

# Abstracts

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# ANALYSIS OF THE INFLUENCE OF SOCIO-ECONOMIC FACTORS ON THE VOLUME OF RAILWAY PASSENGER TRANSPORT IN ŁÓDŹ REGION

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Article presents the determination of the weights of socio-economic factors affecting the volume of passenger transport on individual railway lines located in the Lodz region, as this is very important factor for development of regional logistics. Calculations were made for lines running from Łódź to Sieradz, Kutno, ŁowiczGłówny and Skierniewice. Passenger transport on these lines is operated by the carrier Łódź Agglomeration Railway. The transport data containing the number of transported passengers and the transport work done in 2017 were used for the analysis. A partial correlation coefficient was used to obtain values of weights of the analyzed factors. During the calculation of correlation coefficients, transport gauges were used as explanatory variables (dependent variables). The socio-economic factors influencing the volume of rail passenger transport on individual lines were taken into account, among others: the number of registered passenger vehicles per 1000 inhabitants, number of registered business entities, the value of fixed assets in business entities (this value reflects the size of business entities) and the number of people commuter for work. During the analysis, an additional, important factor influencing the volume of transport, which is the availability to the railway line for individual inhabitants was also determined. It is the value associated with the location of stations (stops) on the population centers (cities or villages). The availability parameter for an individual stop is affected by the distance of the stop from the city center, the condition of the network of roads leading to it ( $L_S$ ), and the size of the population in which the stop was located ( $W_M$ ). In order to determine the availability to the whole railway line, the availability of all stops located on it ( $D_S$ ) is summed up. Next, the quotient of this sum and the length of the analyzed railway line is calculated. On this basis, the availability of the all railway line is determined, which is shown in the formula (1).

$$D_L = \frac{\sum D_S}{L_L} \quad (1)$$

To calculate the partial correlation coefficient, a correlation matrix, containing interrelations between all analyzed variables, was used. To calculate the algebraic complement of individual matrix elements and determinants obtained from the correlation matrix by plotting throws and the columns an engineering calculation software Mathcad was used. During calculating the weights of particular factors affecting the volume of rail passenger transport on individual lines located in the Łódź region for each socio-economic factor, the absolute value of partial correlation coefficients ( $C_{Ci}$ ) was summed for the number of trains and the number of transported passengers. Then the summed value was divided by the number of analyzed gauges describing the volume of transport. This operation is presented by formula (2).

$$I_F = \frac{\sum_{i=1}^2 |C_{Ci}|}{2} \quad (2)$$

By dividing the received values  $I_F$  for each socio-economic factor by their sum, it is possible to determine the weights of individual factors affecting the volume of passenger transport on railway lines in the Łódź region. The obtained weights can be used in the future during the multi-criteria analysis of railway lines in the Łódź region. These weights allow to avoid the subjective assessments of experts, that have been often used in previous analyzes.