains with target speeds of 200 kms/h or higher. Also all other connectors ensuring links of the CTH with individual parts of Poland – in

areas with uncomplicated natural topography – will be built in a geometrical standard enabling, as a target, launch of carriage with speeds of 250 km/h or higher – even if initially they are built as single-track sections.

Phased development of the railway network The proposed model of railway CTH infrastructure construction is evolutionary and phased development of the railway system with “reasonably” high speeds treated as an integral element of the network rather than a discrete subsystem. As part of those measures at first sections necessary for the CTH to function will be built as well as those improving geographic routes of lines going to the main centres and areas of the country. At this stage "spokes” will consist of new sections of the network and of the sections of the existing infrastructure with proper routes that will be renovated or retrofitted to the extent permitting the maximum usage of their (conditioned by the geometry of the lines) capacities with regard to maximum speeds that can be attained. In particular, on the Central Railway Trunkline that is the main skeleton of the Polish passenger network it is desirable that, as a target, speeds are attained that match those that almost fifty years ago were designed for it (namely 250 km/h). Meeting of that parameter will be dependent on the financial resources available to the State and will take into account the transport needs of the country, including in that regard handling of the CTH.

Thereafter - as the demand grows - parts of classical network sections will be modernised so as to attain the design speed of 200 km/h or more - and sections for which retrofitting to accommodate such speeds is impossible will be doubled by newly constructed (in a phased manner) sections of high speed lines. In particular this pertains to routes that match the routes of the HSR Y project.

The evolutionary manner of reaching increasingly shorter trip times between the CTH and the main Polish cities and regions is a safeguard against a high risk of huge infrastructural projects i.e. oversizing of investments against needs and the economic capabilities of maintaining the viability of the project. Such a manner of project implementation utilises to the maximum extent the available resources: with regard to infrastructure, rolling stock, manufacturing potential, competencies and funding. This also enables a flexible response to increasing demand triggered by project execution. Within the framework of Concept implementation as a target we should end up with the constructed node of the system and radial pairs connecting all the areas of Poland. It will also be required to achieve improved throughput of some routes starting from the Warsaw railway node.

The technology of power supply An issue that must be solved at the stage of building of new elements of the railway infrastructure and modernisation, including electrification of the existing sections of the networks, is an issue of selecting the power supply system. The direct current supply 3kVDC system that dominates in Poland is obsolete and inefficient in terms of its economic performance especially with large demands for capacities e.g. at high train speeds. At the same time modern electric rolling stock for speeds of 200 kms/h or higher is currently in use in Poland (ED 250 drafts of cars and ES64U4 locomotives) enables operations both in direct and alternating current systems. That is why the railway network retrofitting and modernisation project connected with the CTH, inclusive of related new rolling stock purchases, as well as complementary projects may become the beginning of a long term evolutionary conversion of Polish railway power supply system from 3 kVDC direct current to 25 kVAC alternating current, which is in line with what is happening in other countries that deploy this voltage system (the Czech Republic, Slovakia, Ukraine, Lithuania, Russia, Canada). However it should be stressed that the change of power supply technology would need to happen with taking such factors into consideration as availability of funds and an evolutionary change of rolling stock available to carriers so that the modernisation of key fragments of infrastructure would not lead to a situation when the owned rolling stock resources could not be used on those sections. The planned instruments of supporting the purchases of rolling stock should take into account the parameter of accommodating a dual power supply mode.

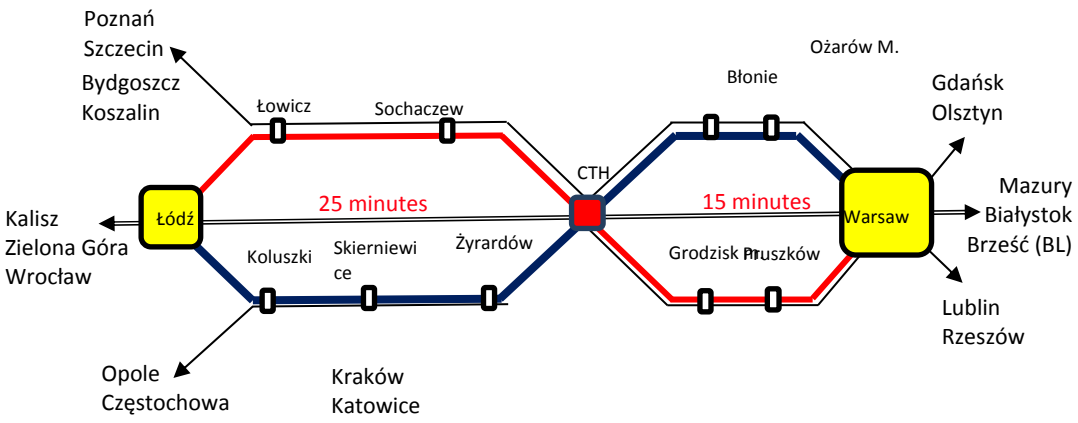
Collaboration with Intercity The collaboration with the main carrier of the domestic system of passenger long-haul carriage is of key importance to the attractiveness of the CTH and to the development, on its basis, of new

service functions in transport. In particular, passengers commuting to the CTH –who will be transferring to a plane should have a possibility of completing a check-in when aboard a train – including also a possibility of having their luggage checked-in. The above functionality requires a special design of Inter City rolling stock that is dedicated to handle the CTH as well as of the infrastructure of the node itself. The system currently in operation in Germany should be treated as a minimum and an independent standard of service in that regard where Lufthansa and Deutsche Bahn offer to their passengers tariffs whereby it is possible to combine an international flight from/to any airport in Germany with a railway trip and an airport check-in at the railway station (c.f. similar offers between Paris and the Brussels airport and between Brussels and the Amsterdam airport). A similar use of the domestic passenger carriage system designed according to the Hub&Spoke model based on the CTH enables the construction of an express system for dispatch of postal and courier shipments between the main cities of the country and their air forwarding abroad via this node. In this case the construction of the CTH node should allow for the warehouse/sorting office for such shipments and the infrastructure of the node itself and the passenger rolling stock handling the CTH should be specifically designed to meet the conditions of fast and reliable unloading of such parcels when the train is stopped at the station.

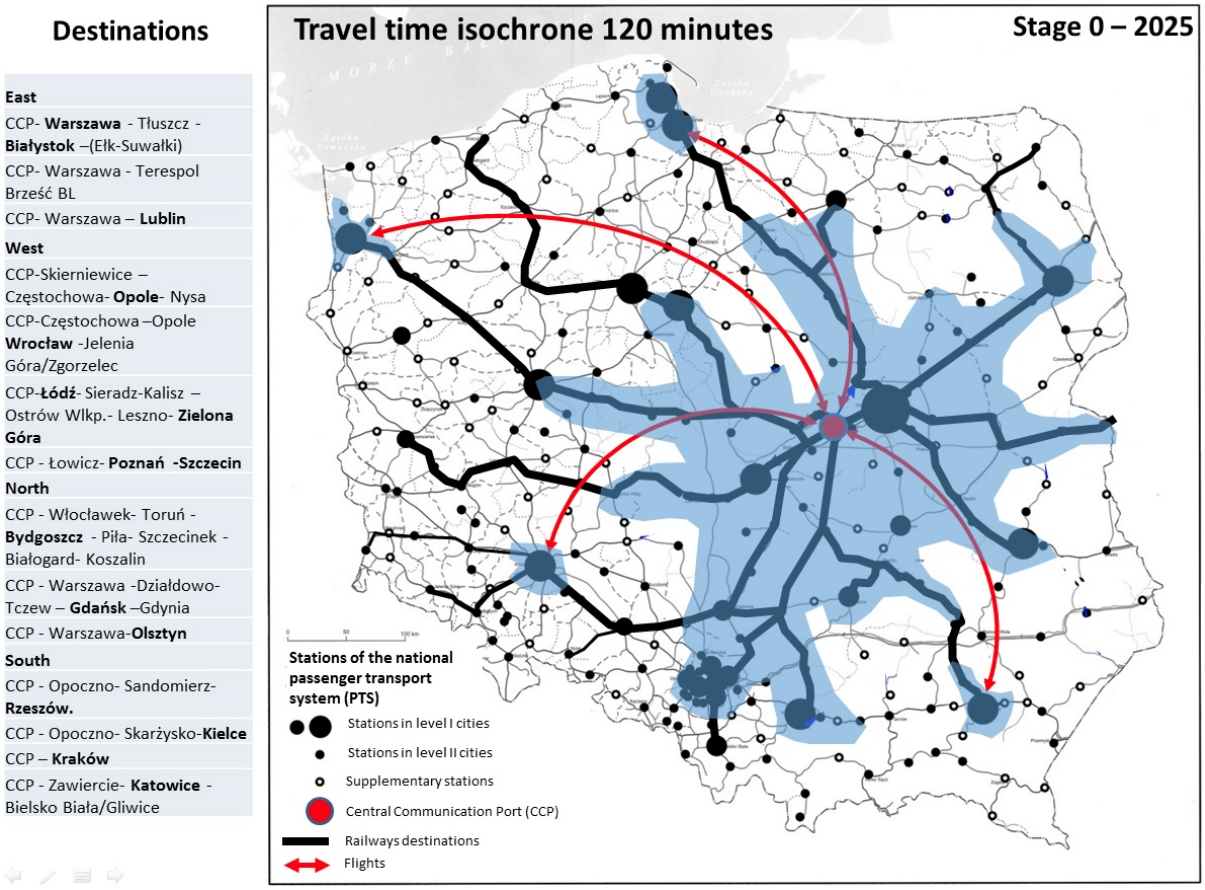
3. THE RAILWAY NETWORK CONNECTED WITH THE COMPLETION OF THE CTH

The stage necessary in order to execute the Concept assumes investments directly connected with the CTH: track sections necessary to launch carriage and the very facility of the Central Transport Hub. This stage assumes the construction of the node and of direct connectors enabling fast arrival/departure from the node to railway lines going to longitudinal and latitudinal directions both for interregional, regional and agglomeration trains. In the location chosen namely **Stanisławów** this means first of all - the construction of the CTH inclusive of the railway node system containing connectors between lines no. 1, no. 3, no. 4 and the extension to reach CTH of line no. 447 with exits to Warsaw and to Sochaczew (3) and Koluszki (1), and additionally with exits to in the direction of Płock on the Central Rail Line North route, Nowy Dwór, Grójec and Central Rail Line (4), and also - secondly - a new railway line Warsaw - the CTH - Łódź Fabryczna on the designed HSR "Y" line, whose final parameters will be defined at a later stage in project work.

As a result of "phase 0" implementation it will be possible to retrofit the domestic system of passenger carriage operating in the "Hub&Spoke" model, and it will also be possible to include the CTH in the agglomeration transport systems of Warsaw and Łódź as well as to launch metropolitan transport utilising the the CTH and integrating – into one system – Warsaw, Łódź and the CTH whilst ensuring the maximum level of good railway connections with the other key cities. With regard to the integration of Warsaw-Łódź agglomeration we will be witnessing a significant improvement of transport availability as a result of adopting the following system of connections of Warsaw, the Solidarity Airport and Łódź:



The nationwide network of railway connections inclusive of a 120 minute isochrone of commuting to the CTH will look therefore as follows:



The aforementioned investments are not sufficient to build a universal nationwide system of interregional passenger railway carriage covering with its availability all the regions of the country, one that is designed and based on the Hub&Spoke model. In order to implement this task one should consider the extension of the railway network of the Republic of Poland. The potential scenario of such extension, implemented within the framework of subsequent national railway programmes funded from the current and next EU budgetary perspectives (Perspective 2020-2025 and Perspective 2025-2030) are presented in Attachment 3.

D. THE CTH AS A TRANSPORT NODE THAT IN AN OPTIMUM MANNER IS CONNECTED WITH THE ROAD NETWORK

For the CTH to function it is necessary to extend the system of expressways and motorways in order to ensure the integration of the node with the road system of the Republic of Poland. For the selected location in **Stanisławów** this may mean the retrofitting of the A2 motorway on the Łódź - Warszawa section followed by routing, design and then the construction of the Motorway Ring Road of Warsaw.

The retrofitting of the A2 motorway For the planned investment the retrofitting of the A2 motorway will first mean the construction of a relevant direct connection of the airport with the motorway and ensuring a collision free connection with the high speed line. In this context it should be mentioned that in the vicinity of the planned location a services point is already located (MOP Baranów), ensuring of a collision free connection with the railway network is provided by the purpose built flyover located on the route of the A2 motorway. The

above mentioned circumstances constitute a very good starting point to build connectors to the passenger terminal located in **Stanisławów**. In subsequent project efforts one should provide for an independent system of access roads to the cargo terminal. Those roads should not be the same as access roads to the passenger terminal. The next challenge connected with the construction of the CTH is to add a third lane to the A2 motorway on the Łódź - Warsaw section in locations where it is possible. It is necessary to ensure urgent routing of road sections. A parallel task is to provide for urgent connection of the road network to the area covered by the future airport for the construction time whereby access will be ensured for staff, construction vehicles etc. In order to ensure efficient conduct of the construction process one would need to consider the division of the construction of the road system from the construction of a new node on A2 so that construction and haulage of bulk materials could be organised directly from the motorway.

The construction of the Motorway Ring Road of Warsaw In line with the Concept of Spatial Development for the Country by 2030 near the CTH node it is expected that a Motorway Ring Road of Warsaw will be built, a circular road routed from 40 to 50 kilometres from the centre of the capital city. The Ring Road is expected to run among others through Płońsk, Wyszogród, Sochaczew, Grójec, Mińsk Mazowiecki, Wyszków and Pułtusk. It should be considered whether it is possible to build the Motorway Ring Road of Warsaw running in direct vicinity of the CTH utilising the new node necessary to service the CTH. This will ensure free access to the Central Transport Hub for travellers arriving from all directions. The CTH is a determining factor for the phased beginning of construction for this investment. In particular already at the stage of building the CTH it is necessary to lay a section of about **65kms** of the Ring Road of Warsaw connecting DK 92 (the Sochaczew node) - the CTH node to A2 - the S8 express road - the S7 express road (the node in Grójec). It should be noted that already now on the section of DK 50 corresponding to one of Warsaw Motorway Ring Road scenarios the average daily traffic of vehicles is from 12 to 20 thousand vehicles (“The annual daily traffic of motor vehicles on the network of national roads in 2015” the General Census of Traffic 2015 GDDKiA (https://www.gddkia.gov.pl/userfiles/articles/g/generalny-pomiar-ruchu-w-2015_15598//SYNTEZA/MAPA_SDRR2015_DK.pdf). After the commissioning of the CTH to the extent of needs resulting from road traffic the following sections of Motorway Ring Road of Warsaw can be completed: the Grójec section (S8) – Kołbiel (S17 Node) - Mińsk Mazowiecki (A2 Node) - Wyszków (S8 node) and the northern section - the node on A2 near the CTH - Sochaczew - Wyszogród - Zakroczym - Serock - Wyszków. The combined length of the Warsaw Motorway Ring Road understood in such a manner is approx. 306 kms. From the standpoint of the needs of the Central Transport Hub the section Mińsk Mazowiecki - Wyszków does not however have such a prominent importance. The extension of the road road network for the needs of the Central Transport Hub is hence limited to the number of approx. **248 kms**. It should be stressed that at the current stage there are no clear grounds to indicate that on the entire section the road described above would need to be an A class road. Allowing for adequate terrain reserves it is possible to base the road on the GP standard (two times two lanes, in selected sections at times 2+1) and the utilisation of the sections that are currently under construction e.g. the ring road of Góra Kalwaria.

E. THE CTH AS THE INTEGRATOR OF THE WARSAW-ŁÓDŹ AGGLOMERATION

General Assumptions A natural consequence of the construction of the CTH is the emergence, in its direct vicinity, of the so called Airport City enriched with commercial functions. The terrains located at the main transport thoroughfares (mainly roads) may as a result of it be converted into a modern business park with recreational and entertainment functions. For the Solidarity Airport it means that a natural factor driving the increase in revenues may be revenues from non-aviation activities. The investment into construction of the so

called Airport City is a commonplace development trend for airports. Airports are looking for revenues that are dissociated from handling of aviation traffic as thus they are trying to diversify the revenue streams. Due to such approach the manager may decrease the level of airport charges and at the same encourage passengers to use a given airport (source: Services offered by airports in the European Union and Poland - selected issues, joint publication edited by Filip Czernicki and Tadeusz Skoczny, Warsaw 2011).

At the same time the construction of the CTH will create in its vicinity an area with the best transport accessibility in the country with regard to both domestic and international transport. This will be a very strong impulse bolstering the economic growth of such region. The integration of the Warsaw and Łódź agglomerations that will occur with the implementation of that project will lead to the emergence of a metropolis of global prominence will be a significant economic growth factor and a developmental opportunity – especially for the Łódź region. In order to achieve this basic objective certain specific transport investments must be implemented that will serve the improvement of the quality of transport systems of both agglomerations, such as:

Railway connections A new fast Warsaw-Łódź railway line will be a significant integrator of such agglomeration (its final parameters will be defined later in project works, see above). The new railway line Warsaw - CTH - Łódź will allow to ensure quick trip time to the CTH irrespective of the agglomeration traffic or possible closures resulting from failures or maintenance or repair works on the existing lines. The CTH itself will perform the integration function as it will at the same time be the railway station for express metropolitan Warsaw-Łódź trains of the Warsaw-Łódź agglomeration railway and a terminal station for suburban railway systems of Warsaw and Łódź and the node of domestic IC and IR class trains for the Central Metropolis.

Examples of investments accompanying the construction of the CTH One should also bear in mind certain investments which are not inherently connected with the Concept of the Central Transport Hub but may however be used to implement its objectives. The incorporation of the **High Tech City** is the first of such projects. Areas around large transport nodes always become the areas covered by developments handling many functions. Around airports “Airport Cities” are developed with hotels, conference centres or office and administration developments, business parks etc. In case of the CTH – a facility combining the functions of the main domestic airport or central European airport and the main node of domestic passenger transport the attractiveness of siting of investments will be significantly higher than of an average plot of land neighbouring an airport. The new urban complex will not only be the “Gateway to Poland” but will also serve as her visiting card. That is why the CTH project should be integrated with the concept of building a new city that will be both a Gateway to Poland for passengers arriving to Poland and central element of the new binary Metropolis with global prominence and impact. Such a city should be designed in accordance with the city planning objectives defined in the design selected following an international competition. This new Polish city should not perform the functions connected mainly with handling of transit traffic but should draw on its incorporation merits and become a business, administrative and scientific centre - including for example a campus co-created by a federation of Polish tertiary teaching institutions of the Central Metropolis. The target area of the new urban complex should be at least 10 square kilometres.

The Expo of Central Europe An important element of the new High Tech City may be a global scale trade fair, exhibition and conference centre handling the needs of Central European region which should take part in competition to organise the World Expo in 2030. Lack of such business infrastructure in Poland that would match the required standards and size is one of the developmental barriers indicated by domestic entrepreneurs who for promotional needs and in order to gain access to the required knowledge and contacts are forced to use exhibition centres in other countries and hence are forced to incur significant costs whilst funding the economies of other countries. The construction of an exhibition centre with the exhibition area not lower than 200 thousand m^2 with an allowance enabling further extension, creates a modern backbone to

support domestic entrepreneurship and at the same time serves as the element of business activity - the trade fair industry. The centre located in the direct vicinity of the CTH given the location merits stands a chance of becoming the main exhibition and trade fair facility of the entire Central European region.

The support to the rejuvenation of degraded quarters in Łódź Independently of the investments, in the nearest vicinity of the CTH one may consider the introduction of support mechanisms to Łódź, being a weaker, in economic terms, centre of the Central Metropolis in the rejuvenation projects carried out by its local authorities. In particular in measures pertaining to development for new economic functions connected with the launch of the CTH – valuable and historical urban developments such as the old 19th century ex-factory developments. Among the rejuvenation efforts it should be considered whether it is possible to provide support in the form of moving some of the central administrative authorities to such locations and developing programmes connected with finding employment in the formerly degraded areas for people in the investments developed as a result of opening of the CTH.

Support and promotion of important artefacts of the national heritage located in the vicinity of the CTH With the construction of the Solidarity Airport, given its characteristics, developmental programmes should be connected that will be targeted at important artefacts of the national heritage located in the vicinity of the Port as they should become tools of promoting Poland and her history. In particular support should be extended to: The Museum in Żelazowa Wola, the Museum in Nieborów and Arkadia included on the list of historical monuments of Żyrardów, connected with the life of Saint Maksymilian Kolbe of the Niepokalanów Monastery in Teresin and with regard to conversions of noblemen's mansions located near the CTH enabling their use for cultural, tourist or service purposes.

Other transport initiatives The launch of the CTH also constitutes a driver for a further development of transport infrastructure in the region of the Warsaw-Łódź agglomeration like the in the regions of other agglomerations covered by a public transport system (located on the "spokes" of the transport system). Selected proposals are presented in Attachment 5. Among such initiatives one should especially include the extension of the Warsaw Railway Node and the integration of the railways with the subsystems of urban transport (the construction of the Warsaw railroad ring line, the extension of the Metro system, the construction of new agglomeration lines, relaunch of dormant lines in the agglomeration transport etc.) as well as a similar extension of the Łódź Railway Node (in particular: the rejuvenation of the system of Łódź suburban trams, conversion of the Łódź Kaliska railway station and of the layout of the node, the construction of the P&R system connected with the system of urban transport and railway transport located at the exits from motorways and express roads surrounding the city etc.).

F. THE CTH AS A DEVELOPMENT DRIVER FOR THE INDUSTRY

1. THE AVIATION INDUSTRY

Ensuring the demand for R&D The launch of an air transfer node operating in the intermodal system (combined with the retrofitting of the railway and road systems) will not only exert an impact on increasing Poland's access to the main international transport routes but will also trigger the demand for professionals from the aviation and related industries. This in turn will fuel the development of tertiary education and hence an increase in the scale of research (and as a consequence also of R&D) in such fields of science as aviation, power engineering, electronics, computerisation, electrical engineering, mechanical engineering, ICT and many others. The CTH will become a facility that will stimulate the demand for new technological solutions and in a natural manner will be become a location of their implementation and deployment in the functioning of the port. This to a significant degree will exert its impact not only on the development of Polish science but will also provide to it the place to implement new technologies developed by Polish scientists. The demand for new

technologies and technical solutions dedicated to various area of functioning of the air transport infrastructure of the CTH will also stimulate manufacturing entities implementing those solutions and will ensure that such solutions will migrate from the research phase to the implementation phase. In a similar manner new *strictly* aviation technologies used by, for example, entities engaged in the area of technical handling or service of aircraft will be transferred from research labs to the economy and will thereby increase its innovativeness. It is also natural that the aviation sector is inextricably connected with the aerospace and telecommunications industries. The development of aviation and aviation related technologies will as a consequence lead to works on increasingly sophisticated technological solutions, which will significantly increase Poland's capabilities in those two strategic industries.

Servicing of carriers The launch of the CTH will come with the development of a service backbone for carriers providing transport services from the port. The functioning of such backbone infrastructure means the allocation of businesses, operating in this sector, and comes with new highly specialised jobs (that are far more productive than those in the other sectors of the economy). For example it is worth mentioning here that the productivity in the aviation sector in 2014 in the UK was by over 50% higher than in the remaining sectors of the economy (also those highly innovative ones).

2. THE RAILWAY AND CONSTRUCTION INDUSTRIES

Increased demand for rolling stock A possible retrofitting of the domestic railway transport system implies an increased demand for new types of rolling stock and for technologies used in the construction of infrastructure. At present in Poland rolling stock enabling working speeds of up to 160 km/h is being manufactured. The selected speed technology (200<V<250 km/h) for trains handling the basic backbone of the transport system meets the requirements of the 2 TSI class and already is within the technological reach of Polish rolling stock manufacturers. The execution of the project will trigger demand for new types of rolling stock used in local and regional subsystems whose design may be supported from funds provided by the National Centre for Research and Development. In particular new needs for rolling stock will affect IC class electric multiple units with speeds between 200 and 249 km/h, Push-Pull car trains for interregional and regional rolling stock with speeds from 200 to 249 km/h and locomotives for those trains or special rolling stock for express agglomeration trains of the Central Metropolis with the features of an agglomeration train but offering speeds from 200 to 249 km/h.

The improvements in construction techniques as part of infrastructural works The concept of the construction of the CTH assumes the construction of the CTH itself and a 120 km Warsaw-Łódź line and in more distant future 700-800 kms of new railway lines and 65-248 kms of express-ways and motorways. In order for the CTH to attain direct connections with all the areas of Poland apart from the construction of the new lines it will be necessary to modernise or rejuvenate the existing lines, railway stations and infrastructural facilities. Thus the transport needs around the CTH offer an opportunity for the domestic construction sector. Its comprehensive readiness enables development of competencies spanning multiple industries of infrastructural construction, in particular with regard to: prefabricated technologies and mechanisation of the construction process, power engineering, railway automated solutions, communication or underground structures. Among the technologies applied in infrastructural construction in an infrastructural project of such magnitude one should especially mention the standardisation of types technologies, technologies of prefabrication of civil engineering structures and of mechanisation of the construction process, technologies connected with energy supply and recovery as well as with its storage plus possibly technologies of ensuring alternating current supply for newly constructed sections and other technologies connected with the electrification of lines, modern SRK technologies (e.g. design of cheap typical and mass scale railway carriage and of a system providing safeguards against collision of trains based on geolocation systems). It will be possible to use those competences after the completion of construction outside the borders of the Republic of Poland.

3. NEW MEANS OF TRANSPORT

Between the openness and stimulating a transport revolution. The construction of the CTH and the public transport system for the Republic of Poland based on it assumes the openness to changes that in the opinion of many analysts will occur in transport over the forthcoming ten years i.e. in the period prior to the launch of the CTH. A special attention should be paid to the technologies on which in many countries of the world intensive R&D works are in progress and which may exert an impact on the transport system to the extent comparable to changes that had been caused by the invention of the automobile, railways or an airplane. Such potentially revolutionary technologies include in particular road autonomous transport or magnetic vacuum railways. The development of the technologies indicated above offers an opportunity for the Polish industry for dual applications (civil and military) and will maybe support the construction and the development of industrial capabilities that are important to ensure the defence potential of the Republic of Poland. From that standpoint the construction of the CTH may offer a trigger to implement innovative transport solutions in the Republic of Poland.

Road autonomous transport In technological terms road autonomous transport can be deployed even nowadays. The introduction of wider-scale deployment of autonomous vehicles may, in the opinion of some analysts, change the characteristics of the automotive sector as the sector of the economy from a sector connected with the delivery and use of goods (by vehicles bought by consumers) to a service based economy (consumers will be purchasing a transport service rendered by a vehicle belonging to the service provider). Autonomous vehicles may constitute a sub-system of local public transport - especially in urban areas. The attempts to deploy this technology of carriage are currently afoot in several locations globally. Also in Poland the draft of the Act on the Electric Mobility and Alternative Fuels contains solutions enabling the test implementations of such vehicles. The launch of autonomous transport on public roads would however require the introduction of legal changes to the Road Traffic Act and to the Vienna Convention on Road Traffic ratified by Poland. The autonomous vehicles can however be deployed in the transport sub-system serving the CTH and the emerging urban complex developing around it (the High Tech City) on internal roads - as an integral part of the CTH project independently of changes relating to the traffic on public roads.

On a similar basis the autonomous technologies can be deployed in the framework of pilot complementary projects relating to the construction of local transport sub-systems integrated by a public transport system that will emerge based on the Central Transport Hub. An *a priori* assumption that on the area occupied by the CTH an area open to autonomous transport will be created constitutes a growth stimulus for the industry in question. In this context it should be added that the technology of autonomous (electric) vehicles is within the reach of domestic industry: in Poland there are companies manufacturing advanced technologies in that sector, those providing the most modern sensors used in the aerospace industry or electric drive systems and vehicle charging systems. The Polish automotive industry also manufactures most sub-assemblies for traditional motor vehicles and produces public transport vehicles of all types. The implementation of a public transport sub-system on the plot of land surrounding the CTH that is based on autonomous vehicles creates a demand for products whose manufacturing is within the reach of Polish companies.

Magnetic vacuum railways The concept of a railway travelling in a vacuum tunnel reducing air drag has not yet been implemented in practice. The technological progress however means that the implementation of the technology in question may have a business case. In many scientific centres world-wide, and in the US in particular as well as in the People's Republic of China efforts are afoot on designing an optimum technology for such transport deploying the phenomenon of magnetic levitation. The first test sections of such installations have recently been built in the US. In this context it should be added that the leading projects relating to this technology involve scientific think-tanks from Poland. Should such efforts turn out to be successful the global transport system will be enriched with the fifth means of transport whose benefits are beyond criticism, very

high travelling speeds achieved with a very small power consumption and negligible adverse impact on the natural environment. Given that the CTH in its assumptions is to act as as the heart of the transport system of the Republic of Poland a minimum standard that must accompany its construction is to provide for a space allowance (or free premises in the CTH facility) for possible future extension of the node to include this transport component both on the longitudinal and lateral directions. A possible future extension of the CTH to include the vacuum transport component cannot however disrupt the day-to-day operations of the CTH node. In addition, in the Spatial Development Concept of the Country one should provide for terrain allowances for the construction of line infrastructure of such transport system. Should progress be achieved in works on the concept of vacuum railways it also seems advisable to provide for sufficient terrain allowances alongside the new planned Warsaw-Łódź route (in the HSR trace to ensure ultra-high speed transport between the two agglomerations and the CTH.

It should be noted that the launch of a means of transport operating with the speeds at the level of 600-1200 kms/h has valid grounds especially to connect urban centres inhabited by millions. In Polish circumstances this technology could find future deployment in particular on the transcontinental latitudinal Euro-Asian pair and on the central European north-east pair connecting the main countries of the Central European region, and in the internal domestic transport for a set of city agglomerations with the features of Megapolis whose cores are the Central Megalopolis (Warsaw-Łódź) and the Southern Megalopolis (Silesian-Little Poland<Małopolska>). The prospects of deploying vacuum railways in the Republic of Poland based on the CTH are described in detail in Attachment 4.

VII. KEY MEASURES FOR THE EXECUTION OF THE PROJECT

A. THE ADOPTION OF A PARLIAMENTARY ACT SUPPORTING THE INVESTMENT PROCESS.

1. SOLUTIONS SPEEDING UP THE INVESTMENT PROCESS

An open character of the Act . Accompanying investments It is assumed that a draft Act supporting the investment process will be adopted, its purpose will be to streamline and speed up the procedures and processes connected with project preparation and execution. The Act will in particular define the principles and conditions governing investment preparation and execution with regard to the construction of the Central Transport Hub. A special inclusion in this context is required for solutions used in the Act amending selected Acts in connection with the simplification of the investment-construction process that is currently at the stage of inter-ministerial consultations (draft number UD300). Given the scope and the non-uniformity of investments planned to be implemented the *lex specialis* should however cover principles and conditions of investment preparation and execution not only with regard to the construction of the Central Transport Hub itself (the main investment) but also with regard to the "accompanying investments" by specifying competent authorities for those matters. Only the adoption of such a legal construction in the *lex specialis* will enable rational, effective and consistent implementation of the main investment being airport investments and "airport-related" investments (the Solidarity Airport) and also of the accompanying investments covering investments into railways, roads and other necessary projects (such as transmission grids and networks, waterworks) for so complex and frequently varied investment (construction) plans. The scope of planning regulations will also cover the most important urban transformations connected with the emergence of the CTH, including possibly a new urban centre and industrial, warehousing and exhibition facilities in the closest vicinity of the Port.

Mechanisms ensuring the optimisation of the planning process The central instrument of the designed special solutions will be spatial planning acts adopted at the governmental level. They will specify the core principles of execution for individual investments as well as will characterise their interconnections. A spatial planning act that will be an act of universally applicable law will constitute the factual and legal basis for the issuance of administrative decisions defining precisely the location of investments and specifying their environmental conditions. The purpose of the act in question will not only be to safeguard plots of land for the construction of the CTH and for accompanying investments, including the provisions for the already mentioned modular growth of the Port but it will also in spatial planning terms ultimately define the key conditions of development for new urban centres connected with the Port, including making allowances for warehousing, manufacturing and exhibition premises handling the needs of the Port. The act of spatial planning will be subject to a strategic environmental impact assessment.

The optional nature of the manner specified in the *lex specialis* If for any reasons (legal, factual) a manner provided under other acts of *lex specialis* nature would be more beneficial (e.g. under "road", "railway" Acts) or a totally general manner would be more beneficial – then such other manner could be applied. The investments regarding the preparation and construction of the Central Transport Hub can be executed in accordance with the planned Act or in accordance with other Acts already in force e.g. the Act dated 10 April 2003 on Special Rules Applicable to the Preparation and Execution of Public Road Investments (the Journal of Laws of 2017, item 1496 as amended later) – with regard to the preparation and execution of investments relating to public roads or with the Act dated 12 February 2009 on Special Rules Applicable to the Preparation and Execution of Investments Relating to Publicly Used Airports (the Journal of Laws of 2017, item 1122 as amended later) – with regard to the preparation and execution of investments relating to publicly used airports in the meaning of that Act. The draft Act will enable entities executing investments to resort to different procedures of their implementation and will ensure flexibility in the selection of the adequate manner in which individual investments will be executed. The draft of the Act should also be based on a sufficiently flexible **legal definition of "accompanying investments"** so that it covers all railway, road and other investments deemed necessary to construct the CTH or for its proper functioning and operation and for proper functioning and operation of the system that will emerge based on this node. The range of accompanying investments may include also investments that are only complementary to the main investment. However all the investors will be bound by the spatial planning act that will perform the coordinating role.

Streamlining measures for the investment process The draft of the *lex specialis* should contain all the procedural facilities characteristic of other "special solutions" and should result in an effective and fast land expropriation effect and earlier land reservation effect (no possibility to dispose of the real estate and incur any encumbrances thereon). The solutions provided for under the draft Act cannot constitute a simple transfer of the solutions that are already operational in the legal system, they should be based on "own" solutions, which has valid grounds given the scale, specific nature and the scope of the investment. By way of an example, with regard to the portion of land covered by the CTH, the Act should guarantee the triggering of the land expropriation effect (with regard to the plots of land for the airport), with regard to other real estates (e.g. those located on the planned limited use area) the effect in the form of the right of first refusal may be deemed sufficient.

An extremely important subject matter assumption, which will help to complete the project, is the possibility to make a quick choice of the location which would be combined with environmental impact assessment and obtaining an environmental decision within the meaning of the Act of 3 October 2008 on sharing information on the environment, environmental protection, the participation of the society in environmental protection and environmental impact assessments (Journal of Laws Dz. U. of 2017, item 1405), hereinafter: the

Assessment Act, as well as the purchase of land for projects. Therefore, the bill will provide for detailed solutions in that respect.

Environmental and location decision The bill will provide for adoption of a structure of an environmental and location decision (ELD) and making relevant amendments also to the Assessment Act. An environmental and location decision will be obtained separately for the main project and separately for accompanying projects (subject to the possibility of assessment of so-called cumulative environmental effects of the project objectives. The statutory amendment pertaining to the report on the project's environmental impact (EIA report) will correspond with the above solution. Apart from environmental issues, an EIA report should contain provisions on location conditions, so that it can provide a ground for obtaining a comprehensive environmental and location decision. It should be emphasised that such a report will be an essential piece of evident in an administration proceeding whose purpose is to obtain an ELD.

The scope of the environmental and location decision. The decision in question can, depending on the investor's request, pertain to the entire project or a part thereof, which includes but is not limited to the section of the linear structure, the civil structure or a complex of structure, which can operate independently in accordance with their function. After completion of the proceedings to assess the project's environment impact, ELD will be rendered, where, among others:

- The site of the project will be defined;
- The conditions for the use of the land in the completion and operation, or use of the project, the environmental protection conditions which need to be included in the documentation required to grant a building permit, the requirements on the prevention of industrial failures, any potential requirements on prevention of cross-border environmental impact will be set;
- The need to perform environmental compensation and the need to prevent, limit and monitor the project's environmental impact will be set forth (if necessary);
- The need to create a limited use area will be set forth;
- The plots of land where necessary works are to be performed, i.e. cutting down trees and bushes, deforestation, examination and taking measurements, and environmental compensation, will be designated;
- An obligation to present a follow-up analysis will be imposed on the applicant (if necessary).

The effects of the environmental and location decision. The environmental and location decision, where the plots of land required to perform preparatory works are designated, should provide the ground for performing the works which include cutting down trees and bushes, conducting archaeological or geological research, including works which are performed when civil structures are erected.

Adoption of a structure for a boundary condition envelope. Another structure which could be used in the investment process is the institution of a boundary condition envelope. The concept of an envelope, due to the specific nature of the Polish model of conducting environmental impact assessments (EIA) is a more and more frequent method of planning research and obtaining administrative rulings necessary to complete projects. The concept has been accepted by the public administration bodies which make such an assessment. The adoption of this solution is justified all the more so because, at an early stage of the investment process, there is no sufficient information on the possible and adequate technical solutions which will be precisely defined at a later stage of the investment process. As regards the moment of obtaining ELD, the administrative proceeding should be, therefore, conducted on the basis of a boundary condition envelope. A boundary condition envelope pertains to all the variants (technical solutions) considered and assigns values to each variant for identified aspects leading to a potential environmental impact. An envelope includes significant parameters

which may affect the environment for the considered variants, and identifies the parameters with the highest value of impact and the range of values for each parameter.

The Bill will also assume certain **improvements in the administrative procedure**, which include but are not limited to the exclusion of application of Article 31 of the Code of Administrative Procedure, the possibility of notification about initiation of the proceeding to obtain ELD, also by placing an announcement in the voivodship office and the commune offices competent for the site of the project, as well as in nationwide newspapers. Such a manner of notification about initiation of the proceeding will be effective, in particular, for the owner or the perpetual usufructuary, in the case of undetermined legal status of the real property included in the application for a decision to set the site for the project, or the situation where the cadastre does not contain any data which help determine the personal data which includes but is not limited to the address of residence of the owner or the perpetual usufructuary. The Bill will provide for the possibility of notification about the fact that the decision was rendered, in the same manner.

As of the date of service of the notification about initiation of proceeding pertaining to ELD, the Bill will link certain legal consequences pertaining to the real property referred to in the application for a decision to determine the set for the project, i.e. real property that is owned by the State Treasury or a local self-government unit cannot be traded and the entities that implement the project will have the statutory right of pre-emption to purchase the other pieces of real property. The Bill will also provide for, that the undetermined legal status of the real property included in the application for a decision to set the site for the project, or the situation where the cadastre does not contain any data which help determine the personal data which includes but is not limited to the address of residence of the owner or the perpetual usufructuary, will not constitute an obstacle to initiate and conduct the proceeding, and to render and serve the environmental and location decision.

The Bill should also assume that ELD on the Central Transport Hub will approve division of real property. Maps with projects of division of real property should constitute an integral part of the decision on setting the site for the project of the Central Transport Hub. The real property referred to in the decision on the site of the project will become the property of the State Treasury by virtue of the law. At the same time, if the real property referred to in the decision in question or perpetual usufruct rights to the real property are encumbered with limited rights in rem, such rights will expire by virtue of the law. ELD pertaining to the Central Transport Hub will provide the ground for making entries in the land and mortgage register and in the cadastre. As of the date of rendering the decision on setting the site for the project as regards CTH, the special purpose vehicle will obtain the right to use the real properties subject to the decision.

The Bill will assume that the existing owner or perpetual usufructuary of the real property, as well as the person who has limited rights in rem to the real estate shall be entitled to damages for the real properties and limited rights in rem to the real properties, established on real properties taken over by the State Treasure, in the amounts agreed between the special purpose vehicle and the existing owner or perpetual usufructuary of the real property, as well as the person who has limited rights in rem to the real estate. If the amount of the damages is not agreed on, the amount will be determined by way of an administrative decision. To this extent, the Act must, on the one hand provide for mechanisms which prevent speculative land trade, and on the other hand, it must ensure maximum respect for the interests of existing residents of the areas where the project is implemented.The situation of people who will not be interested in getting a cash equivalent for the land purchased for the project must be taken into particular consideration. Solutions adopted for other public projects should be applied for that purpose. One must also provide for regulatory mechanisms which will ensure fair balance between the interests of the owners of land in the vicinity of the Central Transport Hub and

the general interest manifested in the right of the Republic of Poland to derive financial benefits from projects undertaken with the use of significant public means.

Limiting the possibility to block works. The planned act should also provide that, in respect of the real properties included in the application for ELD, until the end of the proceeding to render such a decision, any proceedings for rendering a decision on the conditions of building and site development, or a decision on the location of a public purpose project within the meaning of the Spatial Development Act of 27 March 2003 (Journal of Laws Dz. U. of 2017, item 1073, with subsequent amendments) shall be stayed. This solution is applied in the Act of 29 June 2011 on preparation and implementation of nuclear power projects and accompanying projects (Journal of Laws Dz. U. of 2017, item 552, with subsequent amendments).

2. The statutory authorization of the Government Representative for the Central Transport Hub for the Republic of Poland

The act that facilitates the investment process for the Central Transport Hub provides for statutory authorization for the Government Representative for the Central Transport Hub for the Republic of Poland to act. The Government Representative shall be appointed and dismissed by the President of the Council of Ministers.

Under a separate power of attorney, the Representative will be able to exercise the rights under the shares held by the State Treasury, on behalf of the President of the Council of Ministers, with respect to entities which conduct the investment process and set up under the act. The detailed scope of powers granted to the Representative, the manner of supervision over the Representative's activity and the manner of providing the Representative with subject matter, organisational and legal, technical and office services will be set forth by way of an ordinance by the Council of Ministers.

3. Promoting development of the aviation market

To maximise the positive impact which CTH will have on the entire aviation sector and the economy, the decision to start its implementation must entail adoption of certain framework solutions pertaining to the development of the aviation market. In particular, adequate statutory solutions should promote the development of the aviation market, transfer traffic in the Republic of Poland and fair competition on the aviation market. They should implement EU strategic documents which provide for protective measures against unfair competition from non-EU countries, as well as prevent unlawful legal practices used by some participants on the market.

B. Initiation of environmental procedures

As early as before the adoption of a special-purpose act, measures should be taken to streamline environmental procedures. These should include but be not limited to preparation of an internal document in the form of a **"Programme of environmental and location research"**, which will provide a basis for adequate performance of research and supervision over them by the Ordering Party. The research programme will provide for connections between research areas both as regards subject matter connections, as well as the deadlines for completion of the research. **The objective of environmental and location research** is to **obtain**

enforceable and final environmental and location decisions, under which it will be possible to complete the project. **All research and proceedings related thereto should, therefore, include:**

- To mobilise the research;
- To conduct the research;
- To analyse the results of the research;
- To prepare environmental reports required to obtain a decision;
- To make arrangements with the relevant authorities;
- To hold public consultations;
- To obtain an environmental and location decision;
- To defend the decision in the course of administrative proceedings and proceedings before administrative courts;
- To duly perform the decision.

The priority objective of the research is to obtain relevant administrative decisions on the basis of reports prepared using the results of the research. The teams which will conduct the research and the teams which will supervise the research should aim at achievement of that objective. When contracting out the individual research paths, contracts will set forth the research objective and the liability for damages of the entity conducting the research during the entire administrative procedure, as well as at the stage of performance of the administrative decision. Research contracts will contain provisions on updating and adjusting methodologies and on the compliance of final reports with legal requirements, including the **possibility to update the documentation before submitting it to the authority and during consultations with authorities** (such an update option may force the Ordering Party to incur additional charges).

The results of the research will be used for analyses, and then will provide a basis for preparation of reports. Pursuant to the Assessment Act, a report on the project's environmental impact (EIA report) will be the basic and most importance piece of evidence in administrative proceedings and proceedings before administrative courts. Note that a **significant part of provisions from reports will be transferred/transposed to the environmental and location decision**; therefore, such provisions will affect the enforceability of the administrative decision.

Contracts for individual research activities or groups of research activities must include and guarantee:

- A possibility **to verify**, whether the results have been correctly obtained, before the works are accepted;
- **Liability for damages** of the contractor for incorrectly corrected data;
- A possibility to access **the underlying data**;
- A possibility to verify, whether the results have been correctly obtained, **before the works are accepted**;
- A possibility to hold talks and consultations before the final acceptance of research results (partial reports, final reports, etc.). Such consultations should be able to end with **conditional acceptance** with suspension of payment of a part of the consideration, until any doubts are resolved by the relevant authority in the administrative procedure;
- **A possibility to share the results in the version before acceptance with other contractors**, as well as a possibility to change deadlines in the case of delays in one of interdependent research paths.

Proper preparation of research, i.e. **proper mobilisation** thereof, is an extremely important element. During the preparatory stage before execution of contracts, it is necessary to verify the resources and capability of

qualitative, quantitative and deadline mobilisation. A research contract should contain provisions that define: for which mobilisation elements the contractor is responsible, for which the mobilisation elements the ordering party is responsible and who is to provide the key research equipment.

During the research, it is possible that it will be **necessary to obtain additional permits/permissions,** e.g. a geological works permit. When contracting out research, the rules for obtaining permits and responsibility for obtaining them must be precisely set forth. Permits valid longer than the research itself should be obtained for the Ordering Party. The Ordering Party must be able to inspect the documentation before submitting it to the competent authority.

Depending on the adopted research model, grouping into research blocks may also facilitate acceptance of contract products, and before that, it may facilitate supervision over the research. When outsourcing research, **one entity would be responsible for the individual research blocks** (or a consortium of entities). After conducting research and collecting data, it is necessary to **perform modelling and analyse the research results**, which may include: an analysis of cumulative effects, a geomorphological analysis, a model of geological and engineering conditions, a model of hydrogeological conditions, assessment of susceptibility of groundwaters to contamination, a structural model of the geological substratum, modelling of noise distribution in the environment, an analysis of the social and economic situation, an analysis of the impact on monuments and the cultural landscape, which are included in the existing documentation, which includes but is not limited to the register of monuments.

C. Preparation of the Warsaw Chopin Airport for the transfer of the civil traffic to the Central Transport Hub

The transfer of the civil traffic. One of the fundamental conditions related to the construction of the Central Transport Hub is to take the decision to transfer the civil traffic from the Warsaw Chopin Airport to the Central Transport Hub. Without that decision, the entire project will not be successful. Interest of airlines is of key important for sustainable profitability of an airport. For a hub airport, the role of a local carrier(s) is particularly important for the undertaking's profitability. If two public civil airports are left, the present location of the Warsaw Chopin Airport (7 kilometres from the very centre) will remain an extremely attractive competitive advantage for passengers travelling from/to Warsaw, even if the time to get to CTH is a little bit shorter. Thus no low-cost carrier or network carrier would move its operations to a more remote airport. To leave active Warsaw Chopin Airport in civil transport would lead to market dispersion and would be a waste of its potential, which is indirectly an outright contradiction of the main objective of the CTH project.

An example that illustrates the failure of an idea to maintain two ports (a "municipal" one and a "suburban hub") is the story of the Montreal Dorval and Mirabel airports:

The Dorval Airport is situated relatively close to the city centre. It had been the main airport for Montreal since 1941. At the end of the 1960' and the beginning of the 1970', it had one of the biggest terminals in the world and was Canada's main hub which served all flights between Canada and Europe. Faced with decreasing capacity, the government decided to build the Mirabel Airport, about 50 kilometres away from Montreal, with the target capacity of about 50 million passengers. According to the plan, the Dorval Airport was to be closed due to its negative impact on the environment and limited development opportunities. The Mirabel Airport was opened in 1975. Initially, all international flights were transferred there, leaving national flights at Dorval. Then, as a result of, among others,

social protest against job reductions, the idea to close the Dorval Airport was abandoned. Limited transfer opportunities and relatively poor access infrastructure (which was not developed, as Dorval was to remain) resulted in very poor popularity of the Mirabel Airport among passengers and airlines, especially in view of the alternative of return to Dorval, to which additional funds were ultimately allocated for expansion (increase of the area to 1620 ha and construction of a parallel runway – which is not possible at Okecie). In the end, the Mirabel Airport was closed due to high maintenance costs and the entire international traffic returned to Dorval. After a couple of modernisations which cost nearly USD 2 billion in total, the capacity of Dorval was increased to 20 million passengers and the airport now serves 15.5 million passengers. As a result of unnecessary loss of time, among others, due to the two-port experiment, as well as the failure to adjust Dorval to the role of mega hub, Montreal irretrievably lost its place on the aviation map of North America. At the same time, the airport in Toronto, which operated as the only airport for the city (except for the regulated activity at the Billy Bishop City Airport), without any infrastructural shortages, definitely rose in importance. In 2015, it served over 41 million passengers and was the second biggest airport in terms of international traffic for the entire North America.

The concept of maintaining the Malpensa and Linate Airports in Milan entails similar disadvantages. Thanks to administrative restrictions, most of the traffic (about 18 million passengers and 160 operations) is artificially retained at Malpensa, which helps it to achieve satisfactory results, but the fact that nearly 10 million passengers and 120 operations are served at Linate certainly decreases Malpensa's attractiveness as a hub and contributed to the falling numbers of passengers and Alitalia's decision to return to Fiumicino in Rome. The need to serve the Milan traffic by virtually three airports (directly by Linate and Malpensa, and through Fiumicino) also contributed to the low effectiveness of the Alitalia airlines.

D. THE ACTIONS AIMED AT ENSURING CAPACITY AT THE WARSAW CHOPIN AIRPORT

Before civil air traffic is transferred to CTH, it is necessary to ensure the maximum capacity available at the Warsaw Chopin Airport. To achieve that objective, it is necessary to **administratively divide the traffic at the airport**, as well as to make the **necessary investments** by Przedsiębiorstwo Państwowe "Porty Lotnicze" [State Enterprise "Airports"]. In the situation in question, the priority is to transfer, pursuant to the applicable laws and regulations, the General Aviation and LCC traffic to another airport situated in the region of Mazowsze. As a result, the Warsaw airport will increase its capacity to accept aircraft which operate in transfer traffic on long-distance routes. Similarly, all infrastructure projects which are planned by CTH will be about solutions which help increase the capacity of the airport as regards the service of wide-body aircraft and passengers travelling in them. Any projects in that respect must be implemented in a manner that makes it possible to avoid or minimise deterioration of coordinate parameters during their implementation. They must not lead to a situation, where the commencement of any project improves one coordinate parameter, but restricts/blocks the possibility of other projects whose objective is to improve other coordinate parameters, or will even cause their deterioration, resulting in no improvement of or deterioration of the capacity, after costs were incurred (for example: widening the taxiway could result in reduced number of spaces on the apron and would prevent the maintenance company which operates in the airport from conducting its business; expansion of the terminal infrastructure in the form of a so-called "barrack" does not solve the problem of the Schengen/non-Schengen sorting office and parking spaces, and could be more time-consuming than the expansion of the northern pier and less optimal as regards type E contact desks for the Fire Service).

Capacity at an airport should be considered mainly as infrastructure capacity, environmental capacity and airspace capacity considered jointly and in mutual correlation, both on a daily and hourly basis. This fact may be illustrated by the existing limit of daily capacity which amounts to approximately 600 aviation operations a day (the maximum number of operations estimated by PPL is 650 after introduction of the Quota County daily system) and maximization of hourly capacity (number of operations per hour). Now, there are operation hours,

when the limit has already been used or is almost used (it is not possible to perform more operations now) and hours, when there is considerably less use. It results from arrival and departure waves which direct result from market demand. The main carriers (including PLL LOT) have very limited opportunities for so-called flattening those peaks. The main factor which limits the capacity, which will be exhausted in the following years at the Warsaw Chopin Airport, is the environmental capacity. The real opportunities to increase it are very limited, very time-consuming, and, in the case of entering the Limited Use Area, it could put the airport at the risk of paying huge damages (LUA).

Due to the existing limitations, the Warsaw Chopin Airport is not able to ultimately ensure the capacity necessary to serve the air traffic, before CTH is constructed, by infrastructure projects alone. Even big investments would not translate into its real increase. It is necessary to undertake other parallel and close coordinated actions inside PPL and with third-party partners to maximise the transfer traffic at the Warsaw Chopin Airport (which will become a base for CTH's operation). The actions include:

1. To create Core Night, which will help achieve the environmental objectives by nearly complete elimination of air operations between 11:30 p.m. and 5:30 a.m.

2. A potential introduction of administrative division of traffic based on another port which operates together with the Warsaw Chopin Airport, which will make it possible to relieve the Warsaw Chopin Airport by transferring part of its traffic to the other airport. Introduction of administrative division of traffic requires an action taken by the minister competent for transport, and an approval of the European Commission pursuant to Article 19.2 of the Regulation of the European Parliament and of the Council (EC) No. 1008/2008 of 24 September 2008 on common rules for the operation of air services in the Community (Official Journal of the European Union L 293 of 31.10.2008, p. 3).

3. Introduction of the Quota Count system for daytime operations - the Quota Count System will help increase the number of air operations during the day, while meeting the noise restrictions.

Capacity projects must be correlated with environmental restrictions (600 operations during the day, 50 at night).

E. PREPARATION OF RULES AND PROCEDURES FOR DEVELOPMENT OF AREA WHICH WILL BE LEFT AFTER THE CIVIL TRAFFIC WILL BE TRANSFERRED FROM THE WARSAW CHOPIN AIRPORT

The transfer of the civil traffic from the Warsaw Chopin Airport will entail a decision on the form and manner of the adjustment of the airport for the needs of the government (military) air transport. The above should be the object of interest of the Government and should provide necessary airport infrastructure which guarantees high quality of service for government (military) aircraft in order to organise and secure flights with the key persons in the country (the HEAD and STATE statuses), operated with the use of aircraft of the Armed Forces of the Republic of Poland.

The release of unnecessary areas after the Warsaw Chopin Airport and their allocation for other purposes (for examples, pursuant to National Real Property Reserve Act of 20 July 2017 (Journal of Laws Dz. U. item 1529)) must provide for the possibility of separate government (military) air operations, and their new manner of management should ensure that the requirements set by the Armed Forces of the Republic of Poland are met.

F. RECONSTRUCTION OF A NETWORK OF AIR ROUTES AND NAVIGATION PROCEDURES

The concept of building CTH will require changes in air space management and adjustment of arrival and departure procedures to the requirements of the airport manager. The new location of the main national

airport means the need to reconstruct the current network of air routes and procedures, including changes in the field of terminal and route navigation, as regards:

- To map out the airport's CTR (Control Zone),
- To map out the airport's TMA (Terminal Control Area),
- To develop take-off and landing procedures – SID, STAR (Standard Instrument Departure, Standard Instrumental Arrival),
- To adjust the structure of ACC space to the needs of traffic flow of the airport,
- To adjust the network of air routes to the new TMA of the Warsaw airport hub,
- To reorganise the air space in cooperation with the military party, among others, as regards TSAs (Temporary Segregated Area) and TRAs (Temporary Reserved Area).

The implementation of new operating procedures and solutions also includes implementation of new techniques and technologies which are properly adjusted to the needs of cooperation between Approach Centre (APP) and aerodrome control TWR within CTH. It requires a new layout of air space structures to be developed and simulated for the whole Warsaw Flight Information Area.

The need to ensure air control services. The implementation of the concept of CTH will require provision of operating personnel for: ACC (Area Control), APP (Approach Control), TWR (Aerodrome Control) and FIS (Flight Information Services).

Achieving the optimum number of employees will help manage the ACC/APP sectors, adjusted to the needs of CTH, in a manner that ensures the required capacity of the space of Warsaw FIR. In addition, it will be necessary to ensure adequate TWR personnel, equipped with comprehensive tools and devices which increase the safety of operations at the airport and in its vicinity.

The need to provide communications, navigation and supervision infrastructure. Development of infrastructure related to air navigation is closely correlated with modernisation of air space structures and development of air traffic services. From the perspective of proper provision of services for CTH, the key task is to ensure adequate radio and telecommunications infrastructure, including proper communications in air traffic management. The project of construction of CTH will require revision of the economic and operating assumptions contained in mid-term and long-term plans of the Polish Air Navigation Services Agency.

G. ADOPTION OF A LONG-TERM PROGRAMME

To complete the described undertaking, it is necessary to ensure funding for expenses paid from the state budget. By 31 March 2018, the Government Representative for the Central Transport Hub for the Republic of Poland should prepare a draft of the long-term programme within the meaning of Article 136 of the Public Finance Act of 27 August 2008 (Journal of Laws Dz. U., item 1240, with subsequent amendments), which ensures the completion of actions set forth herein, i.e. financing of the construction of the Central Transport Hub with accompanying projects in 2018-2030, and submit it to the Council of Ministers. The long-term programme should include projects listed herein, which include but are not limited to railway and road projects, with their division into stages. The financing should include the part financed with domestic funds, including the funds of the stage budget, the funds of the Railway Fund and the National Road Fund. Moreover, it should include grants from EU funds, where necessary. As there are not sufficient funds to complete the tasks in the long-term programme, it is necessary to indicate relevant sources of financing, or to ensure additional funds from the existing sources as part of the above-mentioned sources. It should also be mentioned that to adopt the said programme it may be required to make a strategic environmental impact assessment.

VIII. A PRELIMINARY FINANCIAL ANALYSIS

A. PRELIMINARY COST ESTIMATES

1. ASSUMPTIONS MADE TO ESTIMATE THE COSTS

For the purposes hereof, the key potential costs and income have been initially estimated. The estimates provided are to be used to determine the project's approximate financing needs, with the assumption of similar amounts of payments by the public party during operation. It should also be emphasised that the estimates provided are not based on detailed analyses and calculations, as those are yet to be verified as part of feasibility studies for the individual projects making up CTH. For the purposes of the estimates provided, the costs were not divided according to the organisational structure and the share of private partners in the individual projects.

2. A COSTS ANALYSIS FOR THE AVIATION COMPONENT

The costs and the impact on the economy of similar airport projects. In the respect concerned, the costs of similar projects (construction of brand new airports) in other places in the world should be presented. A project of similar scale to that of the Central Transport Hub (at its first stage) was the construction of the **Berlin** Brandenburg International Airport. Currently, its total cost is estimated at approximately EUR **6.8 billion**. However, note that the bulk of those costs result from project and design errors which have already delayed the construction works for 5 years. The initial budget of the project amounted to **EUR2.8 billion**. On the other hand, the BBI airport will use the area and part of the infrastructure of the Schoenefeld Airport, which reduced the costs of the project. Another airport which is now being constructed a greenfield project is the new international airport for **Istanbul**. The first stage is to be ready to serve about 90 million passengers per year and its target capacity is 150 million passengers per year. The cost of the project is estimated to be about **EUR 7 billion**. By contrast, the total cost of construction and expansion of the present international airport in **Dubai**, including the construction of Terminal 3 (the biggest passenger terminal in the world) is estimated to be **USD 6 billion**. The airport served 78 billion passengers last year. Constructed as a greenfield project before the Olympic Games in Athens, the new international airport was a project whose cost was estimated to be about **EUR 2.1 billion**. The airport serves 21 million passengers and is ready to be expanded to achieve the capacity of 50 million. The **Kuala Lumpur** International Airport in Sepang currently serves 48 million passengers. It was commissioned in 1998 after 5 years of construction whose costs is estimated to be **USD 3.5 billion**. The **Denver** International Airport, which replaced the old Stapleton airport in 1995, cost **USD4.8 billion**. It is one of the biggest airports in the world in terms of area (about 13,600 ha). It has 6 runways and serves over 54 million passengers and 575 thousand air operations. Of course, the above-mentioned examples are not the most expensive projects in the world. The construction of airports such as the **Kansai** International Airport, the **Hong Kong** International Airport or the **Daxing** International Airport consume budgets reaching as much as **USD 20 billion**. Such huge investments are justified by the understanding of the positive impact which a hub airport generates for the local economy. The so-called *economic impact* of the airport in **Dubai** amounts to **USD26.7 billion** annually (source Oxford Economics, of which nearly **10 billion** are attributed to the direct impact). A very similar number is ascribed to the airport in Denver (source: Colorado Department of Transportation).

The estimated cost of the construction of CTH. Whereas the construction of the Central Transport Hub in Poland should not entail any special engineering challenges (no need to construct artificial islands or

embankments, relatively flat terrain, moderate climate), it should be estimated on the basis of the above-mentioned examples that the budget of the project which meets the above-mentioned strategic assumptions should will amount to **PLN 16-19billion** (USD 4-5 billion). It will be possible to make the cost estimate more specific only at the stage of more advanced study work on the project, or consultations with entities which specialise in implementation of similar undertakings.

3. A COST ANALYSIS FOR THE RAILWAY AND ROAD COMPONENTS

To launch the operation of CTH, there are some undertakings of key importance. These include the construction of the Warsaw - Łódź railway and the CTH junction with a railway station, and a rail layout which includes connections between lines No. 1, No. 3, No. 4and an extension of line No. 447 to CTH. In accordance with the HSR Study, the Warsaw - Łódź section, in the standard of 350 km/h was estimated at approximately PLN 8 billion (net). The construction of the line in the 250 km/h standard and its optimisation for solutions required for that standard may be significantly cheaper in relation to the estimated costs from the feasibility study (for the line for 350 km/h). The HSR Y Study does not contain the CTH railway station. Whereas the cost of the Berlin Hauptbahnhof cross railway station in 2006, with track systems – including underground rails and alteration of the layout of roads and a tube station – amounted to about EUR 1 billion, and the cost of the underground railway station Łódź Fabryczna, including track systems of 12.5 kilometres in length, amounted to **PLN 1.75 billion** in 2016, the railway component of CTH with connections to the lines (about 30 kilometres long) may be estimated to cost about PLN 2-3 billion. These are approximate estimations, as the final cost of the project will result from the adopted spatial concept for the entire integrated railway and airport hub, and the decisions which define the scope of the project. Taking the cost optimisation for the construction of the Warsaw - Łódź line for the accepted speed of 250 km/h and the cost of the CTH railway station into consideration, the estimated amount of funds necessary to finance the project as regards the underlying railway component amounts to **PLN 8-9 billion** net.

The total length of the Warsaw Motorway Ring Road is about 306 kilometres, where the total cost of about 65 kilometres of the section which is necessary at the stage of construction of CTH, i.e. the road connection of the interchange on DK 92 - the CTH interchange on A2 - the interchange on S8 - the S7 interchange); then, assuming the cost of PLN 27 million/km of the road, the amount of about **PLN 1.755 billion** (in accordance with the data provided by the General Directorate for National Roads and Motorways); the cost of the southern ring road connecting the interchange on A2 near CTH - Grójec - Góra Kalwaria - Kołbiel - Mińsk Mazowiecki amounts to 2.875 billion, and the cost of the northern section - the interchange on A2 near CTH - Sochaczew - Wyszogród - Zakroczym - Serock - Wyszków amounts to 3.996 billion, which totals 248 kilometres and the amount of PLN 6.871 billion (in accordance with the data provided by the General Directorate for National Roads and Motorways). It should be emphasised that, at the present stage, there are no explicit grounds to assume that the said road is to a Class A road along its entire length. The above cost assumes the parameters of an accelerated speed road (GP-class road: two times two lanes, 2+1 in some places) and the use of the sections which are being currently constructed, e.g. the ring road of Góra Kalwaria. For the construction of the entire ring road of 306 kilometres, the average cost amounts to 27 million per kilometre of the road. Considering that, on the one hand, from the perspective of the implementation of the Central Transport Hub project, it is not necessary to construct the whole Warsaw Motorway Ring Road; on the other hand, however, that to complete CTH, it is necessary to construct additional motorway connections, one must find that the above amount of **PLN 6.871 billion** sets the maximum limit of the financial needs for the expansion of the road network in relation to CTH – with respect to the Warsaw Motorway Ring Road by 2028.

The above calculations do not include the costs of expansion of A2 Motorway with necessary lanes and the cost of connections which provide the Solidarity Airport with access to the Warsaw Motorway Ring Road. The calculations do not include other lesser costs related to the implementation of this Concept, either. The said costs should be estimated at a later stage of the works. As there are not sufficient funds to complete the tasks in the long-term programme, it is necessary to indicate new sources of financing, or to ensure additional funds from the existing sources.

4. SUMMARY OF INITIAL EXPENDITURE RELATED THE IMPLEMENTATION OF THE PROJECT

The above means that the implementation of the basic scope of the undertaking will entail the costs of **34.87 billion**. The above estimates do not include the subsequent stages of expansion of the railway network, commercial projects aimed at integrating the Warsaw-Łódź conurbation (the site of High-Tech City, Expo for Central Europe), as well as other complementary projects; transport, tourist and urbanization projects which may be implemented in conjunction with CTH (revitalization of urban layouts of Łódź, promotion of national heritage sites in the vicinity of the Solidarity Airport, development of transport infrastructure around the Warsaw-Łódź conurbation and as part of complementary projects, etc.) Each of such projects requires separate analyses, including analyses from the perspective of economic rate of return.

B. THE FINANCING OF THE CONSTRUCTION AND OPERATION OF THE CENTRAL TRANSPORT HUB AND THE ACCOMPANYING INFRASTRUCTURE

1. GENERAL ASSUMPTIONS

The concept of the Central Transport Hub includes a number of projects of interdependent and complementary nature. For each of those projects, a different strategy of obtaining funding which includes its specific nature may be considered. As specific works on obtaining funding for the individual investment projects will require further specification and greater progress of concept and project works, it is not appropriate to determine the details of the manner of obtaining funding for each of the projects, at the present stage of the undertaking.

2. THE FINANCING OF PREPARATORY WORKS

Preparatory works will be financed with the budget funds to the extent to which such preparatory works will be included in the responsibilities of the Government Representative for the Central Transport Hub for the Republic of Poland, but, above all, with the funds which are at the disposal of the entities which conduct the investment process. This means that special purpose vehicles will be the first to be charged with the financing of preparatory works, which entails the need to ensure funding for those SPVs. To the extent, to which preparatory works overlap with the objectives of the state enterprise Przedsiębiorstwo Państwowe Porty Lotnicze, preparatory works (which include but are not limited to traffic forecasts, works related to the operation of the Warsaw Chopin Airport) will be funded by that enterprise. Regardless of the above, some preparatory works may be financed by **Polski Fundusz Rozwoju S.A.** As a potential investor. To the extent the costs of the said works will constitute value added for the undertaking, they can be subsequently transferred as in-kind contributions to companies established by entities which conduct the investment process or purchased from RFR S.A.

3. THE FINANCING OF THE AVIATION COMPONENT

The starting point for the financing of the aviation component is the implementation of the project by an entity designated for that purpose in the act on the implementation of the project, i.e. by a company 100% owned by the State Treasury. The said company will be entrusted with the implementation of the for-profit project related to the construction of the most profitable part of the project, i.e. the erection and operation of the aviation component, as well as the management of the land owned by the State Treasure and situated on the premises of the future Airport City.

The said company may use the following external sources of funding: the funds from the **European Fund for Strategic Investments** (EFSI) or its subsequent editions, financing granted by **international financial institutions** (including the European Investment Bank, the European Bank for Reconstruction and Development, the Asian Infrastructure Investment Bank), financing granted by **commercial banks**, **Bank Gospodarstwa Krajowego**, financing granted by **other financial institutions** (investment funds, pension funds, insurance companies), for example by subscribing for infrastructure bonds, financing from **EU grants**, for responsibility of a special purpose vehicle for the elements of the railway component within the airport.

No opportunity to finance the aviation component with EU funds. Pursuant to the Regulation of the European Parliament and of the Council (EU) No. 1300/2013 of 17 December 2013 on the Cohesion Fund and repealing Council Regulation (EC) No 1084/2006 (Official Journal of the European Union L 347 of 20.12.2013, p. 281, with subsequent amendments), investments in airport infrastructure such as construction of a new airport do not qualify for EU grants, including the Infrastructure and Environment Operational Programme 2014-2020.

Acquisition of investors. In order to complete the individual projects which make up the aviation component, the special purpose vehicle will also be able to establish companies with other entities. Any potential sources of contributions to such SPVs would come from the funds of the "parent" company. The other funds may come from infrastructural funds managed by Polski Fundusz Rozwoju S.A. or from the funds of private investors, in the event of a decision to implement the project with majority or minority participation of a private entity, or when implementing the project in a concession model.

Potential private investors could be, e.g. airport operators which have experience in conducting business at airports on a scale similar to the planned CTH. It should be noted that the aviation component creates relatively extensive opportunities for obtaining **funding on the market** without or with limited recourse to the public party. After reviewing the global sector, it seems that a financing formula which is worth considering may be the so-called project finance approach. In such an investment process, economic factors and strategic issues play the key roles.

The economic factors which affect the opportunities for generating financial flows through the airport will include but be not limited to: **Limit the risks related to the construction and operation of the airport** (e.g. to assume the liability by the public party for environmental, geological and administrative risks; to assume a transparent strategy of contracting works, to select reliable partners, to provide adequate contractual performance bonds, to transfer responsibility for risks to the parties which has the most extensive knowledge and experience in managing them), **reliability of the traffic estimates** (considering independent, multi-variant and long-term air traffic forecasts prepared by reputable consulting entities which have experience in greenfield airport projects), **a strategy for collecting fees** for landing and passenger service, **the amount of estimated investment expenditure** which is the function of the expected scope and objectives (e.g. to select of an entity responsible for the railway component in the area of the airport, to ensure adequate stages of the

construction of the airport, to correlate expenditure with air traffic forecasts, etc.), **operating effectiveness** and the potential to generate **income from other activity** by the airport.

Strategic factors should include decisions on the manner of implementation of the project, including formulas and structures of the owner SPV, as well as its revenue model, the decision on transferring the whole or a part of the risk to the SPV, by e.g. ensuring by the public company certain minimum traffic which guarantees a certain level of revenues, among others, in the context of the planned closure of the Warsaw Chopin Airport, as a result of opening CTH.

4. THE FINANCING OF THE RAILWAY AND ROAD COMPONENT

General notes. The railway and road component of the project is assumed to be profitable only to the extent allowed by EU regulations. On the other hand, an entity that implements this kind of projects has more opportunities to use EU funds than the entity which is responsible for the aviation component.

The railway component. Budget funds. The railway projects would require the National Railway Programme to be supplemented and the projects related to CTH to be given an adequate priority on the list of tasks included in the programme, adequate additional funding to be provided for those projects. The decision to build the Central Transport Hub may, as a consequence, lead to the consideration of **updating the National Railway Programme,** both as regards **the tasks selected for implementation** and **the change of scope (and costs) for the tasks** which are included in NRP but whose scope should be adjusted for the construction of CTH (e.g. because of new requirements concerning the speed standard of the line, the capacity or other parameters). The changes may entail adequate increase of the funds allocated to NRP.

The railway component. EU funds. As part of the next EU framework, EU funds may be used to finance part of the extension of the railway network. If certain conditions are met, there is also an opportunity to finance preparatory works (documentation) as part of EIOP 2014-2020 for the next framework. Moreover, pursuant to the valid Regulation No. 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010 (Official Journal of the European Union L 348 of 20.12.2013, p. 129, with subsequent amendments) (CEF), the concept works on HSR on the Warsaw – Poznan section were included among the projects which may apply for EU grants. The maximum level of grants for study works amounts to 85% or 50% depending on the available fund envelope (the cohesion or general envelope, respectively). The CEF budget in the transport sector within the Framework 2014-2020 amounts to **EUR24 billion**, of which EUR 11.3 billion are funds transferred from the Cohesion Fund, which were distributed between the cohesion states as part of so-called national envelopes. The value of the Polish national envelope amounts to EUR 4.14 billion. Almost 90% of the amount was allocated to railway projects. Considering the fact that the national envelope for Poland was fully allocated, there is a possibility to obtain funds from CEF for study works on HSR at the Warsaw - Poznan section only from the main envelope.

The road component The road projects would require the National Road Construction Programme to be supplemented and the projects related to CTH to be given an adequate priority on the list of tasks included in the programme, adequate additional funding to be provided for those projects. In respect to road projects which are about the construction of a connection between the existing A2 motorway and the airport, including the construction of a new motorway interchange, it would be possible to finance the documentation in that respect from the funds from the state budget or the National Road Fund.

In respect to the performance of construction works which include the construction of the said connection, financing could also be provided from the funds of the National Road Fund. It is also possible to obtain funds

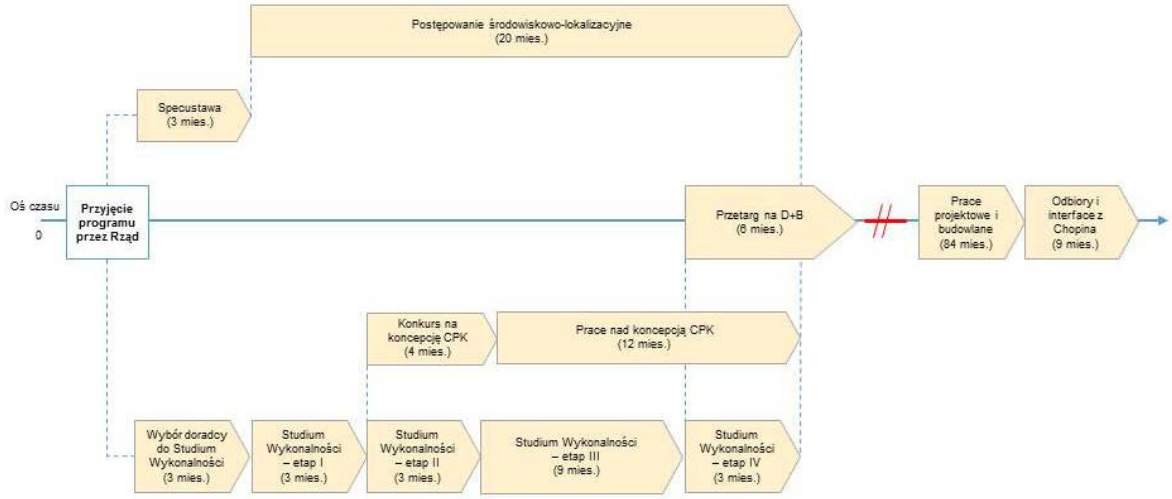
for that purpose from EU funds available after 2020 and designate a new source of financing for their implementation or to provide additional funds from the existing sources.

IX. THE IMPLEMENTATION SCHEDULE FOR THE UNDERTAKING AND MONITORING THE PROGRESS OF WORKS

A. THE SCHEDULE

General rules – parallel performance of works. The adopted schedules aim at completion of the basic investment process by 2027. One of the fundamental risks related to the project is delayed commissioning of the Solidarity Airport, which would result in greater distance between the Polish and the Western European aviation market. Therefore, the individual project tasks will be performed simultaneously. This applies both to the individual project tasks, referred to herein, and to the individual tasks as part of one investment task (i.e. as part of a construction of an interchange, a construction of line infrastructure, etc.) At the same time, it must be emphasised that some actions referred to in the Concept (the change of strategic documents, planning acts, adoption of a long-term programme) may require strategic environmental impact assessment. The assessment may result in adjustments to the submitted schedule.

The schedule of construction of the Solidarity Airport. It must be assumed that, immediately after this document is adopted by the Government, works will start to select technical advisor(s) who will prepare a feasibility study for the project, adopted in stages. Simultaneously with the selection procedure, urgent works should start to prepare an act which would streamline the investment process. For the project to be completed, it is necessary for the act to be adopted and come into force as early as this year. The technical advisor(s) should also be selected this year to assist the Government and the SPVs established by it in the implementation of the project. After the act comes into force, the environmental and location proceeding defined therein should be immediately initiated. It will take 16-20 months to complete. Simultaneously, works on the first stage of the feasibility study will start as of the beginning of 2018. They will also help prepare an international competition for the architectural concept of the airport. The duration of those works should not exceed three months, if you consider that, during that period, updates of traffic forecasts and the location analysis will already be known (the works on the said analyses are currently in progress). The next stage entails a tender for the architectural concept of the airport. Along with a competition procedure, the technical advisor should be entrusted with further findings which will help start the work on the concept. The resolution of the competition of an architectural concept, and at the same time, the end of the second stage of cooperation with the technical advisor should take place after 4 months have passed. The next stage includes parallel works on the architectural concept, performed by the selected studio in cooperation with the technical advisor(s) (which should take about 12 months) and the preparation of the next stage of the feasibility study by the technical advisor(s). The next stage of works should end after 9 months and should make it possible to open a tender for the selection of the contractor in the Design & Construct model. Of the 6 months allocated for the said tender, 3 months would be allocated to the period before final adoption of the architectural concept and the next 3 – to the period after the adoption of the concept. Such a manner of proceeding will require a detailed procedure for the tender. The final stage of works of the advisor will be performed simultaneously with the tender. The award decision will be taken after the completion of the environmental and location proceeding and will start an 84-month period of construction and design works, which will follow a 9-month period of acceptance and preparation of the Solidarity Airport to take over the traffic from the Warsaw Chopin Airport. The said schedule provides, therefore, that the works will be completed by the end of 2026. The schedule for the construction of CTH, including the critical path, is the following:



Postępowanie środowiskowo... – Environmental and localisation proceedings (20 months)
Specustawa... – Special statutory act (3 months)
Oś czasu – Time axis
Przyjęcie... – Adoption of the programme by the Government
Przetarg... – Tendering procedure for D+B (6 months)
Prace projektowe... – Design and construction works (84 months)
Odbiory... – Acceptances and an interface with the Chopin airport (9 months)
Konkurs na... – Competition for the CTH concept (4 months)
Prace nad koncepcją... – Work on the CTH concept (12 months)
Wybór doradcy... – Selection of the advisor for the Feasibility Study (3 months)
Studium Wykonalności... – Feasibility Study – stage 1 (3 months)
Studium Wykonalności... – Feasibility Study – stage 2 (3 months)
Studium Wykonalności... – Feasibility Study – stage 3 (9 months)
Studium Wykonalności... – Feasibility Study – stage 4 (3 months)

The schedule for the expansion of the railway and road network. The construction of the railway and road network around the Solidarity Airport does not provide for any interference with the Nature 2000 area, which significantly speeds up the investment process. The railway network would be expanded in the following stages. The selection of the entity that will prepare the project's documentation with a feasibility study, environmental report and a functional and utility programme (4 months) and providing the contractor with the time to prepare the documentation (18-20 months). About 5 months should be allocated to select the contractor for the project in the Design and Construct model, where the said period could partially (3 months) overlap with the time necessary to develop the documentation. About 40 months should be allocated for the project itself due to its less complex nature than for the Solidarity Airport (including the design stage – 6 months, the time necessary to obtain administrative decisions – 4 months, construction works and acceptance – 30 months). The total minimum time of works related to the expansion of the railway network should be set at 65 months. For complex engineering construction, the said period may be extended to 83 months. Therefore, the period of works should not exceed 7 years. According to the data obtained from General Directorate for National Roads and Motorways, the estimated period of works on the Warsaw Motorway Ring Road should be 8-10 years in the present conditions (without taking mechanisms which facilitate the implementation into account).

B. MONITORING PROGRESS OF WORKS

The progress of works will be monitored in accordance with the rules set forth in the Ordinance of the Council of Ministers of 27 April 2017 on appointing the Government Representative for the Central Transport Hub for

the Republic of Poland. Pursuant to § 2.2 of the Ordinance, the Representative's tasks should include supervision over the implementation of the Central Transport Hub project. Pursuant to § 5, the Representative may provide the Council of Ministers with analyses, assessments and requests related to the scope of the Representative's powers and shall have the obligation to inform the President of the Council of Ministers of any risks to the performance of the assigned tasks. Pursuant to § 7 of the said Ordinance, the Representative shall provide the Council of Ministers with a report on their activities at least once every half a year.

In accordance with the said Ordinance, as part of the Representative's report on their activities, the Representative is hereby obliged to provide the Council of Ministers with information on the progress of the project, which includes but is not limited to the progress of the main objective and detailed objectives, and any potential risks to the completion of the project, at least once every half a year.

ATTACHMENT NO 1

PLL LOT CONSOLIDATION POTENTIAL OF THE CENTRAL AND EASTERN EUROPEAN MARKETS

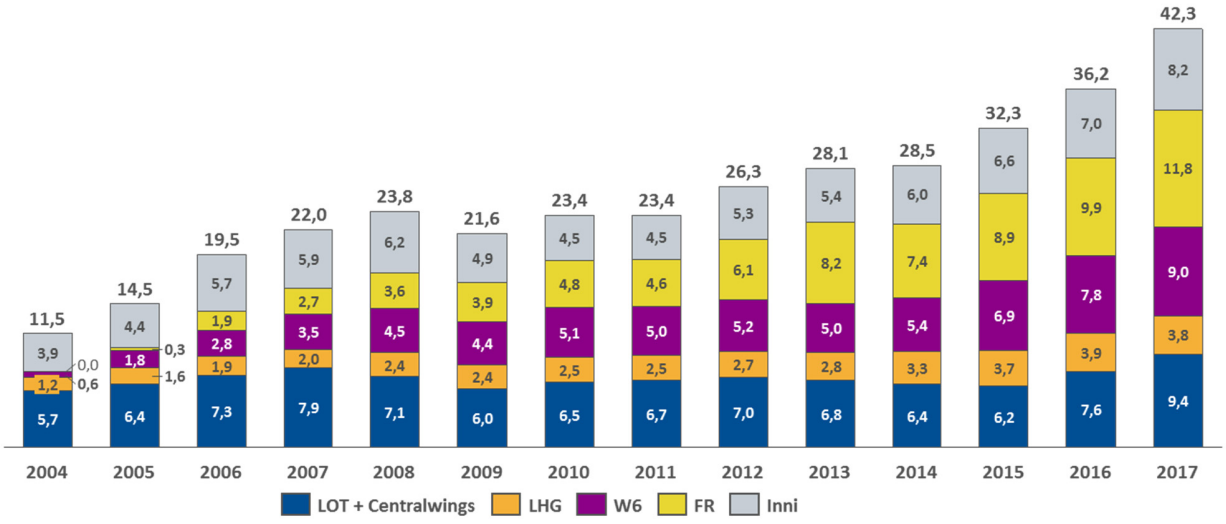
MARKET CONTEXT

In the years to come the CEE markets consolidation will dynamically develop. The effective implementation the PLL LOT strategy will allow to strengthen its position as the region leader.

The aviation sector consolidation process is closely linked to the market deregulation. Liberalisation of air traffic in the Central and Eastern Europe started a decade later that in the Western Europe and almost four decades later than the USA. Therefore, the aviation market in the region is now at an early stage of consolidation trend that in the more mature markets, such as the Western Europe, and particularly the United States.

After the EU accession of the majority countries of Central and Eastern Europe and market liberalisation the local network carriers not adequately accommodated to the new market conditions and this allowed the low cost carriers and Western Europe large network carriers to expand fast. Therefore, the majority of local national carriers had to suspend their activities or request state aid as PLL LOT did.

Change in seats offered in the Polish market in between 2004 and 2017 (in millions)



Source: DIIO data.

RESTRUCTURING

The restructuring plan implemented over 2013–2015 received a positive opinion through the Decision of the European Commission granting the state aid, which thereby has confirmed the reliability of long-term business plans submitted by the Company. One of the key restructuring initiatives consisted in the revision of the service network and flight timetable, which have not focused on the development of the own service network based on Warsaw hub so far.

The Polish Airlines LOT effectively underwent restructuring process following which the Company gained self-financing capacity and a very competitive cost structure. In 2014, after 7 years of losses the Company restored the profitability at the core business level. The positive result was again achieved in 2015 (excluding some one-off accounting incidents - sale & lease back transaction) and in 2016 when LOT's result on core business of PLN 184 million was a record-breaker with over PLN 300 million net profit.

PROFITABLE GROWTH STRATEGY

The year 2016 was the first of the PLL LOT profitable growth strategy implementation for the years 2016–2020+. Over one year the Company started or reinstated as much as 23 routes. It increased the number of operations by 24% up to 82 thousand; offering through ASKm – by 35% up to 11 billion (the fastest growth among all European airlines); number of seats offered – by 24%, up to 7.5 billion (the largest number in its history).

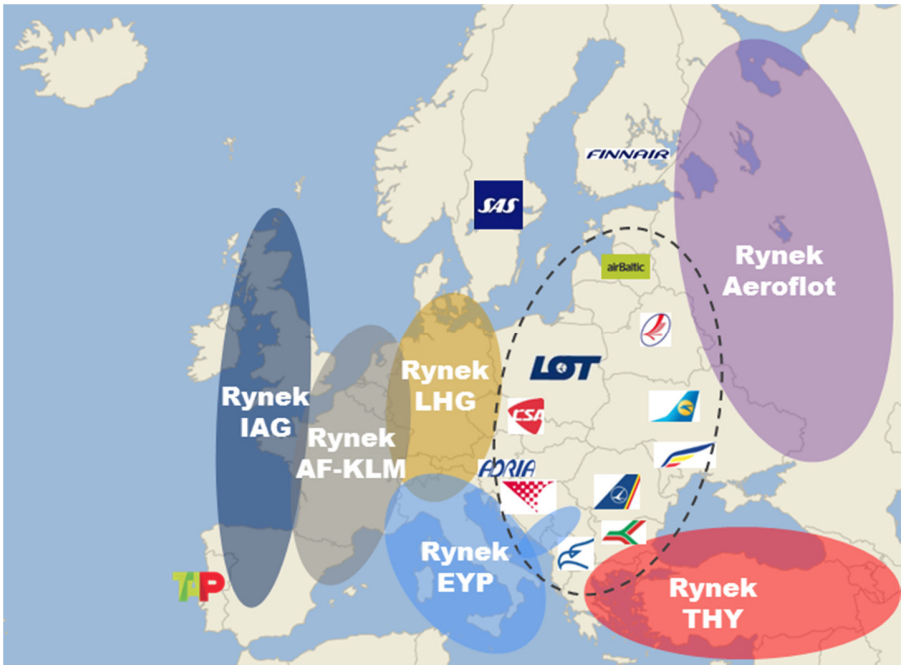
It should be emphasised that in spite of such a surge in growth – mush faster that the market average – the passenger load factors have remained practically at the same level and the network profitability assumptions have been fulfilled. The financial and carriage results as well as offer growth rate in the first months of 2017 also make the PLL LOT business plans reliable and show the Company can quickly and profitably develop.

The concluded contracts and first deliveries of narrow-body aircrafts, including the most-up-to-date B737-8MAX which the Company is the second in Europe to receive, constitute another element supporting the PLL LOT ambitions. Also the contracts for further deliveries of wide-body Dreamliner aircrafts, for the first time in B787-9 version, to be incorporated in the fleet in 2018, have been finalised. Only in the first half of 2017 LOT Company increased its fleet by 6 aircrafts in total, including four Boeings 737-800 and two Boeings 787-8, for which the Management Board negotiated funding in the form of financial leasing.

UNTAPPED MARKET POTENTIAL

The Central and Eastern Europe region is one with quickly developing aviation markets with a vast demographic and economic potential. In spite of this there is no dominant network carrier to play the role of consolidator in the region. The market is fragmented with weak local national airlines and network carriers from outside of the region (Western Europe, Turkey, Russia and Persian Gulf countries).

Lack of a dominant network carrier in the CEE region

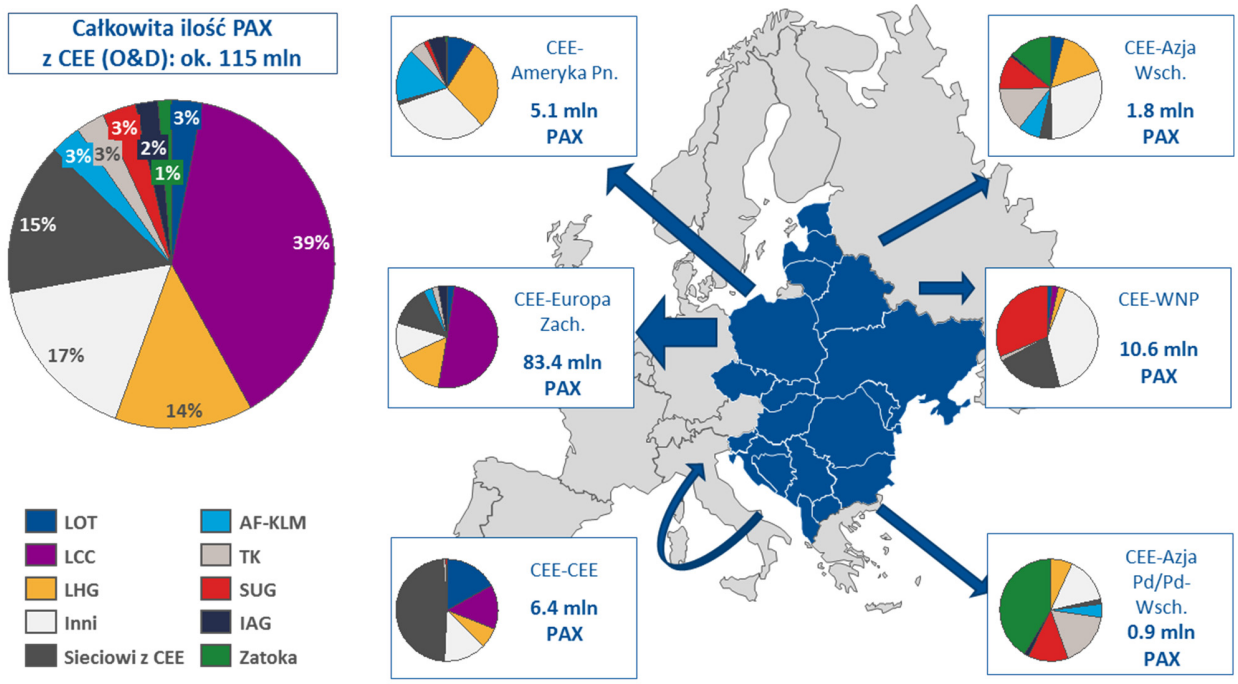


POSITION AND MARKET ADVANTAGES OF PLL LOT

The PLL LOT Company is the largest in the CEE region both in terms of the fleet, number of serviced routes, revenues and number of passengers carried. A considerable advantage in the segment of long-range flights is a particular asset.

PLL LOT Company is one of the oldest carriers in the world with a recognisable trademark and well-established position in the CEE region. In the regional market LOT Company has already now a noticeable share in the segment of operations into the North America in the regional market and between the towns' pairs in the CE region.

Market shares in selected passenger movements from the region in 2016



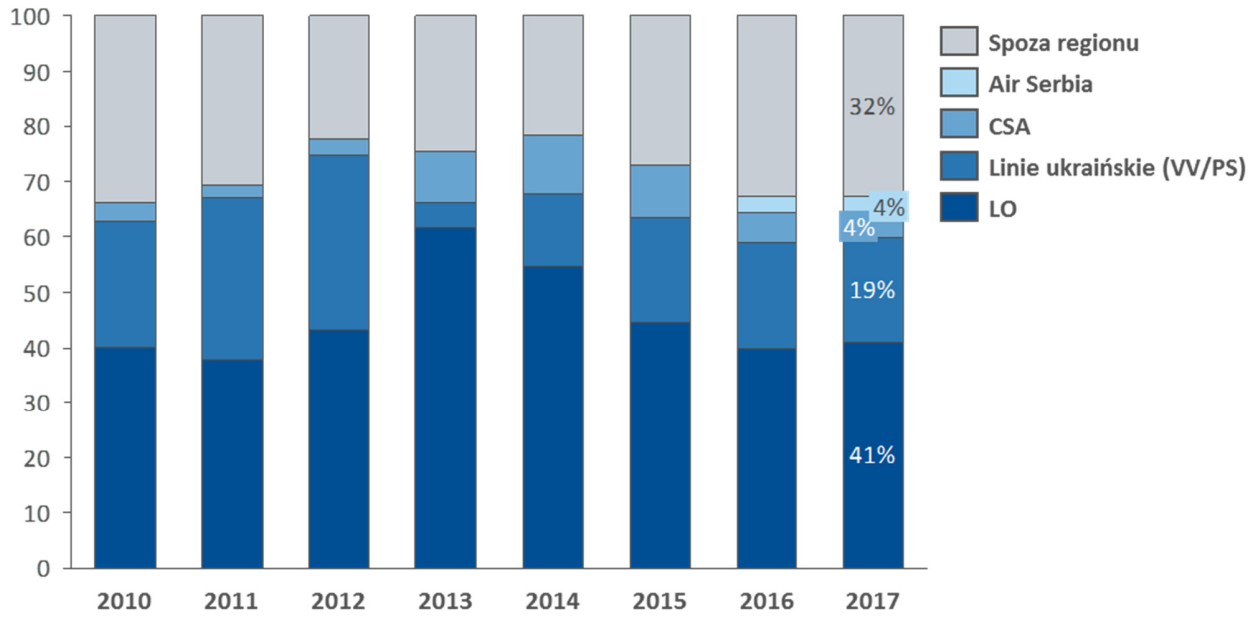
Source: GDD.

The ability of PLL LOT Company to be a significant carrier not only for Poland but also for the whole region is confirmed, among other things, by the acquisition of shares of the Estonian Regional Jet and by operating the flights from Tallinn in 2016 under an innovative formula of cooperation with Nordica lines. Furthermore, the Company will launch regular transatlantic flights from Budapest to Chicago and New York as of 2018.

PLL LOT has a developed and profitable air network to the North America and East Asia as well as almost 45 years of experience in operating such routes. The Company outstrips all other regional competitors (CSA and Ukraine International) in terms of long-range operations. It should also be stressed that the majority of network carriers in the region do not show any ambition to develop own independent service network and focus on the transport to the hubs outside the region.

Today, the LOT Company is an unquestionable leader in terms of long-range operations. In total, the Company operates 9 routes: from Warsaw to New York, Newark, Chicago, Toronto, Los Angeles, Tokyo, Beijing and Seoul, as well as from Cracow to Chicago. The LOT Company also inaugurated the first service to Central Asia, i.e. to Astana, capital of Kazakhstan, in the history of Polish aviation.

Change in share in the long-range flights from the CEE region (2010–2017)



Source: DIIO data.

Strong position on the domestic market is another factor that places PLL LOT in advantageous position for the role of potential region consolidator. With 38 million population Poland is the largest economy in the region with one of the highest growth rates in Europe. Operations at the transit airport are easier and less risky, if the transit flow of passengers may be supplemented with local passengers.

The geographical location of Poland and Warsaw is also advantageous as a place for construction of a large transit airport being the main base of PLL LOT – flight time from any large town in the region to Warsaw is less than two hours so that a transit airport in the capital of Poland makes an attractive alternative for the passengers in the region. Location in the centre of the CEE region at a sufficient distance from the existing large hubs outside the region makes the construction of an independent transit hub easier.

Attachment No 2

18 September 2017

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Project name:

Feasibility study for the location of the Central Transport Hub for Poland

Addressee:

Polski Fundusz Rozwoju, Książęca 4 00-498 Warszawa

Subject of the technical note:

Considered locations of the Central Transport Hub

As part of the tasks entrusted to Arup by the Polish Development Fund (PFR) under the agreement "Location Study for the Central Transport Hub project", preliminary analysis of location possibilities for the Central Airport (being an element of the Central Transport Hub) was carried out.

Initial analyses (so-called screening) were carried out by Arup experts and took into account issues such as:

- availability of suitable space for the construction of the airport and supporting infrastructure,
- topography,
- population density (both in the location itself and in the surrounding areas),
- environmental aspects (presence of national parks, Natura 2000 sites, larger rivers, wetlands, identified breeding sites of birds, etc.),
- available and planned transport infrastructure,
- the airport's catchment area;

The mapping was carried out for an area with a radius of about 50 km from the centre of Warsaw.

The analyses carried out on the basis of the above-mentioned criteria show there are several possible locations for the project, in particular:

• “Stanisławów-Baranów"

A site of potential surface area of approximately 11,340 ha, located between the national road No. 50, Freedom Motorway A2 and the railway line No. 3 in the north (alternatively, the smaller area of 3,240 ha, located on the northern side of the railway line).

It is a lowland area with low height difference, relatively sparsely populated, deprived of elements that may constitute a major obstacle to the implementation of the project from the point of view of spatial development (available size and dimensioning of the area are appropriate for an airport with the given parameters), with potentially vast communication possibilities (especially in the railway segment).

Grójec

A site of potential surface area of approximately 6,600 ha, located on both sides of the national road No. 50 on the section between Grójec and railway line No. 8.

It is an area located higher and characterised by greater height difference than “Stanisławów-Baranów”; however, it still meets the requirements for a new location of the airport.

The area is relatively sparsely populated, deprived of elements that may constitute a major obstacle to the implementation of the project. The potential area of the location is sufficient to complete the task and provides the possibility of expanding all complementary functions. The location has sufficient communication potential.

The above information is the result of preliminary work carried out by Arup. At a later stage, detailed analysis and multi-criteria evaluation of the identified locations will be carried out.

At the request of the Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland, the possibilities of designing new procedures in the airspace for both location groups were analysed. None of the locations raises substantial objections.

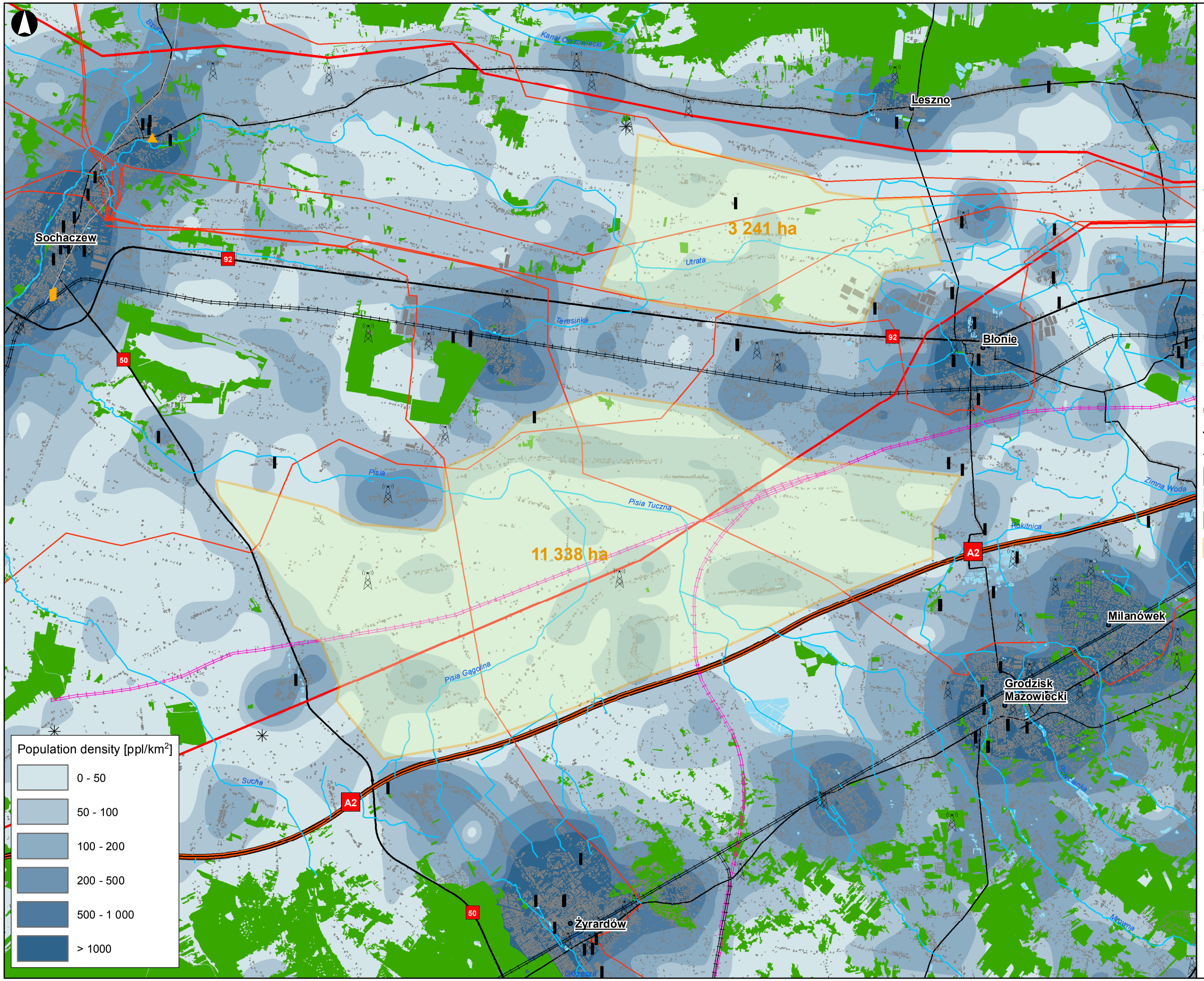
Associate Director
Ireneusz Kołodziej

Ireneusz Kołodziej

Attachments:

1) **Stanisławów-Baranów – potential CTH location sites**
2) **Grójec – potential CTH location sites**
3) **Map of the location of potential CTH sites in relation to the Capital City of Warsaw**

A3



Legend

High object type
- Industrial chimney
- Lighting mast
- Telecomunication tower
- Wind turbine
- Water tower
- Other
- River

Electrical Network
- Highest voltage line
- High voltage line

Railroad traction
- one track, not electrified
- one track, electrified
- multiple tracks, electrified
- Designed High Speed Railway

Road Network
- Highway
- Primary Road
- Secondary Road
- Buildings
- Surface water
- Forest
- Area suitable for airport location

Data Sources: GUS, OSM, CODGIK, GDOŚ, GDDKiA, PLK,

P1	01-02-08	WD	RC	IK
Issue	Date	By	Chkd	Appd

Metres: 0 — 1 350 — 2 700 — 5 400

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Job Title
Area suitable for airport location Stanisławów - Baranów area

Job Title	Scale at A3
Central Transportation Hub	**1:100 000**

Job No	Numer Rysunku / Drawing No	Rew/Issue
257234-00	**006**	**P1**

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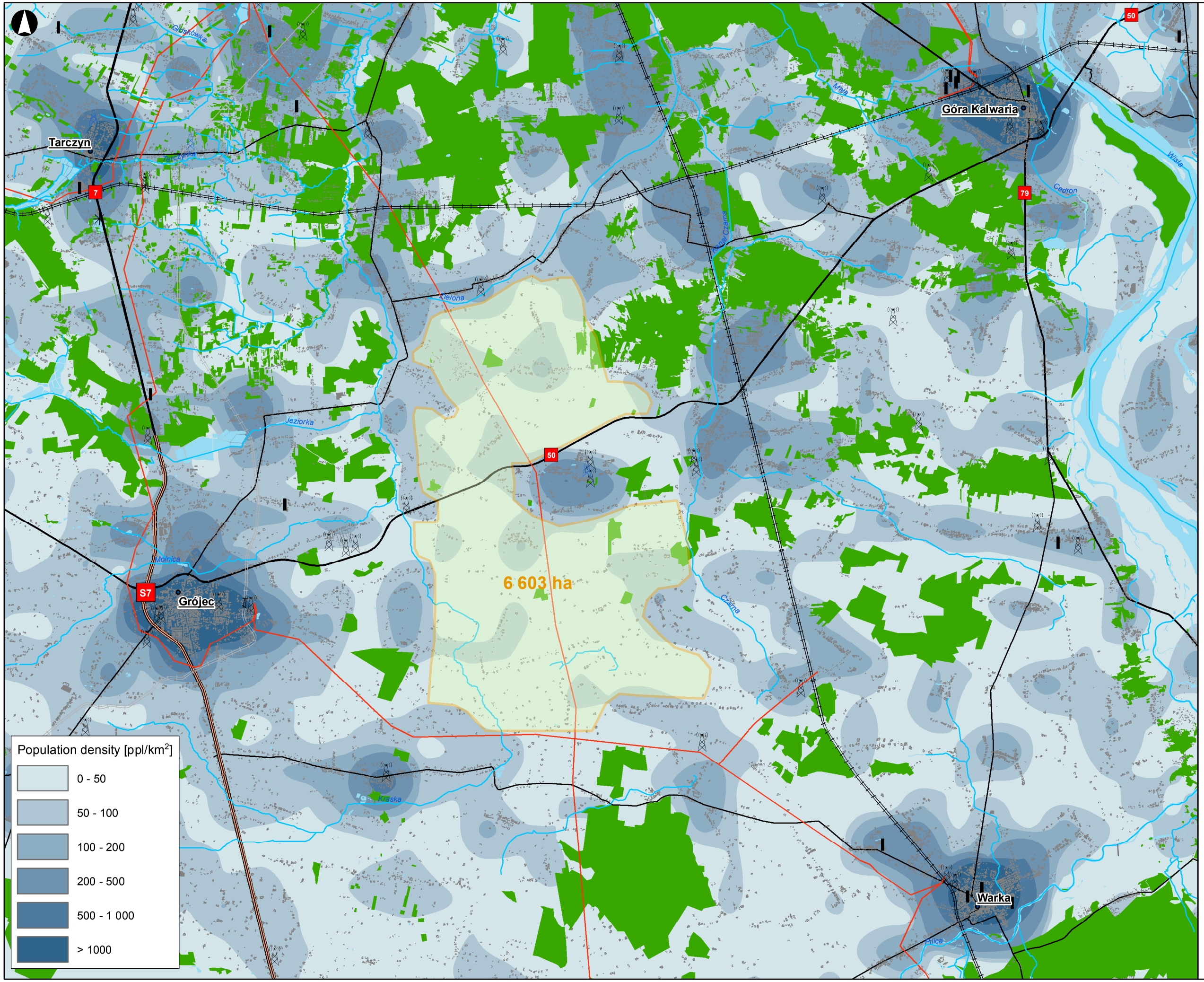

Legend

High object type
- Industrial chimney
- Telecomunication tower
- Wind turbine
- Water tower
- River

Electrical Network
- Highest voltage line
- High voltage line

Railroad traction
- one track, not electrified
- multiple tracks, not electrified
- multiple tracks, electrified

Road Network
- Expressway
- Primary Road
- Secondary Road
- Buildings
- Surface water
- Forest
- Area suitable for airport location

2017-09-11 11:47:18

Data Sources: GUS, OSM, CODGIK, GDOŚ, GDDKiA, PLK,

Issue	Date	By	Chkd	Appd
P1	01-02-08	WD	RC	IK

Metres: 0 | 1 350 | 2 700 | 5 400

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Job Title
Area suitable for airport location - Grójec area

Job Title	Scale at A3
Central Transportation Hub	**1:100 000**

Job No	Numer Rysunku / Drawing No	Rew/Issue
257234-00	**007**	**P1**

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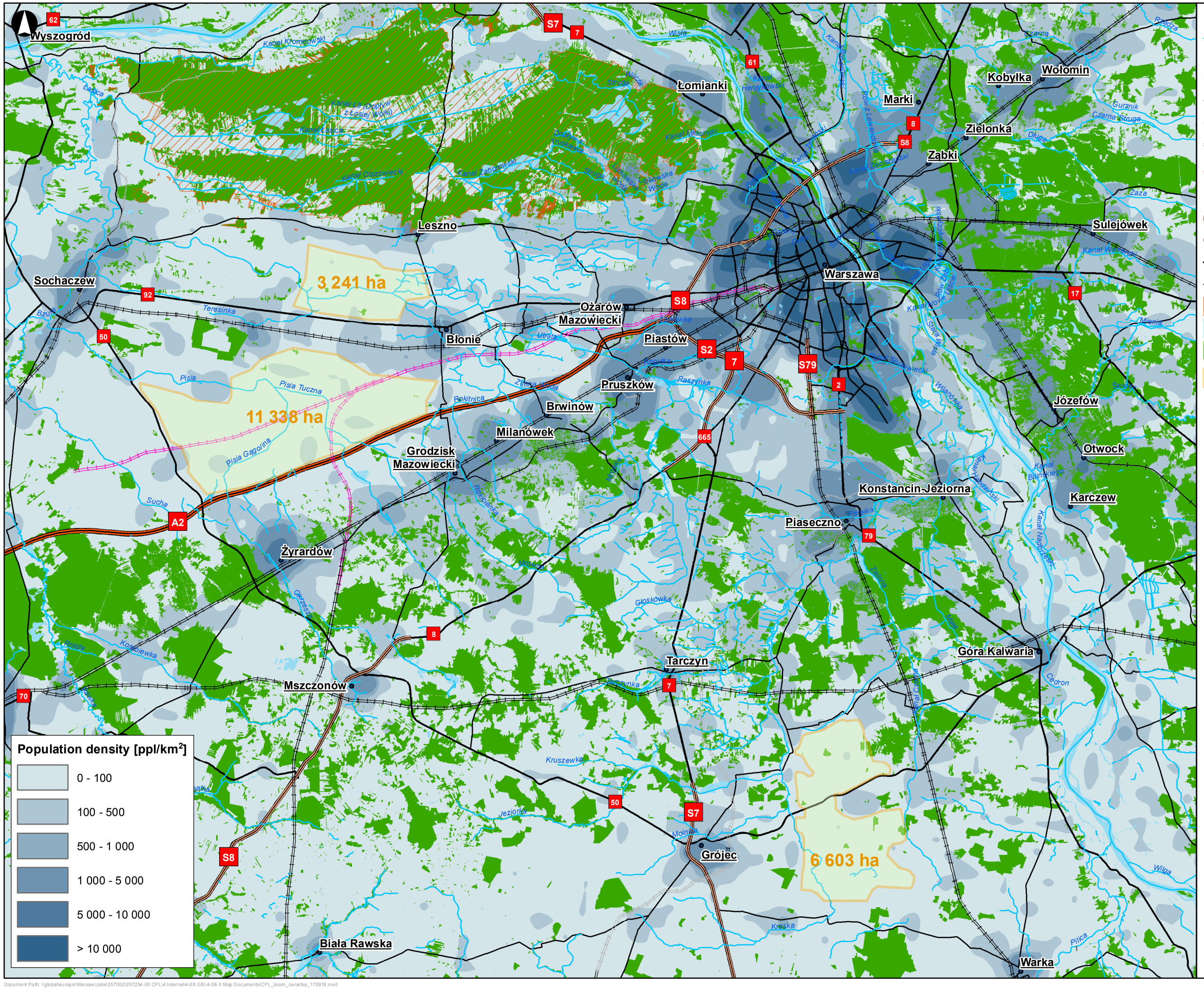
A3



Legend

- River

Railroad traction

- one track, not electrified
- one track, electrified
- multiple tracks, not electrified
- multiple tracks, electrified
- Designed High Speed Railway

Road Network

- Highway
- Expressway
- Primary Road
- Secondary Road
- National Park
- Surface water
- Forest
- Area suitable for airport location

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Data Sources: GUS, OSM, CODGIK, GDOŚ, GDDKiA, PLK,

P1	01-02-08	WD	RC	IK
Issue	Date	By	Chkd	Appd

Metres

0 3 350 6 700 13 400

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Job Title

Areas suitable for airport location

Job Title	Scale at A3
Central Transportation Hub	**1:250 000**

Job No	Numer Rysunku / Drawing No	Rew/Issue
257234-00	**008**	**P1**

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ATTACHMENT NO 3

POSSIBLE SCENARIO OF THE RAILWAY NETWORK EXTENSION

This material constitutes an attachment to the Investment Preparation and Implementation Concept: Solidarity Airport – Central Transport Hub for the Republic of Poland and it presents the scenario of the railway network extension in the Republic of Poland in order to create a universal national system of interregional railway passenger transport services covering and making accessible all country regions, developed on the basis of Hub & Spoke model, with the main hub being the Central Transport Hub. The investments described in the Concept are not sufficient to ensure the attractive offer of connecting CTH with all the main centres and country areas as well as to develop a universal national system of interregional railway passenger transport services covering and making accessible all country regions. In order to create the national railway transport system, it is necessary to adjust and develop the existing railway network in the Republic of Poland.

1. GENERAL REMARKS

The possible scenario of such development presented below assumes two implementation stages:

- **The first stage**, implemented in the years 2018–2027 from the current EU financial perspective funds and the 2020–2025 (+2) perspective funds, will serve filling the main gaps in the Polish railway network, that is building the missing elements of the railway network as well as modernising and revitalising the existing network to use its geometric parameters to the greatest extent in order to ensure the communication services in all country areas. The absolute majority of the above-mentioned investments will be implemented to develop the transport system oriented at the country's internal needs.
- **The second stage**, implemented in the years 2025–2035 from the 2025–2030 and the following perspective funds as well as from the national funds, will be directed at improving the quality of the national infrastructural network by building new sections of the high-speed railways in order to improve the travel time of the existing connections. The tasks carried out under this stage will serve both, the country's internal needs and international transport connections of Poland – especially with the Trimarium countries.

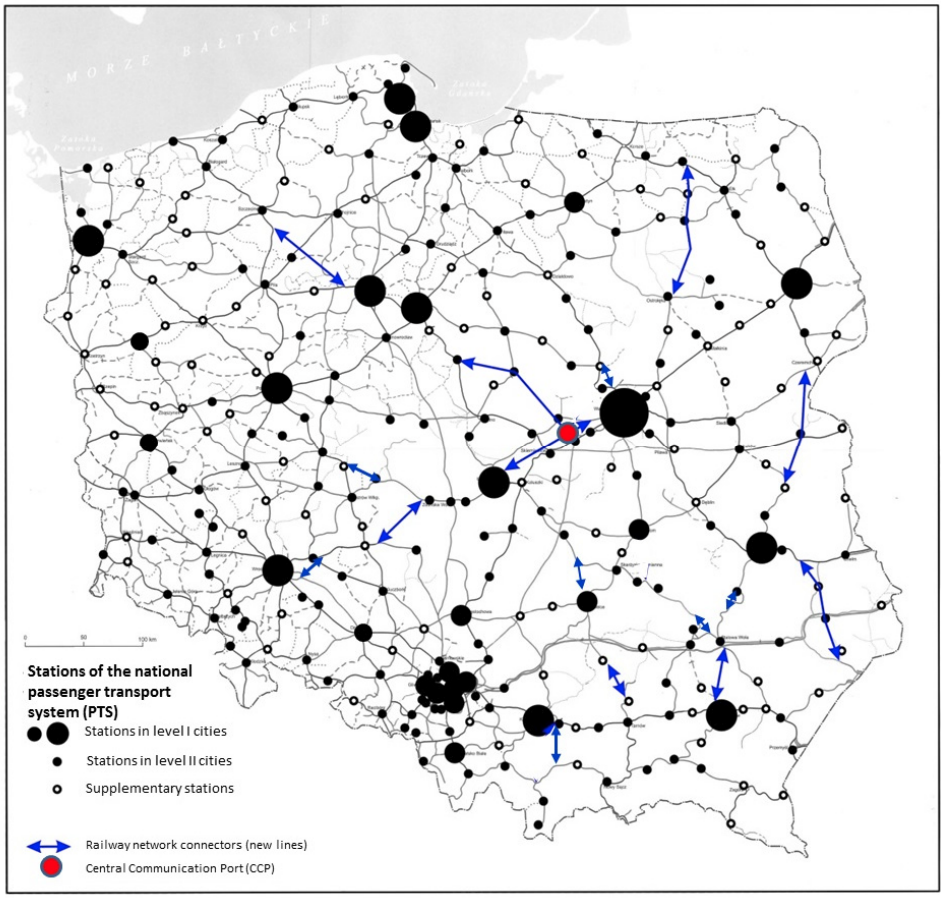
2. FIRST STAGE OF THE RAILWAY NETWORK EXTENSION

At this stage of the programme the missing elements of the national network are going to be developed, enabling the launch of transport with geometrically correct routes, using the parts of already existing infrastructure with the maximum use of its current geometrical parameters. Thanks to such an approach it is possible to achieve, in an economically rational way, a sudden improvement in connection times between the CTH and centres and areas in the case of which the national connections with the central part of Poland are irrationally long (Lower Silesia, Central Pomerania, Kujawsko-Pomorskie Voivodeship, Roztocze). This stage assumes the development of new linking lines – "connectors" of the existing network characterised by the parameters enabling the speed of at least 250 km/h as well as the improvement of the existing railway lines used in the long-distance transport system (among others adjusting the Central Rail Line to the speed of 250 km/h and achieving the speed of over 200 km/h for the line No 6 Warsaw-Białystok).

Network connectors

5% of existing infrastructure

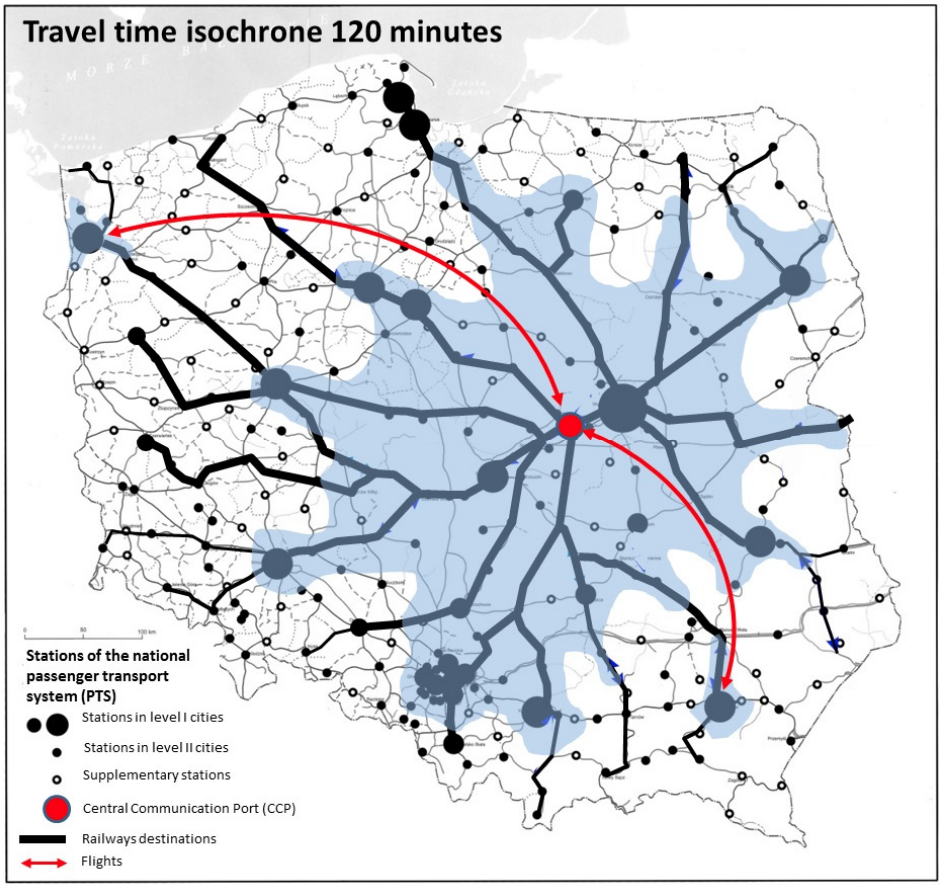
Section	Length (km)
Warszawa – Łódź Kaliska	125
Sieradz - Wieruszów	54
CMK – Baranów(CPK) - Płock –Włocławek	120
Łącznia W-wa Wsch-Marki	2
W-Wa Choszczówka – Nasielsk	33
Kalisz – Pleszew	35
Szczecin Port- Dąbie	6
Kielce-Janów/Końskie	25
Czernica Wr – Ligota	24
Zbydniów –Zalesie gorz.	9
Ostrołęka –Pisz Giżycko	122
Nakło –Okonek	72
Podłęże – Piekiełko	39
Busko Zdrój- Żabno	42
Łętownia - Rzeszów	41
Trawniki - Zamość – Tomaszów Lub.	99
TOTAL (spokes)	848
Complementary connectors	
Biała Podlaska – Fornołów	45
Milanów- Biała Podlaska	35
Skróty linii 68 (Kraśnik +Zaklików)	21
TOTAL	**101**



As a result of the implementation of the first stage, all Polish regions will be covered with the mutual transport accessibility and they will have rail connections with the CTH characterised by the parameters which are competitive with the road transport, and the time of the connections of the main urban centres in the country (with the exception of Szczecin and Rzeszów) with the CTH will not exceed 120–150 minutes. In the majority of cases the developed elements of the infrastructure will also significantly improve the organisational possibilities of the regional transport which falls within the responsibility of the local authorities of voivodeships (especially in the eastern part of Poland). Thanks to the above-mentioned investment plans the existing railway network will be extended by approximately 5%.

Etap 1 - 2025

East
CCP - Warszawa - Ostrołęka – Pisz- Giżycko
CCP- Warszawa – Białystok- Suwałki
CCP - Warszawa - Terespol Brześć BL
CCP - Warszawa – Lublin- Zamość- Tomaszów Lubelski/Chełm
West
CCP- Piotrków Trybunalski – Częstochowa – Opole
CCP- Łódź - Sieradz- Wrocław- Jelenia Góra/Zgorzelec
CCP- Łódź-Kalisz – Leszno – Głogów-Zielona Góra
CCP - Łowicz- Poznań –Gorzów wlkp.
CCP-Łódź -Kalisz –Pleszew – Poznań-Szczecin
North
CCP- Płock- Włocławek- Toruń Bydgoszcz - Szczecinek - Białogard- Koszalin
CCP – Warszawa-–Gdańsk
CCP – Warszawa- Olsztyn
South
CCP- Opoczno –Sandomierz- Rzeszów
CCP- Opoczno –Końskie- Kielce- Busko Zdrój - Tarnów –Nowy Sącz
CCP-- Kraków
CCP- Zawiercie- Katowice - Bielsko Biała/Gliwice/Rybnik



The system of direct connections and 120 minute isochrone of reaching CTH – 2025

The first stage includes two types of investments defined by their working names as “Growth” and Solidarity. Investments from the group **“Growth”** connect Polish centres of the economic growth and, as such, they have the biggest impact on the increase of the GDP growth rate. After the implementation of this group of tasks, all main urban agglomerations in the country will have the direct connection with the CTH characterised by the correct geometrical shape and good technical parameters. The investments planned within this stage are necessary in order to ensure the accessibility to the CTH from the centres of most of the main agglomerations within the time of approximately 2 hours[1] or shorter, which guarantees the attractiveness and the intermodal competitiveness of the collective public transport system on the national level. The achievement of such parameters of the transport system connecting the main national residential areas will ensure the appropriate level of profitability of the whole national long-distance transport system. In principle, new railway lines developed under the “Growth” component will be the double-track trunk lines characterised by the geometry adjusted to the speed of at least 250 km/h.

The investments from the **Solidarity** group aim at addressing the transport-related exclusion areas and they constitute the indispensable infrastructural projects within the policy of levelling growth opportunities in the

[1] In the case of Rzeszów and Szczecin, at this stage of infrastructural network development, the railway system will not be capable of fulfilling the condition on accessibility to CTH within approximately 2 hours. If such CTH accessibility isochrone is treated as a standard guaranteed to all urban agglomerations in the country, it should be considered to maintain the regular air connection between the CTH and these centres as a public service (in the case of Szczecin it is appropriate to consider further investments aiming at extending and increasing efficiency of the transport connections with the Szczecin – Goleniów airport).

peripheral areas. Implementation of this group of investments will result in fulfilling the criterion of ensuring accessibility of all Polish regions to collective public transport system built on the basis of CTH. These parts of the network are located further from the CTH hub and they are used to provide services in the areas of transport-related exclusion, with lower population, but significant tourist appeal. In most cases, the regions which fall within the scope of this group projects are concerned with the high level of unemployment. The majority of new sections of track covered by this group may be built as a single-track. Connections developed on the existing infrastructure will, by its character, have lower profitability than the connections in the group "Growth", but they are indispensable to build the universal national system of interregional transport. After the implementation of the indicated investments, all main Polish areas will have direct connection with the CTH characterised by the correct geometrical shape and good technical parameters. Moreover, in the eastern part of the country, while implementing this component tasks, it is necessary to foresee the development of supplementing parts of the railway network not related with the direct connections to CTH, but enabling launching the **circumferential connections** in relation to "spokes" coming from the CTH – to ensure direct connections between the main centres in the eastern Poland: Białystok, Lublin and Rzeszów.

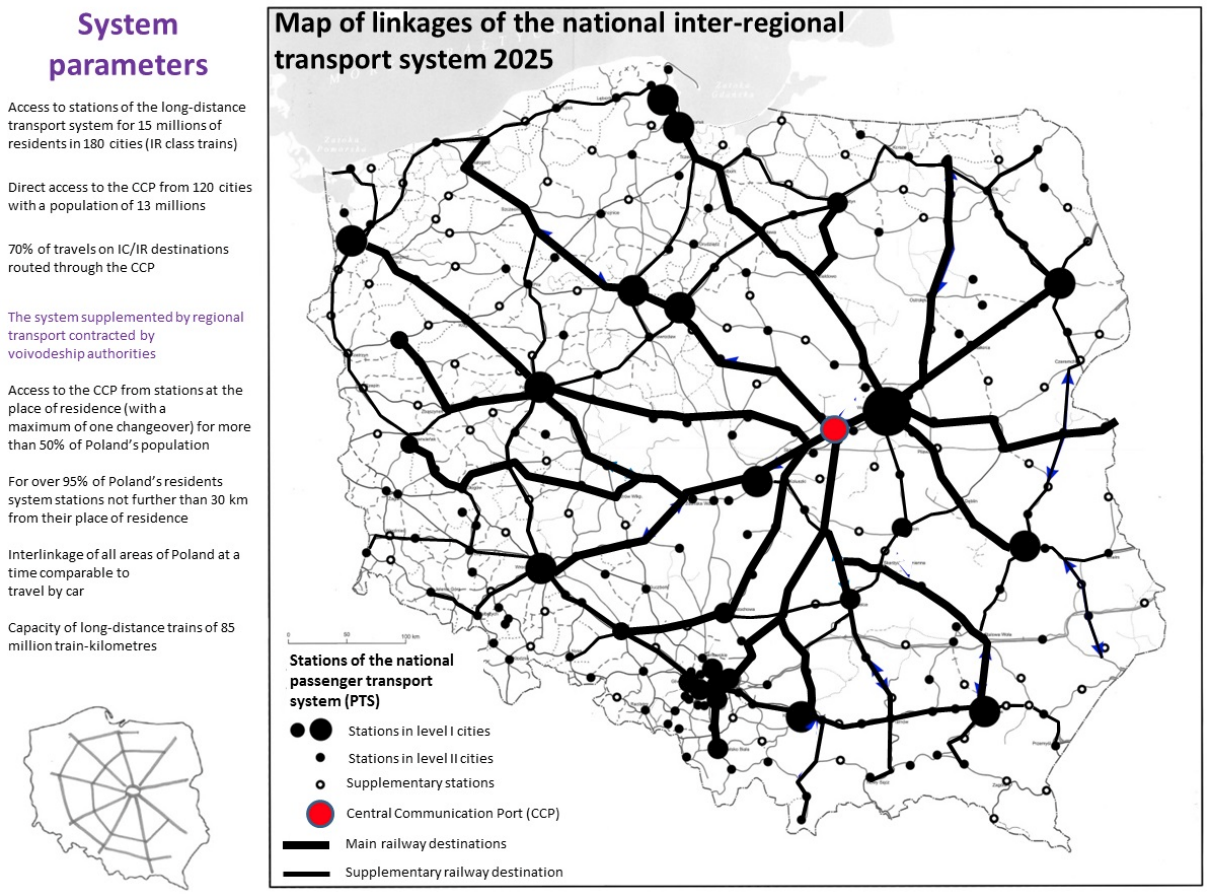
Investments implemented under the first stage are presented in the table below:

No.	New railway line section – spoke-like relations	Length (km)	Environmental factors
1.	**STAGE 0** – Building of CTH and Warsaw-Łódź line	153	No significant conflicts
	Stage 1a		
2.	CTH – Płock – Włocławek	120	Crosses the habitat site of Natura 2000 "**Kampinoska Dolina Wisły"** and the bird site **"Dolina Środkowej Wisły"**
3.	Warsaw Choszczówka – Nasielsk	33	Crosses the edge of the habitat site Natura 2000 **"Świetliste Dąbrowy i Grądy w Jabłonnej"**
4.	Junction Warszawa-Wschodnia – line No 21	2	No significant conflicts
5.	Zbydniów – Zalesie Gorzyckie	9	No significant conflicts
6.	Łętownia – Rzeszów	41	No significant conflicts
7.	Wąsocz Konecki – Tumlin	25	Crosses the habitat site Natura 2000 **"Dolina Czarnej"**
8.	Sieradz – Wieruszów	54	No significant conflicts
9.	Czernica Wr. – Ligota	24	No significant conflicts
10.	Kalisz – Pleszew	35	No significant conflicts
11.	Szczecin Główny – Szczecin Dąbie	6	Crosses the bird site Natura 2000 **"Dolina Dolnej Odry"** Crosses the edge of the habitat site Natura 2000 **"Dolna Odra"**

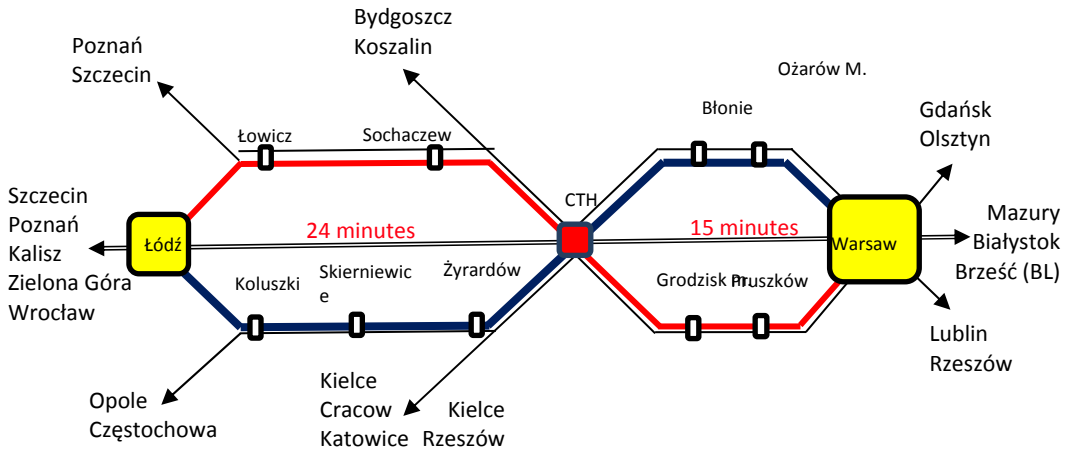
	Stage 1b		
12.	Ostrołęka – Pisz	72	Crosses the bird site Natura 2000 **"Dolina Dolnej Narwi"** and **"Puszcza Piska"** Crosses the habitat site Natura 2000 **"Sasanki w Kolimagach**"
13.	Nakło – Okonek	71	Crosses the habitat site Natura 2000 **"Dolina Łobżonki"**
14.	Busko Zdrój – Żabno	42	Runs in the proximity of the habitat site Natura 2000 **"Ostoja Szanicko-Solecka"**
15.	Podłęże – Tymbark /Mszana Dolna[2]	39	No significant conflicts
16.	Trawniki – Krasnystaw and Wólka Orłowska – Zamość	46	No significant conflicts
17.	Zamość – Bełżec	43	Crosses the bird site Natura 2000 **"Dolina Górnej Łabuńki"** and the habitat site Natura 2000 **"Dolina Łabuńki i Topornicy"**
New sections for circumferential relations (in eastern Poland)			
	New railway line section	Length (km)	Environmental factors
18.	Biała Podlaska – Fronołów	45	No significant conflicts
19.	Milanów – Biała Podlaska	35	No significant conflicts
20.	Two shortcuts in the course of line No 68 Lublin – Stalowa Wola near Zaklików	21	The shortcut in Zaklików crosses the habitat site Natura 2000 **"Uroczyska lasy Janowskie"** and bird site Natura 2000 **"Lasy Janowskie"**

[2] line to be implemented under the National Railway Programme.

System of interregional railway passenger transport after the implementation of the first stage will look as the following:



CTH hub after the implementation of the first stage – 2027



3. THE SECOND STAGE OF THE RAILWAY NETWORK EXTENSION – EVOLUTIONARY EXTENSION AND INTERNATIONAL INTEGRATION

At this stage of the programme the evolutionary supplementing parts of the national infrastructure will be implemented in the form of track sections characterised by high speed parameters (250 km/h) duplicating the

existing infrastructure in order to improve the attractiveness of the national transport system in the scope of decreasing the time travel. After the implementation of this task component the network sections operated with the speed of over 200 km/h on the main transport routes in the country will be longer and uniform, thanks to supplementing or extending the network built or rebuilt at the first stage enabling achieving high speed. Moreover the international, cross-border projects will be implemented, integrating the Polish railway transport system with the systems in the neighbouring countries of the Trimarium region. It is especially recommended that the following task components were implemented at the second stage:

2.1 Extending Central Rail Line to the north from the area around Włocławek to Tczew (the similar route to the one predicted in the "Targeted Programme for the High Speed Railway development in Poland until 2040" – PKP 1995 and the concept of the Country's Land Management from 2011) will allow a quick connection from the CTH to Tricity and covering Grudziądz with the good railway services. In this way over 90% of the route in the connection from CTH to Gdańsk will be covered by the line of the 250 km/h speed.

2.2. New railway line sections servicing the connection CTH – Radom – Ostrowiec Świętokrzyski – Stalowa Wola – Rzeszów. The aim of this group of tasks is to ensure connection of the CTH with Rzeszów in the time below 120 minutes, as well as including Radom – the second centre of the Mazowieckie voivodeship with the population of 220 thousand residents – into the system of direct national transport built on the basis of CTH. It is foreseen to build, in the scope of the investment, new sections CTH-Warka and Radom-Iłża-Kunów.

2.3 Extending Central Rail Line to the south (to the Rybnik and Bielsko-Biała agglomerations and to the country border) and **South Metropolis integration** together with the development of the fast line Cracow – Katowice and the Lesser Poland-Silesia transport hub, on the crossing of this line with the extended Central Rail Line, for the Lesser Poland-Silesia metropolitan area. This investment task component is the most important one for the country development from all of the investment tasks in the second stage, as it concerns the internal integration of the most populated residential area in the country, improvement of the integration of this area with the Central Metropolis, as well as building the cross-border connections with the Trimarium countries.

The planned scope of investments constitutes a synthesis of the solutions proposed in the "Targeted Programme for the High Speed Railway development in Poland until 2040" (1995) and later documents concerning the Central Rail Line extension to the south (e.g. Halcrow consortium 2011). "Targeted Programme for the High Speed Railway development in Poland until 2040" assumed the extension of the Central Rail Line towards the area near Czechowice-Dziedzice and branches for cross-border transport to Żylina in Slovakia and Ostrava in Czech Republic. Apart from its cross-border character, the new line allowed servicing Bielsko-Biała and Rybnik agglomerations without the use of Katowice hub. The scope developed by the Halcrow consortium assumed, in its turn, the extension towards Olkusz and branches towards Cracow and Katowice, and further extension of the line from Katowice to Ostrava (via Rybnik) and to Żylina (via Bielsko-Biała). The synthesis of these solutions assuming the direct Central Rail Line extension to the south to Bielsko-Biała and Rybnik agglomerations (and cross-border connections to Czech Republic, Slovakia, Austria or Hungary) with the use of the existing line No 93 and at the same time the branch in a form of crossing towards Katowice and Cracow, allows the fastest transport between these centres with the central part of Poland and with each other. Moreover, it grants possibility to build an important railway hub integrating the services for the Southern Metropolis and ensuring covering with mutual accessibility all of its urban agglomerations.

Thanks to changing the route in the new cross-border connection section of the line from Czechowice-Dziedzice to Ostrava via Jastrzębie-Zdrój it will also be possible to cover this city, the second biggest centre in the Rybnik agglomeration with 90 thousand habitants, with transport services. Jastrzębie-Zdrój is the biggest Polish (and Central-European) urban centre without the access to the railway transport.

The cross-border section to Ostrava will enable including the extended Central Rail Line in the planned corridor of the high-speed line Ostrava – Brno – Vienna, and the building and rebuilding of the railway line section to Żylina will allow including the Central Rail Line into the Slovak line No 120 Bratislava – Żylina which is currently modernised on all its length (203 km) to the speed of 160 km/h.

All of the above-mentioned new and modernised railway lines (including lines to Żylina and Ostrava) are mentioned in the regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010 (OJ L 348 of 20.12.2013, p. 129 as amended) and therefore they may be implemented with the use of the funds available under the CEF mechanism.

2.4. Building the new section of railway line Łódź – Sieradz – Kalisz (Nowe Skalmierzyce) in the tracks of high speed railway (KDP) "Y".

Thanks to supplementing the sections of new railway lines built during the first stage (Sieradz – Wieruszów and Kalisz – Pleszew) by the new railway line of the 250 km/h speed, the time travel between the CTH and Szczecin, Poznań, Zielona Góra and Wrocław can be shortened. Supplementation:

– in the case of connection to Poznań will enable rail traffic with the constant speed of 250 km/h from CTH to Pleszew, that is on over 70% of the route length (the remaining section of the line Pleszew – Jarocin will be modernised to the speed of 150–160 km/h).

– in the case of connection to Zielona Góra will enable rail traffic with the constant speed of 250 km/h from CTH to Kalisz that is on over 45% of the route length (the remaining sections of the line No 14 and 286 Kalisz - Zielona Góra will be modernised to the speed of 150–160 km/h).

– in the case of connection to Wrocław will enable rail traffic with the constant speed of 250 km/h from CTH to Wieruszów, and further from Ligota to Czernica, that is on almost 70% of the route length (the remaining sections will be modernised to the speed of 150–160 km/h).

The conception works on the high-speed railway in Poland were included under the North Sea – Baltic corridor set out in the regulation (EU) No 1316/2013 of the European Parliament and of the Council. The question of the possibilities of financing the building of high-speed railway from the EU funds in the next EU financial perspective is open. In order to consider the high-speed railway among the priorities financed from the CEF in the next perspective, it is justified to prepare the study of this investment as fast as possible. As for the new railway line sections which do not meet the requirements for the high-speed railway, but are included in the Trans-European railway network connection, it will be possible to apply for the EU means in line with the rules of appropriate Union programmes.

2.5 Cross-border investments in new corridors (potential)

Polish investments in high parameters trunk-line North-South (Central Rail Line extension in both directions) will enable the creation of fast railway passenger connection being a transport axis for the Trimarium countries on the meridian relation. This connection will be especially the spine of the passenger transport in the Central-European mega-region, the core of which are the metropolitan areas of: Warsaw and Łódź, Cracow and Upper Silesia, and Budapest, Bratislava and Vienna. This passenger transport corridor would supplement the existing European cargo corridor RFC 5 (Baltic – Adriatic).

While creating new international corridors under the TEN-T network, it should be considered to include the branch of the Baltic-Adriatic south axis and to build a new railway line in the direction of Budapest running under the Tatra Mountains for the **Baltic-Black Sea corridor**. During the meeting in Tatrzańska Łomnica on 28.02.2016, Presidents: of Poland Andrzej Duda and of Slovakia Adriej Kiska declared the necessity to build the

transport connections between Poland and Slovakia, including among others the railway tunnel running under the Tatra Mountains. Such a concept is much more realistic, if it constituted an element of the widest international Trans-European project integrating the Trimarium countries. However, building a new fast corridor Poland-Slovakia-Hungary means the necessity of crossing under the High Tatra Mountains, as well as the Low Tatra Mountains.

Another possible transport corridor, which is worth considering on the next TEN-T revision, is the **Warsaw – Prague corridor** crossing Wrocław (and running further towards South-West Europe). The implementation of this project would demand on the Polish side the modernisation of the line No 274 Wrocław – Wałbrzych and building a new infrastructure for fast passenger trains between Wałbrzych, Kamienna Góra and Lubawka, and on the Czech side building new track between Lubawka and Hradec-Kralove – along the planned express way R11/S3. The fast railway line Wrocław – Wałbrzych – Kamienna Góra on the Polish side would play an important role in the internal national transport.

2.6 Agglomeration, cross-border sections in the south of Poland located **outside the currently existing European corridors** on the peripheral mountain areas characterised by the high population density and significant tourist appeal. This component of actions assumes the implementation of railway network supplements in the south of the country, integrating larger urban centres into agglomeration structures (Świdnica-Wałbrzych, Tarnów-Nowy Sącz, Rzeszów-Krosno-Jasło-Sanok), and ensuring transport accessibility of the railway areas of strategic touristic importance. In each of the predicted cases it is possible to use the built sections of track in the international traffic with the use of existing border crossing points (in Łupków, Muszyna, Lubawka).

Summary of the stage 2 projects concerning the national railway network extension is presented in the table below:

Radiuses (Spokes)	New sections
Extension of the Central Rail Line towards the north	**175 km** Włocławek płn. – Grudziądz – Tczew/Malbork
Extension of the Central Rail Line towards the south direction Bielsko – Ostrava (Bron/Vienna) and Katowice and Cracow with building of the interchange to service the South Metropolis (WMŚ)	**61 km** Extension of the Central Rail Line Biała Błotna – Chełmek (on the line Nr 93 – with modernisation of the section Chełmek – Oświęcim – Czechowice-Dziedzice – Bronów to the minimum speed of 160 km/h on the length of 42 km)
	50 km – connector **Central Rail Line – Cracow**
	15 km – connector **Central Rail Line – Katowice**
	32 km new section (in the route of old lines) Bronów – Jastrzębie--Zdrój – CZ (Bogumin/Ostrava) including Jastrzębie-Zdrój into this connection
KDP Y Łódź – Sieradz – Kalisz	**49 km** Łódź – Sieradz
	47km Sieradz – Kalisz
CTH – Radom – Rzeszów	**65 km** CTH – Grójec – Warka

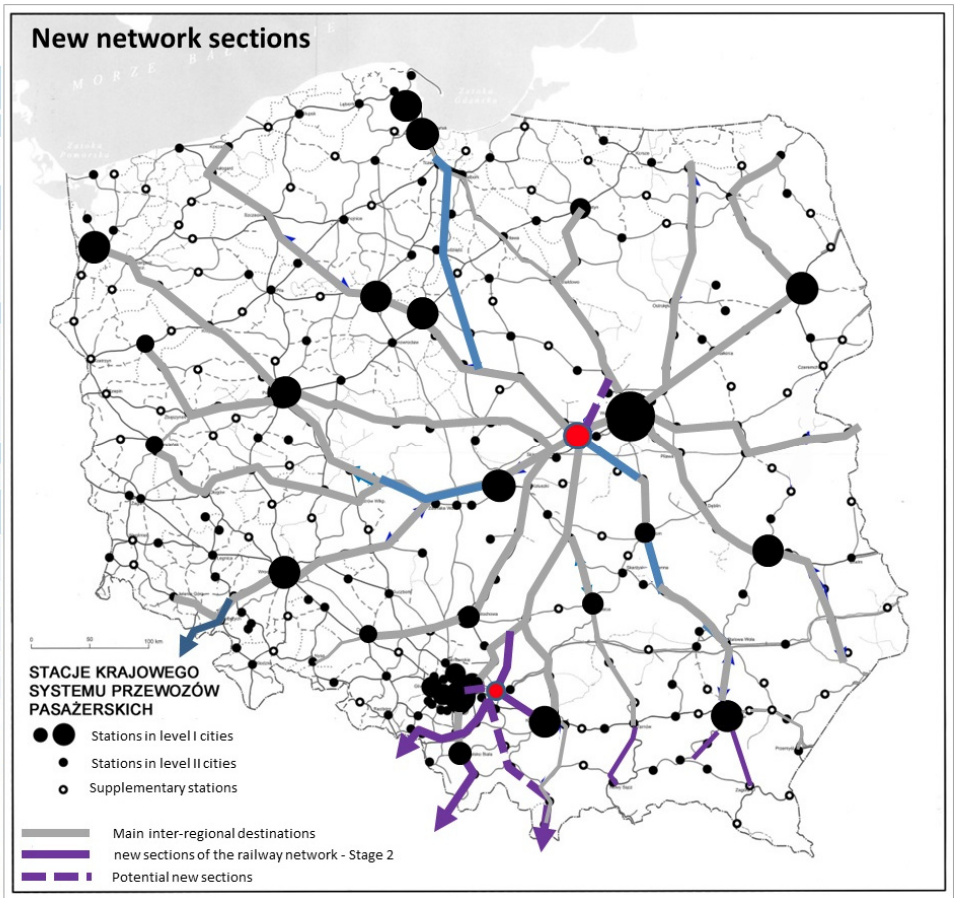
	52 km Radom – Iłża – Ostrowiec Świętokrzyski
Agglomeration, cross-border sections in the south of Poland	**50 km** New line Rzeszów – Sanok
	28 km shortcuts of the line Rzeszów – Jasło (with junction in the direction of Krosno)
	35 km shortcuts of the line Tarnów – Nowy Sącz
	30 km shortcut of the line 274 Świebodzice – Wałbrzych and Wałbrzych – Sędzisław, and new line Świdnica – Wałbrzych.
Possible sections – possible for implementation with specific conditions in place	
Branch from Central Rail Line towards Zakopane and further via Slovakia to Budapest	**98 km** new railway line (partly in the track of existing lines) dedicated to high-speed passenger trains, from Lesser Poland-Silesia hub on the crossing of the extended Central Rail Line and the new line Katowice – Cracow running via Wadowice, Sucha Beskidzka, Chabówka, Nowy Targ to Zakopane and further through the tunnel under the Tatra Mountains, as an element of the 200 km new line via Slovakia (e.g. Liptowski Mikulasz, Zwoleń) to Budapest. Implementation of the project only in the case of development of teh new international corridor (e.g. Baltic – Black Sea – via Poland – Slovakia – Hungary – Romania)
Kampinos junction CTH – Nowy Dwór Mazowiecki	**37 km** shortcut bypassing the Warsaw Hub (for possible implementation in the case of abandoning the building of the Central Rail Line North section). To be implemented only in the case of confirming its viability based on the experience from at least several years of CTH operation as the interchange for the national transport

After the implementation of the investment's second stage, new railway network sections and the connections network with the 120-
-minute isochrone of the route will be the following:

Stage 2 - 2030

Section	L. (km)
CMK – north extension	
Włocławek – Grudziądz-Tczew	175
Destination CCP- Radom-Rzeszów	
CCP- Grójec-Warka	65
Radom – Iłża- Ostrowiec Świętokrzyski	52
CMK – south extension	
CMK(Biała Błotna) – WMS-Chełmek (linia 93)	61
Kraków-WMŚ-Katowice	65
- Jastrzębie Zdrój – Gr. Państwa (Bogumin)	32
KDP - Y common section	
Łódź-Sieradz-Kalisz	96
South new sections of railway network	
Świebodzice/Świdnica-Wałbrzych – Sędzisław	30
Tarnów- Nowy Sącz	35
Skrót Rzeszów – Jało/Krosno	28
Rzeszów- Sanok	50
TOTAL	689

Potential new sections	I. (km)
WMS- Wadowice-Chabówka- Nowy Targ-Zakopane –Słowacja	98
CPK- N. Dwór Mazowiecki	37
TOTAL	135



Stage 2 - 2030

East

CCP - Warszawa - Tłuszcz - Ostrołęka - Pisz- Giżycko

CCP- Warszawa - Tłuszcz - Białystok –(Ełk – Suwałki/Sokółka-Grodno)

CCP - Warszawa - Terespol (Brześć BL)

CCP- Warszawa - Lublin – Chełm(Kijów)

CCP - Warszawa - Lublin - Zamość-Tomaszów (UKR --> Lwów)

West

CCP- Skierniewice –Częstochowa -Opole (Nysa)

CCP-Łódź - Sieradz- Wrocław (Praga/Drezno)

CCP- Łódź- Sieradz-Kalisz - Głogów-Zielona Góra

CCP -Łowicz- Poznań - Zbąszynek – Gorzów Wlkp.

CPP-Łódź -Kalisz -Pleszew- Poznań - Szczecin

North

CCP- Włocławek- Bydgoszcz - Okonek-Szczecinek - Białogard- Koszalin

CCP –Płock-Grudziądz-Gdańsk

CCP—Płock-Grudziądz-Malbork-Elbląg (Kaliningrad)

CCP-Warszawa- Olsztyn

South

CCP-Radom-Stalowa Wola-Rzeszów-(Humenne- Bukareszt)

CCP- Opoczno - Kielce - Tarnów- Nowy Sącz-Krynica (Koszyce)

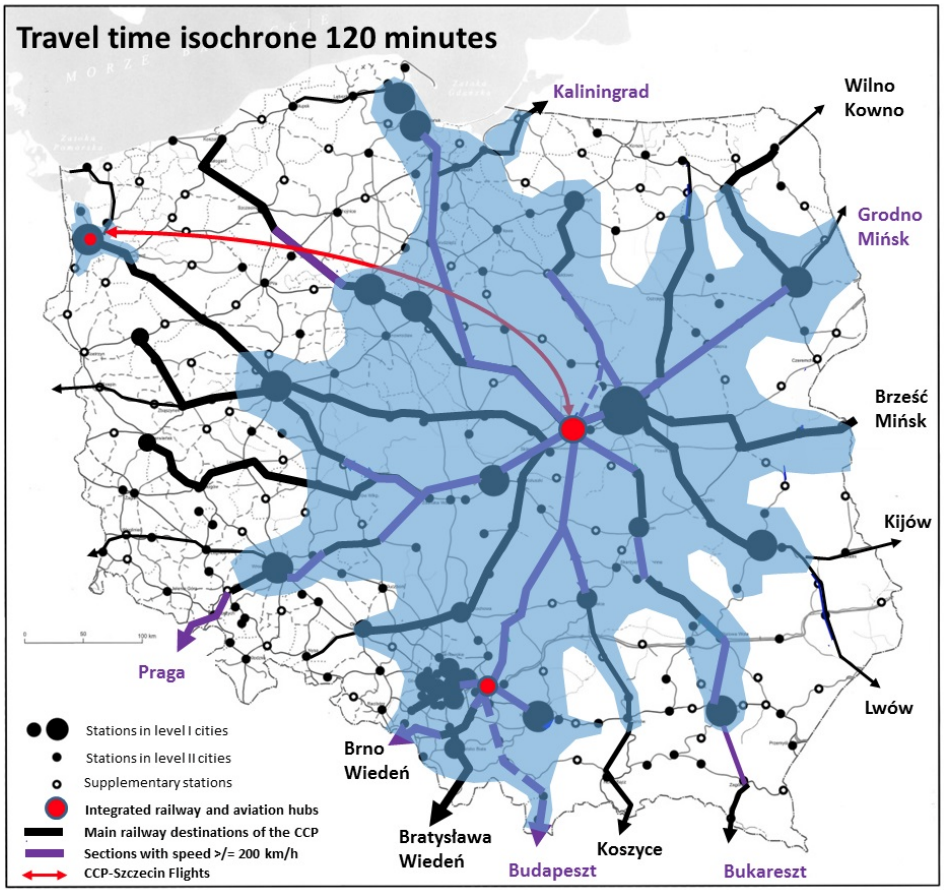
CCP- Opoczno - Psary -Kozłów - Kraków

CCP- Psary- Zawiercie- Katowice – Gliwice/Rybnik

CCP –WMS-Bielsko Biała – Żylina-Bratysława

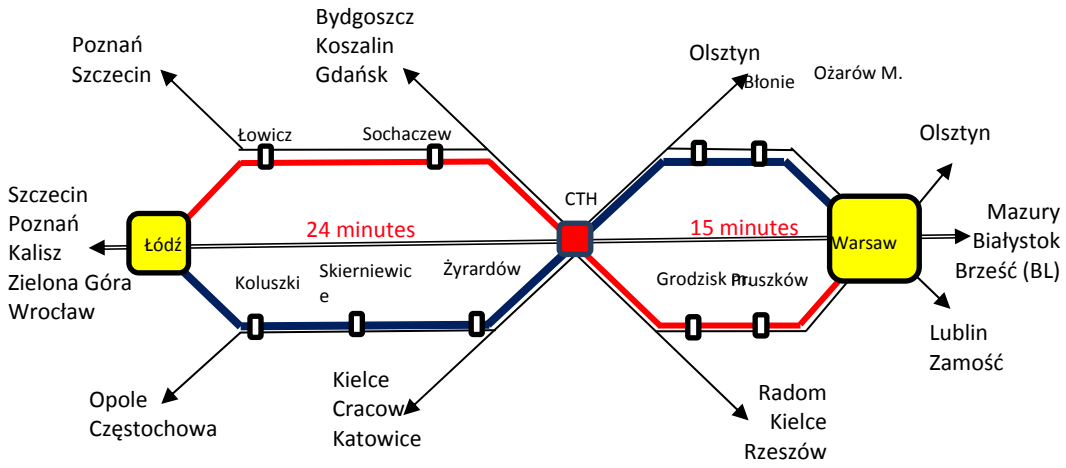
CCP – WMS-Jastrzębie zdrój-Ostrawa – Brno -Wiedeń

CCP-WMS- Zakopane –Bańska Bystrzyca-Budapeszt



Route isochrone of 120-minute and main connections in this section with the speed of at least 200 km/h.

CTH hub after the implementation of the second final stage (2035)



4. TRAVEL TIME

After the implementation of the above-mentioned investments the time travel between individual urban agglomerations and areas in Poland will decrease significantly, and the railway transport will achieve a constant competitive advantage in relation to the road transport. As the newly built infrastructure will be used not only by the Inter City class trains, but also those of the Inter Regio class servicing the poviat centres, the improvement of transport accessibility will concern all the country, and not only its main urban agglomerations. The planned time travel to and from the CTH after the implementation of the planned investment programme, divided according to the implementation of individual railway network extension stages, is presented in the table below:

Centre	**Stage 2027**		**Stage 2035**	
	Distance to CTH	Travel time to/from CTH	Distance to CTH	Travel time to/from CTH
Warsaw	**37**	0:15	**37**	0:15
Łódź	**85**	0:25	**85**	0:25
Cracow	265	1:30	**275**	1:15
Zakopane (2027 – via Podłęże)	398	3:25	398	3:25
Katowice	265	1:30	**275**	1:15
Gliwice	292	1:55	302	1:35
Rybnik	310	2:00	320	1:45
Ostrava	350	2:30	360	2:15
Bielsko Biała	320	1:55	--------	--------

WMS – Lesser Poland–Silesia Hub	--------	--------	**240**	1:05
Bielsko-Biała	--------	--------	295	1:30
Jastrzębie-Zdrój	--------	--------	317	1:35
Ostrava	--------	--------	345	1:55
Zakopane via WMS[1]	--------	--------	366	1:45
Budapest (new route via WMS and Zakopane)[2]	--------	--------	605	3:10
Wrocław	310	2:00	**305**	1:40
Wałbrzych	389	2:55	385	2:25
Jelenia Góra	435	3:20	410	2:45
Szklarska Poręba – Jakuszyce	472	3:55	447	3:20
Legnica	375	2:30	370	2:10
Zgorzelec	472	3:20	468	3:00
Nowe Skalmierzyce (Kalisz/Ostrów)	210	1:20	205	1:00
Zielona Góra	455	3:25	445	2:45
Poznań	315	2:05	**310**	1:50
Gorzów Wlkp.	470	3:30	465	3:15
Szczecin	520	3:30	**515**	3:15
Grudziądz	--------	--------	215	1:05
Gdańsk	355	2:40	**325**	1:45
Gdynia	376	3:00	346	2:05
Słupsk	486	4:00	456	2:55
Białystok	215	1:30	215	1:15
Suwałki	355	3:00	355	2:30
Grodno	300	2:15	300	2:00
Lublin	212	1:45	212	1:45
Tomaszów Lubelski	332	2:45	332	2:45

[1] Only in case of developing the WMS-Zakopane- (Slovakia/Hungary) line.
[2] Ibidem.

Lviv	432	3:50	432	3:50
Radom	--------	--------	108	0:35
Stalowa Wola	298	2:30	255	1:45
Rzeszów	**365**	**3:05**	**310**	**2:00**
Krosno/Jasło	430	3:35	365	2:25
Sanok	--------	--------	375	2:35
Płock	80	0:25	80	0:25
Włocławek	130	0:42	130	0:42
Bydgoszcz	235	1:40	235	1:35
Toruń	185	1:10	185	1:05
Koszalin/Kołobrzeg	440	3:25	440	**3:25**
Kielce	156	1:00	156	1:00
Busko Zdrój	210	1:40	210	1:25
Tarnów	267	2:10	267	1:55
Nowy Sącz	355	3:30	345	2:40
Olsztyn	257	2:00	257	2:00
Częstochowa	200	1:20	200	1:20
Opole	294	2:20	294	2:20
Nysa	344	2:45	344	2:45
Pisz	220	1:45	220	1:45
Giżycko	272	2:15	272	2:15
Ełk	275	2:20	275	2:20
Biała Podlaska	210	1:45	210	1:45
Brześć (BL)	250	2:05	250	2:05

5. TRAIN TRAFFIC CYCLE AND ECONOMIC PARAMETERS OF THE CARRIAGE SYSTEM

The majority of national inter-city trains will have their routes changed to run through the CTH hub, including all the national cross-town connections. The average cycle of train traffic between CTH and the Warsaw city-centre will amount to less than 10 minutes with the travel time of the fastest trains amounting to less than 15 minutes. Train traffic cycle with one hour intervals or more frequent for the trains connecting CTH with each of the regions of Poland will ensure mutual accessibility of all of these regions with the average time for change

not exceeding 30 minutes (and maximum time of 1h). This cycle should be serviced interchangeably by the IC class trains (which stop only in the main cities and hubs) and IR class trains (which also stop in the poviat centres). When joint with the regional transport subsystems, the national transport system built on the basis of CTH will ensure mutual accessibility for all of the poviat cities in the country.

Assuming the traffic cycle with one-hour intervals (interchangeably by the IC trains and IR trains) on the main connections of spokes directed towards CTH and the cycle with two-hour intervals on the circumferential connections and the cycle with four-hour intervals on the extensions of the parts of connections (of a regional nature), a one year performance of freight for the trains servicing the national long-distance carriages will amount to: after the implementation of the first stage around 81 million train-km, and after the implementation of the second stage – 85 million train-km respectively. The one year cost of operating the system in its maximum option (85 million train-km) may be estimated at approximately PLN 3.6 billion. Assuming that the revenue from the transport service will remain at the level of PLN 46 per passenger (current level) and assuming that the current grants for transport from the state budget will remain at the same level (about PLN 600 million per year), the system's break-even point will be achieved with the year transport on the level of 65 million passengers. It should also be noticed, that the implementation of the above-mentioned assumptions should lead to achieving the interregional transport at the level of 75 million passengers per year, including the transport to and from the airport at the level of minimum 10 million, and reaching 50% share of the railway in the intermodal distribution of traffic to CTH.

Reaching the average commercial speed within the IC connections at the level of 150 km/h and within the IR connections over 120 km/h should be regarded as a distinct goal.

6. INFRASTRUCTURE STANDARDS

Efforts should also be made to avoid collisions of the road and pedestrian network with the railway network on the spokes connecting CTH with the main Polish urban agglomerations by means of two-level crossings and elimination of part of the level-crossings. Among other objectives it should be considered: reaching full automation of the level-crossings on "spokes" connecting CTH with the remaining regions of Poland, limitation of the number of these level-crossings by 50% and introduction of restrictive automatic system of executing penalties from the drivers who break a ban of proceeding to the level-crossing (with the use of level-crossing monitoring) and introduction of the system of informing the driver about the breakdown or an obstacle on the level-crossing. It should also be considered to introduce the automatic system preventing train collisions based on the ICT technologies and geopositioning. It should also be sought to retain the standard of the lack of any constant limitations on the "spokes"' network.

7. SPENDING LIMITS RELATED WITH THE RAILWAY NETWORK EXTENSION BY THE NEW SECTIONS

a) STAGE 1 EU 2020–2025 (+2) PERSPECTIVE

Estimated cost of the national railway network extension under the stage 1 investments implementation (without considering investments implemented under the railway component inextricably connected with the construction of the CTH itself) in the years 2020–2025 (+2) will amount to approximately PLN 16 billion. Additionally it is advisable to consider to allocate from the funds for railway investments a financial envelope dedicated for the complementary investments described in Attachment 5 in the estimated amount of about

PLN 5–7 billion. Therefore, depending on the number of the implemented complementary projects, the spending limits for the railway network extension aiming at creating the universal national transport system based on CTH will amount to **PLN 16–23 billion**.

b) STAGE 2 EU 2025–2030 (+2) PERSPECTIVE WITH POSSIBLE PHASING OF THE PART OF THE PROJECTS UNTIL 2035

Estimated cost of the extension of the railway network characterised by the high speed parameters under the stage 2 investments implementation in the years 2025–2030(35) amounts to about PLN 13.5 billion. Additionally, at this stage a task component related with the building of agglomeration, cross-border sections in the south of Poland for the estimated value of about PLN 5.5 billion is foreseen for the implementation. An important part of these projects was included in Attachment 5 as proposed complementary projects (implemented at the stage 1). Therefore, depending on the level of implementation of this part of tasks at the first stage (in the scope of complementary projects) the spending limits related with the railway network rebuilding at the 2 stage will amount to **PLN 13.5–22 billion** (these values do not include possible (potential) projects related with the possible defining of new international Trans-European transport corridors (e.g. within the Trimarium countries). The overall costs of the national railway network extension by the new sections connected with the development of infrastructure for the transport system based on the CTH foreseen for the years 2020–2030(35) will amount to PLN 35–40 billion.

The document developed by Patryk Wild, the member of the Advisory Team of the Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland coordinating the Team work in the scope of railway network extension with the cooperation of Piotr Malepszak and Wojciech Zdanowski (members of the subteam for the railway network extension).

Attachment No 4

INFORMATION ON THE POTENTIAL TO IMPLEMENT A VACUUM RAILWAY SYSTEM IN POLAND, BASED ON CENTRAL TRANSPORT HUB (CTH), YEARS 2018-2030

INTRODUCTION

This document constitutes Attachment No 4 to the Investment Preparation and Implementation Concept: Solidarity Airport – Central Transport Hub for the Republic of Poland, and it presents a scenario for the development of infrastructure for a vacuum railway system in Poland. The scenario assumes the construction of national sections for a vacuum railway system, and it is closely connected with the development of railway infrastructure, in particular high-speed rail (HSR).

During the first stage of implementation of this technology for public use, in 2018-2030, it is planned to construct a national section on route: Warsaw - CTH - Łódź, ensuring efficient direct communication between the cities of Central Metropolis, and between these cities and CTH. It has been pointed out that in accordance with the conclusions contained in the Investment Preparation and Implementation Concept: Solidarity Airport – Central Transport Hub for the Republic of Poland, the best location for this Port is Stanisławów - a village in the Baranów commune. Assuming this location, the planned Warsaw – CTH – Łódź route will run along the corridor of the planned Y - HSR line.

Past 2030, the works should cover sections CTH – Katowice and CTH – Krakow, to connect Central Metropolis with Southern Metropolis. This solution certainly does improve transport connections between two metropolitan areas, streamlining at the same time the connections between these two large urban agglomerations and Central Transport Hub. Later activities could include the implementation of subsequent national sections and routes leading to southern, eastern and we western borders of Poland. The talks currently on-going in the Baltic States aim at creating a Hyperloop network (an equivalent of Polish vacuum railway system) the south-eastern part of which would run through the territory of the Republic of Poland. Railway lines would go along the corridors of the planned Lon-distance lines. The southern connections are aimed at further integration with the southern countries of Three Seas.

PREROGATIVES FOR INTRODUCING THE VACUUM RAILWAY IN CTH

Building new airports and railway stations is an investment having a long-term impact on the quality and accessibility of transport services. From this perspective, it seems important to undertake actions aimed at optimum integration of various elements of the transport system. Therefore, airports, ports, railway stations, subway stations, bus and tramway stops, as well as stopping points for individual means of transport (enabling connection with a motorway) should be as much interconnected as possible and transformed into integrated hubs for interconnections. Such trend has been observed in most European countries. However, changing the means of transport within an integrated interchange hub is considered as an element that weakens the transport system (Givoni, Banister 2008), thus designing such hubs effectively is an important element of creating the „door to door" systems.

The planned Central Transport Hub will not just be a place where airplanes or trains arrive and from which they depart, but first of all it will be an element of the communication network fostering its integration. Here the passenger will change the means of transport. Such change should be easy, convenient, logical and safe, and at the same time it should not exclude any group of users. At the design stage, it is also important to plan a transport interchange that would make it possible to extend its functionality with the means of transport

available in the near future. The shift of paradigms regarding the principles of mobility, including, i.a., the prospects of mass production of autonomous cars in a near future and implementation of new vacuum railway technology. These innovations will soon create new communication opportunities and at the same time they will reduce negative effects of using currently dominating means of transport, such as road and air traffic congestion or emissions of carbon and other harmful substances, that degrade the environment. According to the European Commission's White Paper (2011), new technologies for vehicles and traffic management will be key to lower transport emissions in the EU and in the rest of the world. The race for sustainable mobility is a global one. Delayed action and timid introduction of new technologies could condemn the EU transport industry to irreversible decline. The EU transport sector faces growing competition in fast developing world transport markets.

It the above perspective, it seems justified to account in the planning process of such a forward-looking project for the possibility of integrating Central Transport Hub with a vacuum railway station.

THE IDEA OF VACUUM RAILWAY

Vacuum railway artery, known also as Hyperloop, is a new mode of transport, combining the advantages of trains and airplanes, and eliminating main shortcomings of the means of transport dominating nowadays. The idea emerged in the early 20 century, but it became technically feasible in 21 century. Thanks to technological development and economic growth people travel more frequently. However, the existing infrastructure fails to satisfy the growing demand for transport services. The average intercity travel time has not been significantly reduced for several decades, and in some cases it has even increased. Time is a scarce resource nowadays, and thus reduction of travel time is the main objective of vacuum trains.

Air resistance is biggest obstacle in obtaining high speed. At the speed of just 50 km/h, air resistance for a moving car represents 50% of movement resistance . At the speed of 200 km/h, air resistance represents 93% of total resistance. A standard car with a 140 HP may get the speed of up to 200 km/h. An engine of over 400 HP is needed to get the speed of 300 km/h, and to obtain the speed of 400 km/h, we need an engine of ca. 950 HP. To move at the speed of 600 km/h 216 more power is needed than for moving at the speed of 100 km/h, and to move at the speed of 900 km/h, the required power increases as much as 729 times. If we want to move at high speed in an atmosphere with normal pressure (101 325 Pa), it is necessary to use engines of very high power. Aeroplanes tackle this problem by rising to the height of ca. 11 km, where the density of air is 3.4 times lower than at earth level. Thus, the power required may be reduced over three times. Aeroplanes move fast, but first they have to rise high.

The idea of creating similar conditions on the ground to those in which airplanes move lies behind the work on vacuum transportation. This idea is not completely new, but only the current level of technology development enables its implementation. The idea is to construct an airtight tube where pressure will be reduced to a level 1,000 times lower than on Earth surface, thus allowing for a 1,000 times reduction of aerodynamic resistances and powers necessary to overcome these resistances. This will not only significantly reduce the power required to obtain the speed of 300-400 km/h, but will make it possible to achieve speeds higher than currently obtained by passenger aircrafts (800–900 km/h).

Vehicles of different kinds, carrying both passengers and goods, will be able to move in the tube artery. The energy consumed for their movement will always be 1,000 times lower that at ground level, because the atmosphere inside the tube is controlled . The highest speeds would be generated in the morning and afternoon, when the traffic is most intensive, accounting for the importance of travel time. During peak hours transport capsules on air cushion or magnetic cushion will be used. At night, goods would be transported at

much lower speeds, as in this case the travel time is much less important whereas energy consumption matters more. Goods could be transported in wheeled transport modules.

ADVANTAGES OF VACUUM RAILWAY

A vacuum railway system allows a synergy effect by exploiting the advantages of railway and of aircraft, while avoiding their disadvantages. The average vacuum conditions in the tube make it possible for the capsules to obtain speeds currently accessible only by aeroplanes, using very little energy. Moreover, the closed environment structure eliminates all the problems caused by the atmospheric conditions outside, thus increasing safety and ensuring constant, unchangeable capacity of the system. A distinct advantage of vacuum railway is the possibility to build railway stations in city centres (unlike airports), which allows for reducing the time needed for passengers to get to the station. The entire system will be fully automated to ensure its optimal functioning, thus improving safety (by eliminating the human factor as the main reason of transport incidents and accidents). Vacuum railway capsules will be departing in few-minutes intervals, that is almost as frequently as the metro.

Another definite advantage of the vacuum railway, compared to the existing modes of transport, is the option to place the tubes in four different configurations: in an underground tunnel, in a cut, on a fill and on supports. Additionally, placing photovoltaic panels and wind turbines along the entire route will make it possible to generate energy which should partially meet the requirements of the system.

IMPROVED PASSENGER INTERMODALITY

Railway development level in Europe has implications for the competitiveness of this means of transport with the aeroplane for distances of up to 400 kilometres. Vacuum railway may become competitive for the distances ranging between 200 and 1,000 kilometres. Strengthened competitiveness is one of the elements of improved passenger inter modality. In line with recommendations of the European Union, by 2050 all airports that belong to the trans-European transport network (TEN-T) should be integrated with the railway system. The Chopin airport in Warsaw as well as Kraków-Balice, Lublin-Świdnik and Szczecin-Goleniów already have such connections. Benefits of rail links with the airport include: lower traffic congestion, improved punctuality, improved safety and lower air pollution. In Germany, Lufthansa and German Railways offer two ticket tariffs to the passengers: Rail&Fly and AIRail. The first one is an option to buy a single ticket for an international flight from/to any airport in Germany with a travel by rail. The ticket is valid one day before and one day after the flight. The passenger may use all kinds of trains. AIRail is an offer created in cooperation with the Fraport, company which owns and operates the airport in Frankfurt am Main. The first connection between this airport and main railway station in Stuttgart was launched in 2001. Two years later, a railway connection with Cologne was opened. Passengers check in at the railway station where AIRail terminal is located. The offer works also the other way round; after arrival, passengers collect their luggage and AIRail terminal and take it to the train. Similar air links connect Paris with the airport in Brussels. Also the passengers of KLM airlines may book a seat in one of the Thalys trains between Brussels-Midi and Amsterdam-Schiphol.

Similar cooperation schemes will be possible between airlines and vacuum railway carriers, based on a distributed passenger check-in process. Passengers travelling by a vacuum train to the airport at Central Transport Hub, within the framework of a single ticket tariff, would check in their luggage and undergo security control at the vacuum railway station in Warsaw or Łódź, and subsequently in other towns incorporated into the system. This would shorten the check-in time at Central Transport Hub, making it more efficient.

DESCRIPTION OF INFRASTRUCTURE

To create a vacuum railway system, it is necessary to develop numerous technologies simultaneously. The project involves not only the construction of the vehicles or tracks. It is an engineering undertaking, aimed at developing coherent systems of track-beds, power supply as well as communication and information systems and systems to exchange data within the vehicle network. In the present stage of knowledge, the infrastructure required for vehicle traffic management may be compared to that used in conventional rail, with some magnetic railway aspects additionally accounted for. The estimates provided by foreign sources, consistent with the forecasts made by Polish engineers, suggest that the implementation of the finished system should be at least 20-40% cheaper than for the High Speed Railway (HSR).

In line with the exploitation assumptions, at least two overhead tubes are necessary to ensure smooth and collision free traffic. Load-bearing structures could be erected for most of the route on pillars, at the height of at least 6 meters above the terrain level. In urbanised areas it is possible for the tracks to be placed in constructions in cuts, underground tunnels or on fills. In such cases, security systems should be used, similar to those used in railway or road tunnels. It will be necessary to build service roads along the vacuum railway lines, to be used as access roads to traction power supply station - linear motors in track beds, as well as the station where pressure will be reduced and low pressure will be maintained. Such roads will be of local character, of 5 m width and will be constructed using concrete surface technology and paved surface technology. The objective of service roads is also to provide access for rescue services and also when the use of heavy equipment is required. The vacuum railway system requires ca. 10 kilometres of power substations as well as a pump house, necessary to reduce and maintain low pressure in the tube.

ENERGY COSTS

One of major challenges facing the world today is to ensure economic development in line with the sustainable development, with special focus on striking a balance between the needs of industry and transport and natural environment protection. This implies a need to implement technical solutions able to address these challenges. As regards transport technologies, the concept of vacuum railway responds to these challenges. In preliminary assumptions (SpaceX, 2013), the system was to rely exclusively on the energy from renewable resources. This however may be a difficult target to achieve, in particular in regions with unfavourable wind conditions or a low average level of annual solar radiation. Currently, a detailed analysis is underway, comparing the costs of vacuum system with the currently available means of transport. Preliminary estimates developed by Polish scientists show that a vacuum railway system may require 80% less energy, compared with HSR of similar capacity (Hyper Poland). These figures result from the fundamental differences between the two systems, including:

- much lower movement resistance (aerodynamic resistance is offset by low pressure in the tube artery and by rolling resistance, which may be reduced, i.a., by using magnetic levitation),
- higher nominal voltage of powers supply system, generating lower energy loss,
- movement of the capsule through the coasting - analogous to trains that move this way along gradients,
- no intermediate stops.

Vacuum railway is conceived as a system of direct transport, transport on demand. This means that a passenger planning to go to destination X enters a capsule together with other passengers going to the same destination X and gets there without changes or stops. Such solution eliminates additional energy consumption, required to accelerate the capsule anew at intermediate railway stations.

LEGAL SITUATION

The universal legal system applicable in the Republic of Poland does not include regulations dedicated specifically to the vacuum railway technology. Taking into account the infrastructural scale of the undertaking as well as the fact that technology will develop with the aim to create a new, alternative system of transport, initially it will be possible to make use laws and regulations currently in force, in particular aviation law and railway law. The purpose of developing regulatory infrastructure should be to implement to Polish legal order regulations concerning the common principles applicable to vacuum railway, in particular regulations on safety and technical standards, as well as on environmental, energy and infrastructural issues . It should also be remembered that the new transport system will be linked with railway -road-aviation infrastructure in other countries and therefore standardisation of regulations at trans-national level should be taken into account.

Considering the need to perform technology tests, it is necessary to account for infrastructural aspects by drafting acts implementing the Act -Construction Law that would describe basic design and construction standards to be satisfied by building structures for vacuum railway . Such documents could be prepared based on the existing ordinances issued by the Minister of Transport and the Maritime Economy on the conditions to be satisfied by railway constructions and their locations, and also on ordinances on technical conditions to be satisfied by road civil engineering structures and their locations. Vacuum railway tubes are simply bridges and viaducts, that is engineering structures in bridge construction terminology and railway terminology.

ECONOMICAL ASPECTS OF THE WARSAW - CTH - ŁÓDŹ LINE

Currently (in 2017), the Warsaw - Łódź route is the most busy thoroughfare in Poland; according to the estimates of PKP Intercity S.A. and the General Directorate for National Roads and Highways (GDDKiA), each year between 16 and 20 million of passengers travel along this route, out of which 30% travel by rail and the rest by road. By comparison, another a little less congested transport corridor is the route between Krakow and Katowice, with a little lower number of travellers, and a marginal share of those using railway - below 1%.

In the preliminary calculations aimed at assessing potential cost-effectiveness of introducing vacutrains on the route Warsaw – CTH – Łódź data for HSR, as an alternative system, were used as a point of reference.

Calculations are based on data concerning vacuum railway, developed by Hyper Poland sp. z o.o. in the course of its work on this technology in Poland (calculations made by experts in, i.a., aviation and bridge construction). Other sources are listed at the end of this section.

An initial comparison of individual cost categories is presented below:

1. Investment costs

a) the estimated cost of constructing 1 km of HSR line is ca. EUR 12-30 million, for the vacuum railway, initial cost estimates for linear infrastructure are ca. 20–40% lower. This cost may be reduced further if estacades on high pillars are given up, and the railway line goes overground, on a low fill,

b) it is estimated that the cost of constructing 1 m^2 of railway station infrastructure would be comparable for both technologies, assuming that the area of vacuum railway station will be smaller than for HSR station, which may result in a lower total cost of constructing the vacuum railway station. In both cases, it is assumed that the existing railway station infrastructure in town centres will be used and a new station will be constructed for the CTH,

c) the cost of purchasing the means of transport (vehicles), which for HSR equals ca. PLN 240,000–300,000 per one passenger seat, in the case of vacuum railway may be even 40–70% lower.

2. Operating costs

a) the cost of maintaining linear infrastructure, which for HSR is ca. PLN 300,000 PLN per kilometre annually, should be as much as 50–70% lower for vacuum railway,

b) the cost of operation and maintenance of the means of transport (vehicles), which for HSR is estimated at ca. EUR 2/km annually, should be ca. 50–70% lower for vacuum railway, mostly due to much lower energy intake.

3. Alternative costs

The value of travel time savings: it is estimated that travel time between Warsaw and Łódź will be reduced from 45 minutes estimated for the HSR to ca. 13 minutes foreseen for the vacuum railway, which could bring ca. PLN 233 million savings on travel time for the current annual number of passengers, which is ca. 16.1 million (assuming the average salary of PLN 4,354 in the 1st quarter of 2017, and the value of travel time index of 82% of average hourly pay – based on Zamparini, Reggiani 2017). Accounting for the foreseen wages increase by the time when the connection will be launched and the expected increase in the number of passengers, the real savings could be significantly higher.

Other alternative costs, such as for example the value of reliability (predictability of real travel time, directly associated with punctuality). The predictability of the travel time seems to be similar for both technologies, however it may in practice turn out to be higher for the vacuum railway thanks to the limited impact of external factors (e.g., weather conditions) on the system.

4. External costs

In further analyses it would be worthwhile to take into account external costs estimations, including: accidents, noise, carbon emissions and environmental pollution. At first sight, the advantages of vacuum railway in this scope are obvious, although the HSR also compares favourably with other means of transport.

Eliminating the impact of external factors (the fully enclosed design of the vacuum tunnel) on the system and its complete autonomy is aimed to minimise the possibility of accidents caused by external factors (e.g. weather conditions, unauthorised entries on railway trucks) and human errors. The situation is similar as regards noise levels.

Extremely low energy intake and the possibility to produce it based on solar panels or small wind turbines placed on top of the tunnel is to mitigate the negative impact on the environment, in the form of carbon dioxide emission or other atmospheric pollution.

5. Summary

The much lower operating costs of vacuum railway allow for setting ticket prices at the level that is unobtainable for the HSR and competitive with the currently available means of transport.

Lower costs of passenger transport should have a positive impact on the pace of socio-economic development of the country.

From economic point of view and based on initial analyses performed by Hyper Poland sp. z o.o. and US companies developing the technology (first of all, Hyperloop One), the vacuum railway seems to be an interesting alternative to the HSR, due to the foreseen lower investment and operating costs, along with external costs reduced to a minimum.

In the context of the planned timeframe for the construction of CTH, the vacuum technology should be mature enough to be implemented simultaneously.

Sources of data used for the calculations:

- Estimated numbers of passengers based on the Ordinance of the Minister of Infrastructure and Construction of 8 December 2016 amending the Ordinance on sustainable development plan for public transport in the scope of communication network for inter-voivodeship and international passenger railway transport" (Polish Journal of Laws [Dz. U.] of 2016, item 1996, pp, 29–30) including data obtained from PKP Intercity S.A. and GDDKiA.

- Investment costs and operation and maintenance costs for the HSP are based on data of the National Union of Railways in Paris (UIC), "High speed rail: Fast track to sustainable mobility", November 2010.

- Investment costs and operation and maintenance costs for the vacuum railway are based on the estimates of Hyper Poland sp. z o.o.

- The indicators used for calculating the value of travel time savings come from Zamparini, Luca, Aura Reggiani. "Meta-analysis and the value of travel time savings: a transatlantic perspective in passenger transport." Networks and Spatial Economics 7.4 (2007): 377-396.

VACUUM RAILWAY STATION INFRASTRUCTURE IN THE CTH

It should be pointed out that individually tailored solutions are made for each interconnection point, depending on the number of passengers, the existing transport network, land elevation, the distance from the city centre, the types of transport means, changes in trends in transport demand (daily, seasonal, weekend), etc.

At a vacuum railway station we can distinguish seven functional zones:

- entrance zone,
- passenger handling zone (ticket counters, information, waiting room),
- technical zone,
- circulation zone (corridors, stairs, lifts),
- departures zone,
- arrivals zone,
- recreation zones (shops, restaurants).

The technical solutions for the vacuum railway station proposed by the Polish team of scientists at the international competition in Dubai allow for flexible design of the building and collision free connection with other means of transport. Some of the functional zones listed above may be planned as common areas for all the means of transport integrated at the CTH. Such solution will significantly reduce the built up area and will facilitate the potential reconstruction of the transportation hub to satisfy the future user requirements. A comprehensive design approach was lacking when many European railway stations were modernized in the second half of the twentieth century. Individual stops for new means of transport were jut "added" to the main station building, with no account taken for the possibility of future development. The space around the railway

station became uncoordinated and unreadable. Thus adequate space reserves for vacuum railway should be accounted for already at the stage of designing the CTH. Additional space is necessary to extend the Central Transport Hub in the future, adding a vacuum railway station, with adequate area foreseen for handling of passengers and for technical infrastructure. It is also important to have adequate space reserve on the access roads to the railway station, i.e. a strip of land at least 20 meters wide where the future vacuum railway lines in various directions could be located (on supports, fills, in underground tunnel or in a cut), going both longitudinally and latitudinally, which probably would be facilitated by a multilevel structure of the station.

In order to ensure that moving inside the station building is fast and easy, the routes of stakeholders should not cress (Leemans, Ivkovic 2011). Thus it is important to ensure that the stops/stations of available means of transport are integrated in the CTH and to provide the passengers with and easy, intuitive system of finding their way to their destinations. The ways to stops/stations of individual means of transport should be located within the user's sight and should be interconnected by the shortest route, so that anyone who enters the building could quickly find out in which direction to go (Ross, 2000). The distance to be covered within the integrated transport hub and the need to change levels are basic elements in the process of making travel-related decisions. Using the means of vertical transport slows the movement of passengers and the pace of walking. The average walking speed is 1 m/s, but when stairs or escalators are used this speed slows down to 0.6 m/s (Leemans, Ivkovic 2011). In order to ensure efficient functioning of the interchange it is necessary to follow the shortest route principle, thus stops for various means of transport should be concentrated. In the report on the HSR-COMET project (Intermodal connection of HSR terminals in metropolitan areas) it is pointed out that the distance between stops shaped not exceed 300 metres, where the accepted distance is 100 metres. For the above reasons, a common central hall from which passengers would be distributed to various means of transport (airport, railway station, vacuum railway station, individual transport stops) seems to be an indispensable element of Central Transport Hub, with a vacuum railway station being a part of it.

It should be remembered that a railway station is not an initial symptom of economic success, but rather a result of such success. Oosten (2000, p. 2) argues: first, before infrastructure can have a positive impact on output, there needs to be a sufficient level of productive activity; second, no amount of investment in core infrastructure is capable of overcoming disadvantaged location; and third, the relationship between investment and growth is interdependent.

Considering the expected economic potential of the new communication port located between two key Polish cities, in the heart of the country, it seems very likely that the above-mentioned conditions for success of the new vacuum railway station will be fulfilled.

CONSTRUCTION OF FIRST VACUUM RAILWAY LINES

At this stage of the programme, basic analyses and tests will be performed of the vacuum railway system, along with tests of ready passenger vehicles moving on test tracks in future operation conditions. The construction of infrastructure planned until 2030 will make it possible to introduce connections on the Warsaw – CTH – Łódź route. This section is of key importance not only for connections with the airport abut also for the integration of cities making up the Central Metropolis. The time of car travel from the planned CTH investment area to the centre of Warsaw is at least 45 minutes, while travel by train takes no less than ca. 25 minutes. Opening a vacuum railway line would allow for fast - no longer than 5 minutes - transport of passengers and goods from the centre of Warsaw (e.g. from Warsaw Central railway station) to the CTH. The proposed line would contribute to the sustainability of the transport system and would improve connections between the planned airport and major railway stations.

The following objectives are assumed regarding the first section of a vacuum railway line:

- fast connections between Warsaw and Central Transport Hub (ca. 5 min), and between Łódź and Central Transport Hub (ca. 8 min) ,
- sustainable development of the transport system, resulting in a more environmentally friendly and reliable system, as well as sound spatial development and spatial order of the region,
- increased safety,
- improved standards of travelling,
- implementation of a new means of transport on Polish territory.

The system should be expanded gradually by:

- first of all, constructing the CTH – Krakow and CTH – Katowice sections (estimated travel time ca. 20–25 minutes). These routes are of key importance not only for connecting the airport with the two cities, but also for integrating these regional cities with the capital and with each other,
- in the next steps, by creating new corridors between other Polish agglomerations. All the new future lines should go from the CTH in various directions (in a spoke-like manner), thus ensuring that people living in the most remote areas of Poland can get to the airport in less than 40 minutes. In the proposal for a new corridor the planned extension of the lines towards Berlin, Prague and Vilnius are highlighted. A corridor between the north-eastern and western border of Poland is among the planned vacuum railway connections in Europe (according to Hyperloop One - USA). The passage through Poland functions in the plans as a north-eastern section of the bypass of the vacuum railway planned to be built in Northern and Central Europe, .

Figure 1. Creation of a vacuum railway network in connection with the planned Central Transport Hub

SUMMARY

From observing global transport trends and considering economic processes taking place in Central-Eastern Europe, it may be concluded that vacuum railway will become one more means of transport within the next decade. This is confirmed by tests carried out in Nevada on 12 May 2017 by the US company Hyperloop One (2017) which have demonstrated that the technology works in the desired scale. Subsequent tests performed in Nevada and in Los Angeles have made it possible to obtain speeds close to 330 km/h on short sections of test tracks.

This means that while planning the Central Transport Hub, it is worth to take the idea of vacuum railway into account. The information contained in this study make such undertaking legitimate. There are indications that vacuum railway will become a complementary means of transport to those available in Poland at the moment. Making the CTH ready for the implementation of the vacuum railway system will boost the attractiveness of CTH for potential users from all over Poland, and ultimately also from the region of Central-Eastern Europe. Even though today there are no legal regulations in the world that would account for using the vacuum railway,

in Poland there are teams working vigorously on the idea and successful on the international stage. Given adequate support, such teams will be able to implement this breakthrough transport innovation in Poland.

All the above-mentioned circumstances make it possible for Poland to become a leader in implementing this technology in Europe, and maybe even in the world. The pilot section implemented on the route Warsaw – CTH – Łódź could play the role of catalyst for development of export potential of Polish companies producing this state-of-the-art technology.

SOURCES

(except for those regarding point 8, which are listed directly under it):

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Attachment No 5

Proposals for regional projects complementary to the Investment Preparation and Implementation Concept: Solidarity Airport – Central Transport Hub for the Republic of Poland for 2018 to 2035

INTRODUCTION

This study which is attached to the Investment Preparation and Implementation Concept: Solidarity Airport – Central Transport Hub for the Republic of Poland presents potential complementary projects for regional or local transport subsystems, integrated with the national system of cross-regional long-distance passenger transport, being built based on the CTH.

The described list of tasks covers the identified and viable **complementary projects,** which, if implemented, would support the national transport system. This requires co-operation with local governments both at the level of the investments as such and later maintenance and use of the infrastructure.

The proposed joint implementation of the complementary project component with local governments reflects the tasks of those governments, both in terms of regional or local development policy and shared public transport organisation. Regional or local shared public transport may and should be the last mile for the long-distance national shared public transport. The achievements of some local governments in construction of local transport systems relying on railways prove the potential needed to implement complementary projects, including: take-over and launch of unused railways, construction of new railways, establishment of local and regional rail operators, innovative railway station development and upgrade projects to make them integrated hubs for connections etc. The implementation of projects in co-operation with local governments – with their financial and organisational commitment – is a prerequisite for efficient use of the already operational infrastructure to meet local or regional needs. In line with Chapter V p. 5 of the "Concept", the main types of complementary projects should concern:

1. Extension of **local and regional transport systems** that integrate in cohesive functional areas in the vicinity of urban centres and enable connection of centres of those hubs in time acceptable for daily commuting to work, school etc.;
2. Integration and **maximisation of transport cohesion of main tourist areas**;
3. Pilot use of new technologies such as **autonomous transport or light rail transportation (LRT)** to build and extend local transport subsystems integrated with the national transport system built based on the CTH.

The list of proposed complementary projects presented in this Attachment is open.

1. Global Metropolis of Warsaw – Łódź

The construction of the CTH will create an area with the best national transport accessibility, both nationally and internationally. This will be a strong impulse to boost the economic growth in the region. The integration of the Warsaw and Łódź agglomeration in one global metropolis, following the project, will be another factor in global economic growth and development opportunity – especially for the Łódź region suffering from structural problems. The integral part of the CTH Concept is a fast railway connecting Warsaw and Łódź and the very CTH – which is the main transportation hub of the Central Metropolis covering the stations of express metropolitan trains connecting Warsaw and Łódź, the Warsaw-Łódź agglomeration railway which is the railway terminus for the suburban Łódź and Warsaw trains and the main hub for the national IC and IR class trains. The projects complementary to CTH in the Warsaw-Łódź region may include in particular infrastructure investments to improve the quality of transport systems of both Agglomerations such as:

1.1 **Extension of infrastructure of the Warsaw Railway Junction and integration of railway with urban transport subsystems**, including:

a) **construction of Warsaw ring railroad** for fast urban railway systems (SKM) to improve the urban and metropolitan rail transport in the cross-ring model (applied in most agglomerations round the world). The project is also a modified implementation of plans from the first half of the interwar period approved by the Polish Parliament (the Sejm) in 1929.

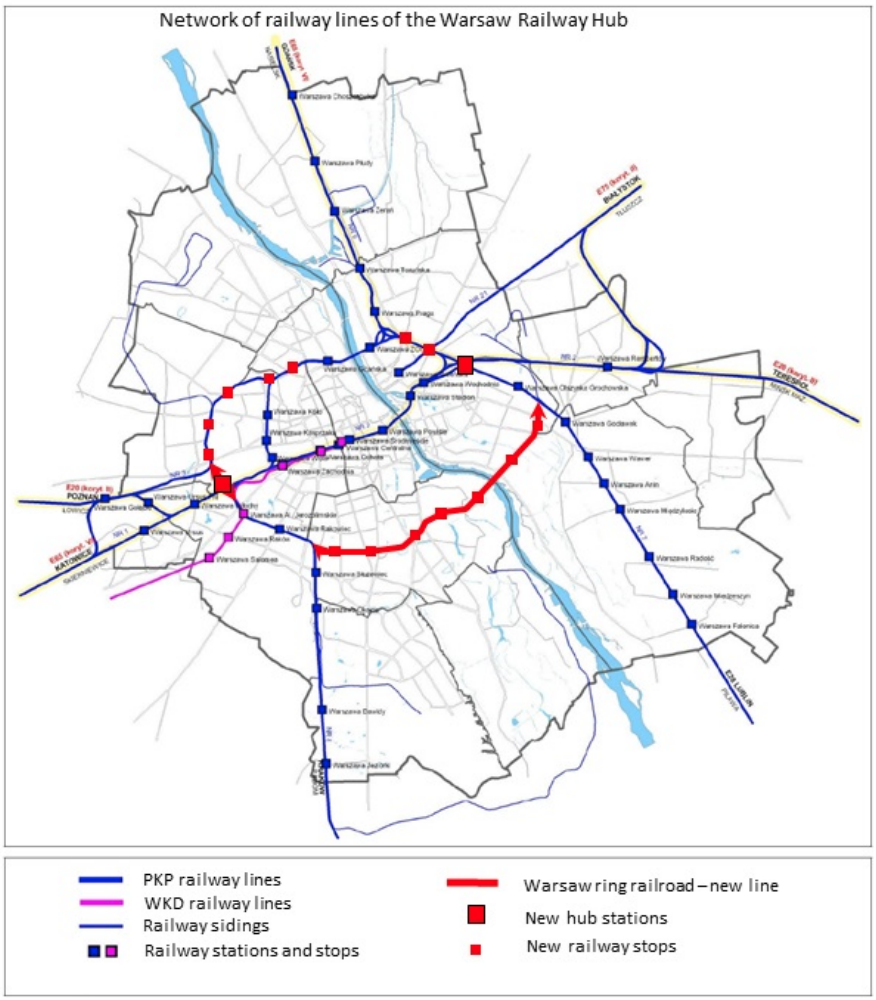

Fig. 1 Warsaw ring railroad

b) **bilateral extension of the overground section of the Metro** up to:
- Łomianki or Czosnów (incl. construction of P&R hubs at S7 hub in Czosnów),
- Konstancin Jeziorna or Góra Kalwaria (along with construction of P&R hub on the Warsaw Motorway Ringroad),

c) **construction of new metropolitan railways** up to the neighbouring county towns:
- Zegrze – Pułtusk – Maków Mazowiecki – Przasnysz,
- Sulejówek – Węgrów – Sokołów Podlaski,

d) **implementation of light rail transportation systems** (LRT) such as Tram-Train integrating trains and trams for routes such as:
- Sulejówek – Warsaw City Centre – Podkowa Leśna (using the Electrical Suburban Railway - WKD and tram tracks in Aleje Jerozolimskie and the railway line 2),
- Wołomin – Warsaw Old Town – Ożarów Mazowiecki (using lines 3 and 21 and tram tracks in Aleja Solidarności and ul. Wolska),

e) **use of unused lines in metropolitan transport** (such as narrow gauge railways of Grójec – Piaseczno).

1.2 **Extension of the Łódź Railway Junction and integration with the urban transport systems**, including in particular:

a) **regeneration, upgrade and extension of Łódź suburban trams**,

b) **reconstruction of Łódź Kaliska railway station** and the node system, including new railway sections for the metropolitan and regional railways in particular going north to south,

c) **construction of P&R** connected to the urban and rail transport systems close to the motorway nodes and express roads surrounding the city.

2. **Southern Metropolis**

The group of projects that integrate the most densely populated region in the country (Małopolsko–Śląski) in a cohesive functional area. The infrastructure and organisational projects implemented within this component will enable daily urban and metropolitan commuting in the Southern Metropolis and access from all its towns and villages to get to the main railway stations handling the national transport system being built based on the CTH. Such projects include in particular:

2.1 **Construction of fast rail connections system that forms the backbone of the transport system of the Southern Metropolis** that enable mutual accessibility: The Górnośląsko-Zagłębiowska Metropolis in Upper Silesia, Kraków Agglomeration, Bielsko Agglomeration, Rybnik and Częstochowa Agglomerations with cross-border connection to Ostrava (the capital of Moravian-Silesian country region). The implementation of this component is possible with the use of the existing railway sections and the ones to-be-built for construction of the fast railway sections (southern extension of the Central Rail Line – CMK), and also construction of the new interchange integrating rail transport of the Southern Metropolis.

2.2 **Infrastructure projects in Silesia**

a) construction of the “Regional Rail”, also called the Silesian Metro, similar to fast urban railway systems SKM connecting the main centres of the Górnośląsko-Zagłębiowska Agglomeration in Upper Silesia, once started and abandoned in the 1980s,

b) internal integration of the Rybnik Agglomeration through construction of new railway sections to connect all centres of this agglomeration,

c) internal integration of the Bielsko Agglomeration using the railway and LRT infrastructure.

2.3 **Infrastructure projects in Lesser Poland**

a) construction of infrastructure for the agglomeration railway in the Kraków Metropolitan Area,
b) upgrade and construction of new railway sections to create fast connections between the main cities of Lesser Poland: Kraków, Tarnów and Nowy Sącz,
c) construction of new and reconstruction of the existing railway sections that lead to main tourist spots (Zakopane, Krynica).

3. The Metropolis of Vistula Mouth

The components of measures aimed at connecting suburban areas to the Tricity Agglomeration is the growth engine for the north of Poland (with unemployment rate of 3.5%) with Elbląg and the Elbląg county, which is currently largely populated and faces serious structural problems (incl. unemployment rate of 12–20%). Investment projects include in particular:

a) construction of Tricity-Elbląg railway incorporating this city into the Gdańsk Bay Agglomeration, launch of fast metropolitan transport (SKM),

b) development of local systems using LRT trains for metropolitan transport and tourism development, including the unused or recovered railway infrastructure (such as Żuławy Narrow Gauge Railway and Lagoon railway etc.).

The fast SKM connection of Elbląg with Gdańsk taking ca. 30 minutes will enable the inhabitants of those centres to commute daily to work or school, and provide Elbląg and Elbląg subregion inhabitants with quick access to the railway station handling the national transport system being built based on the CTH. The implementation of those projects will also improve accessibility of areas with large tourism development potential in Żuławy, at the Vistula Lagoon and along the Elbląg Canal. The improvement of rail transport accessibility will be harmoniously supported by the implementation of the Vistula Spit dug-through project, which will also unlock the tourist potential in the region.

Fig. 2 “Metropolis of the Vistula Mouth” construction of railway Elbląg –Nowy Dwór Gdański – Gdańsk

4. Rzeszów plus “Quadruple City” Agglomeration

a) thanks to infrastructure extension, **Rzeszów Agglomeration** with its 350,000 inhabitants may expand and incorporate Krosno, Jasło, Sanok, Zagórz and Lesko and the so-called “Quadruple City” (Tarnobrzeg, Sandomierz, Stalowa Wola and Nisko) into the agglomeration. The required infrastructure projects – in addition to projects that form integral part of the CTH Concept – is reconstruction of the railway Rzeszów – Jasło along with new 27km long mountain sections and construction of a new railway connecting Rzeszów and Sanok, which is ca. 50km long. The project in the mountainous terrain will be costly, long-lasting and divided into stages – nevertheless the range of the agglomeration with this infrastructure intervention will grow rapidly, and the population will more than double – to 600,000 inhabitants. In the Subcarpathian Province long deprived of large urban centres with urbanisation rate of 41%, the project is a civilisation investment. Quick connection to the main urban centre in the region with a relatively low unemployment rate (6.4%) will benefit the border areas suffering structural job market problems and affected by serious transportation exclusion (unemployment rate of 16–17%). The development of infrastructure in the Subcarpathian Province will also help combine the goals of improving urban centre potential and important national tourist areas. In effect of implementation of CTH projects and complementary projects running under the “Rzeszów Agglomeration” will radically improve the transport accessibility of Bieszczady or Beskid Niski mountains. The new railway to Sanok may become a link in a supranational route of “Rail Carpatia”, which is a railway equivalent of “Via Carpatia” leading to the crossing at Łupkowska Pass to Rzeszów and further on via Lublin and Białystok to Baltic States,

b) **The “Quadruple City”** project submitted by late Minister Grażyna Gęsicka (back in 2006) is to integrate the following towns into one agglomeration in the vicinity of urban centres: Tarnobrzeg, Sandomierz, Stalowa Wola and Nisko. Besides lines connected directly with the implementation of the CTH construction, the project does not require much investment in reconstruction of railway stations into integrated urban transport hubs and P&R and launching agglomeration transport. The Quadruple City, with implementation of the connector Nisko – Rzeszów described in Attachment 2 and repair of Tarnobrzeg – Rzeszów line, will be incorporated into the Rzeszów Agglomeration and the time needed to get from Stalowa Wola to Rzeszów will be ca. 25–30 minutes.

5. **Lower Silesian Tricity**

Reconstruction of railways in the Sudety agglomeration (Jelenia Góra, Kamienna Góra, Wałbrzych, Świdnica, Dzierżoniów and Bielawa) and Legnica-Głogów Functional Area (LGOF), enabling internal transport integration of those areas. The main centres of those areas (Wałbrzych and Lubin) with the existing and extended railway infrastructure will receive interconnections and a connection to the central railway station of the Wrocław Agglomeration in less than an hour. This will create a tri-centre agglomeration with population of ca. 2 million, where the economically weaker southern centre with major tourist attractions will support its development with connections to stronger centres. Investments that are part of the project include:

a) **construction of the agglomeration railway of the copper belt** – upgrade of line 289 Legnica-Lubin section and use of the KGHM industrial railway (Lubin-Polkowice) and extension with a 14-kilometre track towards Głogów to enable incorporation of Polkowice into the metropolitan railway,

b) **construction of sections of new railways** in the Sudety agglomeration: Świdnica – Wałbrzych and Szczawno-Zdrój – Sędzisław, to shorten the journey on the route Wrocław – Wałbrzych – Jelenia Góra and Legnica – Wałbrzych and incorporate Świdnica into it[1],

[1] Concept by M. Kruszyna PhD., Wrocław University of Science and Technology.

c) **upgrade, electrification and restoration to double track of line 137** section Dzierżoniów –Świdnica – Legnica and upgrade and electrification of line 302 Strzegom – Marciszów for quick inter-agglomeration connections of the Sudety and LGOF areas and Wrocław and Jelenia Góra,

d) **support of takeover and reactivation of the closed railways by local government of the region** in Sudety leading to key tourist centres in the region: national parks, historical monuments, spas, main mountain tourist centres and religious sites.

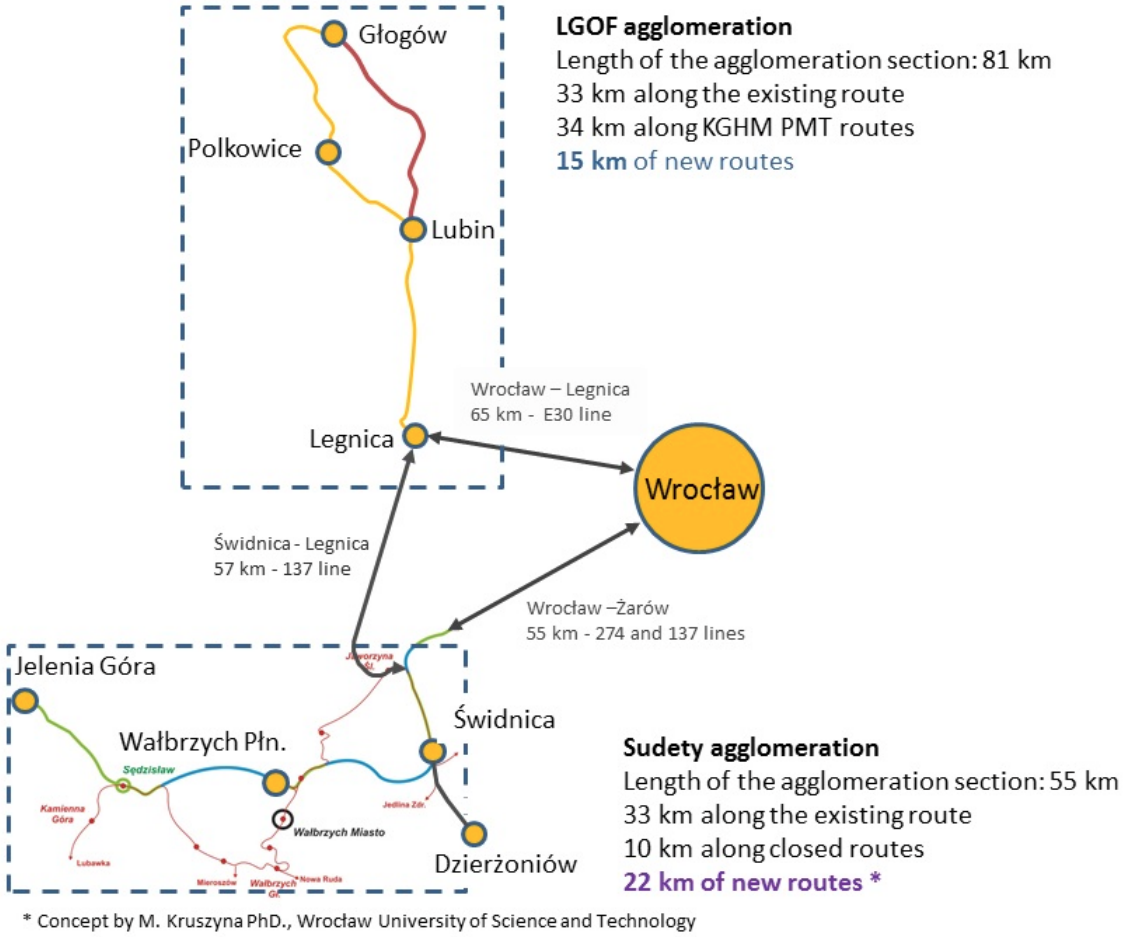

Fig. 3 Lower Silesian Tricity

6. Staropolski Agglomeration

The project integrating in a cohesive functional area of metropolitan character of the former Staropolski Industrial Region: Radom, Kielce, Skarżysko-Kamienna, Szydłowiec, Końskie, Starachowice, Ostrowiec Świętokrzyski, Skaryszew and Iłża.

The agglomeration will have 1.18 million population of which 650,000 in urban centres connected by fast agglomeration railway. The area is currently one of areas most affected by high unemployment and structural problems. The city of Radom with 220,000 population and unemployment rate of 15% is Poland's most unemployed city of all cities with county rights, and the nearby county of Szydłowiec features the highest unemployment in Poland of 26.6%.

As part of the project, besides railway sections falling within the CTH, a profound upgrade of railway line 8 connecting Radom and Kielce will be necessary, including the straightening of the section which will connect the centres within less than 40 minutes.

The railway connection within the agglomeration will create a single integrated job market in the area with population of more than a million. Good connection to Warsaw and Kraków being built as part of reconstruction of railway line 8, motorway and railway connections with the CTH and with Upper Silesia via Włoszczowa and the Central Rail Line (CMK) will help reinforce the development opportunity of this agglomeration through integral incorporation into the "Polish Megalopolis", which will be formed by Central Metropolis and Southern Metropolis.

7. **Kalisz-Ostrów Agglomeration**

The reconstruction of roads and shared public transport of Kalisz and Ostrów Wielkopolski, as centres supporting the 300,000 polycentric agglomeration, integrated with the construction of shared fast railway in Nowe Skalmierzyce.

The key points are:

a) construction of a new hub to become the transport system integrator of the agglomeration,
b) extension of the road system including upgrade to two-lane road parameters of DK 25 between Ostrów and Kalisz and construction of the Kalisz ring road within DK25 and 12 sections and Ostrów Wielkopolski (DK25 and 36),
c) integration of public transport systems of both cities, including: extension and integration with urban transport system of railway stations in Ostrów and Kalisz, launching agglomeration railway such as fast urban railway system SKM (Opatówek – Kalisz – Nowe Skalmierzyce – Ostrów Wielkopolski – Odolanów) with possible construction of new stops and reconstruction of the track layout in Kalisz and construction of the P&R systems at railway stops,

8. **Mazurian Loop**

The launch of a subregional light rail transportation system (LRT) in the place where railways around the Great Mazurian Lakes that connected **Pisz, Orzysz, Giżycko, Węgorzewo, Kętrzyn, Mrągowo**, Ruciane-Nida, and Mikołajki were dismantled in 1945. The project aims to **integrate country centres** of the Great Mazurian Lake Region **and the main tourist attractions** of the region (Krutyń, Twierdza Boyen, Wilczy Szaniec, Mamerki etc.) **The project should be harmoniously connected with the central support for the local government's main project, the so-called "Mazurian Loop**", which is making the water tracks navigable by connecting the main lakes with canals and construction of the bicycle paths, horse-riding tourist routes, tourist hostel water stops, bicycle rental, camping sites etc.

Development of an efficient and inexpensive transport system, which integrates a very attractive tourist region with 250,000 population affected by serious structural problems with medium unemployment rate exceeding 15%, may become one of the factors that will boost economic growth relying on tourist development of the Great Mazurian Lakes. The project will be harmoniously supported by a radical improvement of national accessibility of the national region of Mazuria, which is also integrally tied to the CTH Concept – the extension of the railway system (construction of the Ostrołęka – Pisz section).

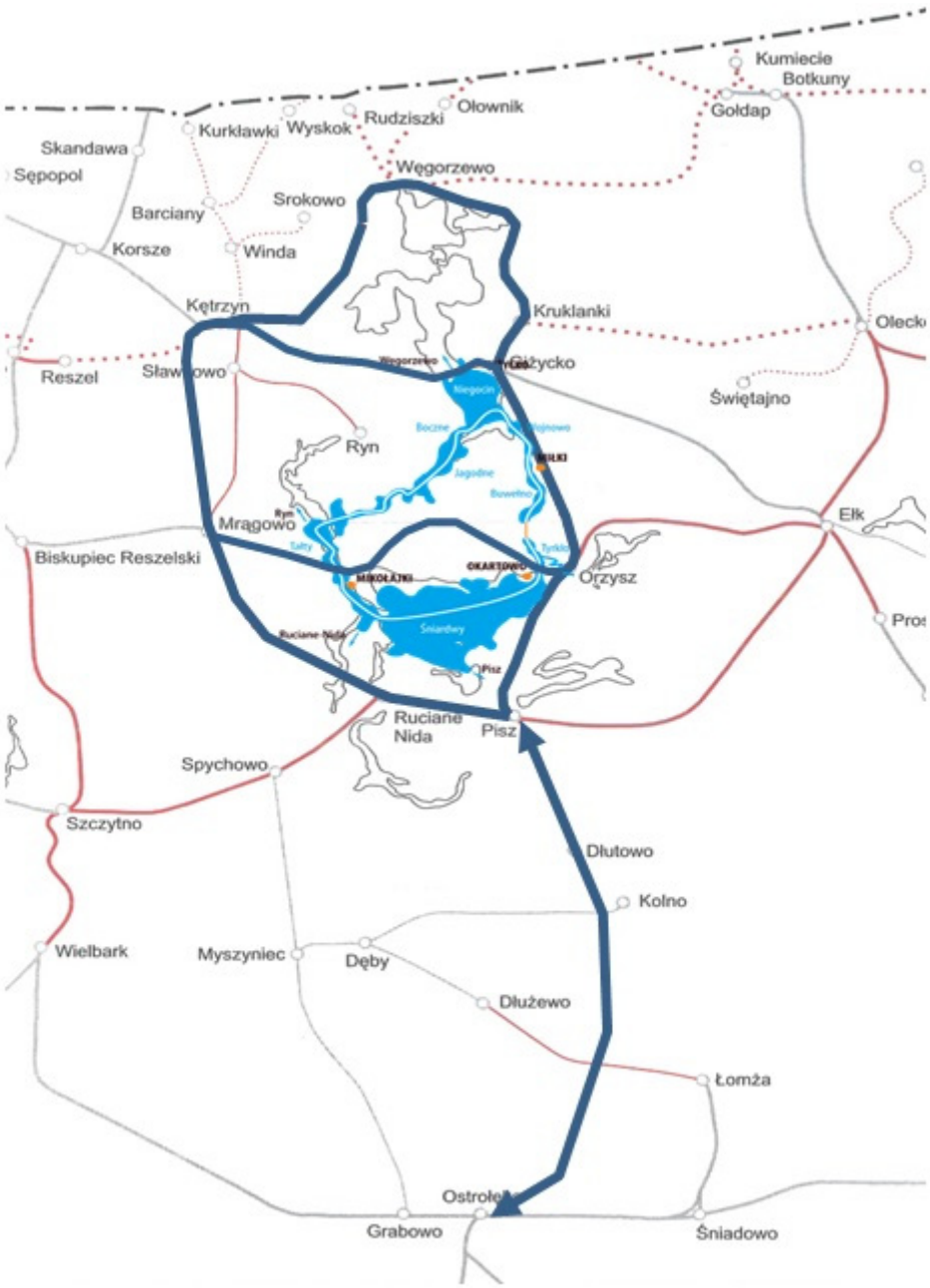

Fig. 4 Mazurian Loop – Railway & Water

9. **Transport integration of the main urban functional areas of the West Pomeranian Province**

The project package that integrates the Szczecin Metropolitan Area and the Koszalin-Kołobrzeg-Białogard Functional Area with the national transport system being built based on the CTH (incl. the air transport system), providing for internal integration of both urban functional areas and improvement of accessibility of areas with excellent tourist interest both in terms of national and regional transport.

Projects complementary to the CTH in the Szczecin and Koszalin subregion may be in particular:

a) **reconstruction of railway infrastructure to improve connection of Szczecin-Goleniów airport with the main urban centres of West Pomeranian Province,** especially:

– restoration of the railway connecting Szczecin Dąbie and Szczecin Główny, to shorten the journey to the centre of Szczecin, from the centre of Poland and from the West Pomeranian Province, also from Szczecin-Goleniów airport,

– extension of railway line 434 (to Szczecin-Goleniów airport) to railway line 401 (Szczecin Dąbie – Świnoujście) along with its electrification – to incorporate the Szczecin-Goleniów airport in the regional railway connection Szczecin – Kołobrzeg – Koszalin, and Szczecin – Świnoujście,

– **upgrade and electrification of railway line 402** (Goleniów – Koszalin).

With those projects, Szczecin-Goleniów airport will receive an arterial railway station (instead of the current terminus station) and will be incorporated into the direct railway of Szczecin Metropolitan Railway (Szczecin – Świnoujście) and the main regional section connecting Szczecin Metropolitan Area and Koszalin-Kołobrzeg-Białogard Functional Area while shortening the journeys,

b) **extension of the Szczecin Metropolitan Railway** with possible use of the Tram-Train or other LRT systems

and

c) restoration of the coastal connection between **Kamień Pomorski and Trzebiatów** (the new route near the coast) using LRT to improve accessibility and attractiveness of the subregion and its transport integration.

10. **Cross-border Interconnectors**

Upgrade of the current railway cross-border connections with countries having wide-gauge systems, to enable connection to the neighbouring cities such as Kaliningrad, Kowno and Wilno, Grodno, Lwów using standard gauge railway and possibly symmetric access to Polish border cities such as Białystok or Zamość with wide-gauge systems. The investments will be implemented using the mixed gauge technology on the existing railway infrastructure.

After implementing this component, the border urban centres of the neighbouring countries will receive direct connection to the CTH. With those modifications of the current cross-border railway sections, the transport system being built based on the CTH will be able to cover a larger population – incl. Polish minority in Belarus or Lithuania – and also increase the reach of the CTH hub as the airport hub. The connections will help develop small border movement and border economic co-operation.

Document developed by Patryk Wild, member of the Advisory Team to the Plenipotentiary of the Government for the Matters of the Central Transport Hub for the Republic of Poland coordinating the Team work in the scope of railway network extension.