

SUMMARY

This monograph is as faithful a reproduction as possible of the study done in 2022 for CPK entitled “Impact of the expansion of the railway network within the Central Communication Port Program (CPK) on the spatial, temporal and transport accessibility of the Polish territory with a special focus on medium-sized cities and public services”. It was prepared as part of the conceptual work on the planned course of the so-called ‘spokes’, and the purpose of this analysis was to assess their rationality and efficiency in relation to the settlement network and demand. At the time of going to press, the concept of ‘spokes’ had become obsolete, but this study shows how such intentions can be analyzed and evaluated in terms of the aforementioned rationality.

The purpose of this study is to answer the question of the spatial and temporal effects of the expansion of the rail network between 2019 and 2040, especially in the case of the highest traffic volumes. It has four specific objectives:

1. to determine the impact of rail network development on spatio-temporal accessibility, especially of medium-sized cities;
2. to determine the impact of the development of the rail network on accessibility to public and partly commercial services;
3. to assess the social and economic benefits of improving the above-mentioned rail network development and improving accessibility;
4. to evaluate the proposed transport network layout from the perspective of maximizing transportation and settlement efficiency.

The analyses were based on data provided by the Central Railway Port company (traffic model data on the network's field layout, distribution of railroad stations and stops, time availability matrices for long-distance and regional traffic). Indicative methods of spatio-temporal accessibility (isochronous, cumulative, travel time reduction, relational connections, etc.) were mainly used. Medium-sized cities were defined as 48 cities with county rights and 268 county towns (*‘starostwo’*).

By 2040, the number of medium-sized cities with access to long-distance railway stations will increase from 132 to 161, i.e. by more than a third, and will already account for slightly more than half of all medium-sized cities (there are 316 medium-sized cities in total). These include cities with county rights such as Grudziądz, Jastrzębie-Zdrój, Krosno, Łomża, and Ostrołęka. The population of medium-sized

cities in the 0-5 minute car isochrone will increase from 4.7 to 5.8 million (by 23.9%), and in the 5-10 minute isochrone from 2.9 million to 3.1 million (by 3.7%).

As regards the overall accessibility of cities of different administrative and settlement categories, the accessibility to the capital city will improve significantly, which currently takes 7-8 hours or more in the most peripheral parts of Poland (Western Pomerania, Sudetes, Bieszczady). Isochrones will become longer in the western (Łódź, Poznań), northern (Tricity) and north-eastern (Białystok) directions. In 2040, their course will be more concentric with respect to Warsaw. In the case of voivodship cities, accessibility will generally decrease from a maximum of 2-3 hours to 1-2 hours. Sub-regional cities, including former voivodship capitals, will see a significant improvement (travel time to a maximum of about 90 minutes). Between 2019 and 2040, the number of possible long-distance connections will increase from 271.6 thousand to 324.0 thousand (19.3%), of which 9.4-21.2% will be in the case of county towns and municipal centres.

The improvement in accessibility calculated on the basis of average traffic speed will be particularly spectacular. In the case of all cities with at least one county town this speed will increase from 66 to 92 km/h, i.e. by 39%. In this respect, the greatest improvement will be observed in relations with towns (41.8-47.7%), which should be evaluated particularly favorably from the point of view of the country's sustainable development. In the case of connections between medium-sized cities and Warsaw, the increase will be 52.1% (cities with poviat rights) and 40.7% (county seats). In regional (voivodship) systems, the average will be 38.7% on average (this value concerns all connections in the country).

In general, the biggest positive effects of shorter journeys will occur on the north-south axis (Gdańsk Pomerania-Małopolska) and from the Warsaw agglomeration to Lower Silesia, which will be in the order of 50% and more on the longest distances. In the matrix of provincial cities, crucial from the point of view of balancing the country's development, the average rail travel time between all 18 centers (including Warsaw) will decrease from 1172 to 852 hours, i.e. by 21.2%. Of which, accessibility to Rzeszów will improve by 36.4%, and to Łódź by 34.3%. The connections to Olsztyn and Opole will be shortened the least (by approximately 17%). The record reduction in time will be on the Łódź-Wrocław route (57.3%). The range of the one-hour isochrones will expand significantly (from 40.0% to 59.8% of the country's territory, i.e. by 47.1%, and from 22.6 to 28.3 million inhabitants, i.e. from 59.2 to 74.0% of the Polish population). The extension of the one-hour isochrone also means the inclusion of more medium-sized cities.

The annual savings have been estimated under various assumptions: PLN 13.6 billion (every Polish citizen travelling once a month) and PLN 59.0 billion (once a week). If only the inhabitants of 316 medium-sized cities are taken into account, the annual savings are PLN 8.1 billion and PLN 35.3 billion respectively. Assuming mobility: travel to Warsaw – twice a year, travel to the closest capital city of the voivodeship – 12 times a year, travel to the nearest city with poviat rights (subregional centers, usually "old" voivodeship capitals) – 24 times a year, and travel to any other capital city of the

voivodeship or a city with powiat rights – twice a year, the total savings of inhabitants of 233 medium-sized cities with access to the long-distance network amount to PLN 6.0 billion. Calculated per capita in these centers, the average is PLN 606, ranging from PLN 50-100 to even over PLN 3,000 (the most peripheral centers, e.g. Suwałki). In the voivodships it varies from PLN 260 (Śląskie) to PLN 2078 (Podlaskie).

In the case of higher education services (universities), in 2019 only 156 medium-sized cities (almost half) had access to a long-distance station providing a connection to any center with a university, and in 2040 this will be 191 cities (without taking into account the unpredictable changes in the university network). Commuting from Podlaskie, Warmińsko-Mazurskie, Podkarpackie and Zachodniopomorskie to leading academic centers will be significantly improved. In 2019, the commute from these areas to one of the eight leading academic centers will be reduced from about 4 hours to about 3 hours. In turn, relational accessibility rates, which take into account access to the number of facilities, will increase from the current (2019) level of 47-49% to about 60% (by about 1/4). In the case of health services, relative accessibility will increase from 22.4% (reference level III hospitals) to 33.1% (spas). In the latter case, a weak connection to the long-distance network will still be a problem in 2040.

The accessibility of major cultural centers clearly depends on their geographical location. Synthetically, the changes in rail accessibility of medium-sized cities to relational cultural services reach 22-27% and will be quite comparable to the previous categories of educational services.

Changes in accessibility to tourism and recreation services will be the most varied and generally the weakest compared to other categories. This is due to the fact that the main residential centers are located in the northern (Baltic Sea Coast) or southern extremities (including several distinct mountain concentrations: Karkonosze, Beskid Żywiecki, Tatra Mountains), or in a more dispersed way in the lake areas. This makes it difficult, if not impossible to be well connected to the railroad network, whose dense course should by definition be inefficient by definition. In general, rail accessibility is currently unsatisfactory, encouraging the proliferation of individual motorization. In 2040, the accessibility of the mountains and the north-east will remain poor. In relative terms, the rates will increase by 38.8% (major tourist destinations) and by 46.9% (major water parks). In general, the accessibility of tourist services can also be improved by better planning of the network of these resorts, including the deglomeration of tourism.

Analyses have shown that the greatest improvement in spatial accessibility by 2040 will occur on connections from the center of Poland to other parts of the country, on most long-distance relations (especially on the north-south axis), and to a lesser extent on many oblique (e.g., inter-regional) and intra-regional relations. This results from the planned model of railway network development, which is based on the centripetal development of transport corridors, with many deficiencies of connections at the periphery. Meanwhile, the target optimal layout of the railroad network (and any other) should have a hexagonal layout. In other words, Poland needs a 'spider's web' rather than a 'hub' (Baranów/Warszawa) and 'spokes'. One of the reasons for this is the polycentric nature of the urban system.