Global J. Environ. Sci. Manage. 5(SI): 96-104, 2019

Global Journal of Environmental Science and Management
(GJESM)

Homepage: https://www.gjesm.net/

SPECIAL ISSUE PUBLICATION
Presented and selected at the ICCMIT'19 in Vienna, Austria

Freight transport development forecasts in enterprises management

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ARTICLE INFO

Keywords:
Demand
Enterprise
Forecats
Freight Transport
Management

ABSTRACT

In this study, an investigation of long-term forecasts relating to the development of the transport sector in Poland is performed, including the ones by 2030 and 2050. Selected transport development forecasts from the perspective of the membership of Poland in the European Union are presented and most of all, from the perspective of national studies. The basement for the review were prognosis of: European Commission, Central Statistical Office, International Monetary Fund, Department of Economic, Sectoral and Agricultural Market of BGZ BNP PARIBAS S.A., Motor Transport Institute, WiseEuropa Institute of Warsaw Transport Institute, as well as prognosis of the scientific experts. Despite temporary economic downturns, the demand for freight transport is steadily growing and, as shown by the forecasts, it will grow in the future. In 2018 the situation on the freight transport market was expected to remain stable, mainly due to the continuous high demand for international carriages.

DOI: 10.22034/gjesm.2019.SI.11

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
36	4	3

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Note: Discussion period for this manuscript open until October 1, 2019 on GJESM website at the "Show Article.

INTRODUCTION

The greatest changes affecting the size and structure of the demand for transport (Wojewódzka-Król and Załoga, 2016) take place in the field of technology and innovation of transport, the structure and technologies of production, business models' management and the lifestyle of the society. The main barriers to the effective and rational functioning and management of freight transport companies (Nogalski and Ronkowski, 2007) are infrastructural, legislative, financial and administrative inconveniences. Due to the substantial span of the factors determining the forecasts of the demand for road freight transport services (Muerza, *et.al.,* 2017), according to International Transport Forum, the time perspective of the assessment (Ottemoller and Friedrich, 2016) of forecasts should take into account the time perspective of about 20-30 years (ITF, 2018). International freight transport companies from Poland have to take action to maintain a leading position in Europe and remain competitive with other entities. The state and prospects for the development of domestic and international road transport of goods in Poland, according to various long-term forecasts, sensitizes the challenges faced by the transport industry and presents possible scenarios of events. For transport and forwarding companies the review of freight transport development forecasts may become valuable source of information that can significantly affect the strategy and therefore potential gains and losses. It also may be an indispensable tool for business owners and decision makers. According to Instytut Badań nad Gospodarką Rynkową (Institute for Market Economics, 2018), the present rate of growth of the domestic demand in 2017 was to amount to 3.1%, i.e. slightly more than in 2016. According to the forecast of the Institute, individual consumption was to increase by 3.3% at that time. The revival of investment demand was to be possible through the implementation of large-scale investment projects in the field of road and rail infrastructure (Rucińska, 2015; Tavasszy and Ruijgrok, 2013). The presentation of the review of long-term forecasts related to the development of the freight transport sector in Polish enterprises (Kozerska and Konopka, 2017) management (Jelonek and Bylok, 2017; Lichtarski, 2015), including the ones by 2030 and 2050, is the objective of the paper. This study has been carried out in Poland in 2017.

MATERIALS AND METHODS

The study problem was to indentify and analyze the most important long-term forecasts of the freight transport in Poland. The selection of the data, its elaboration and compilation results in the preparation of the review as analyzed in the next sections of the paper. Below, there are presented selected transport development forecasts mainly by 2019, 2030 and 2050 from the perspective of the membership of Poland in the European Union and, most of all, from the perspective of national studies. The epistemological foundation of methodological background of the paper is embedded in the analysis of theoretical assumptions of its subjects in reference to the relevant statistical data. The scope of research carried out covers also gathering and selection of appropriate statistical material, quantitative compilation of the statistical data and their critical analysis. In reference to macro-economical analysis the secondary data from European Commission, Central Statistical Office, International Monetary Fund, Department of Economic, Sectoral and Agricultural Market of BGZ BNP PARIBAS S.A., (DESAMA, 2017), Motor Transport Institute, WiseEuropa Institute of Warsaw Transport Institute, as well as the prognosis of scientific experts are used.

RESULTS AND DISCUSSION

European Commission prognosis

Due to European Commission prognosis, freight transport confirms strong correlation with GDP growth until 2030 (European Commission, 2017). The achievement of the TEN-T core network by 2030 and of the wide-ranging network by 2050 is predictable to offer more sufficient transport infrastructure coverage and maintain a attentiveness of intercontinental transport and long-distance flows. Furthermore it is probable to provide support for logistic functions and develop inter-modal integration (Mesjasz-Lech, 2016; Nowicka-Skowron, *et al.,* 2018), throughout the modern management systems which are element of the network, and decrease the time losses with grounds in road congestion (Jong, *et al.,* 2013). Beyond 2030 weaker development forecast together with shifts in GDP composition towards services and information activities and limits to distant supply and off-shoring contribute to a convinced decrease in freight transport activity. Road

freight transport is predictable to raise by about 55% between 2010 and 2050 (1.1% p.a.), but increase is disproportionately spread between the EU15 and EU12. The highest increase in road freight transport activity would appear in the EU12 (72% for 2010-2050, corresponding to 1.4% p.a.) where a strong correlation with GDP growth can be noted. On the whole, road freight transport notices an insignificant decline in its modal share, from 71% in 2010 to 70% in 2050. By 2050, rail freight transport marks the highest increase among the freight transport modes (79%, corresponding to 1.5% p.a.) and raises its modal share from approximately 16% in 2010 to 18% in 2050. The considerable raise in rail freight transport activity is primarily determined by the completion of the TEN-T core and wide-ranging network; thus developing the competitiveness of the mode in transport enterprises management. Previously final energy demand in the transport sector has grown-up in line with the enterprises transport activity (Załoga, 2013). On the other hand, regardless of the predictable increasing trends in enterprises transport activity beyond 2010, final energy demand become stable by 2050 to altitudes slightly lower than those noted in 2010. The estimation confirm some weak growth in energy demand (0.3% p.a.) in the shortterm, primarily determined by the strong improvement in the freight transport activity subsequent to the crisis (Fig. 1).

Efficiency enhancement should appear in freight transportation, and constrain the consequence of the growing activity on energy demand (Fig. 2). Heavy goods vehicles (HGVs), which right

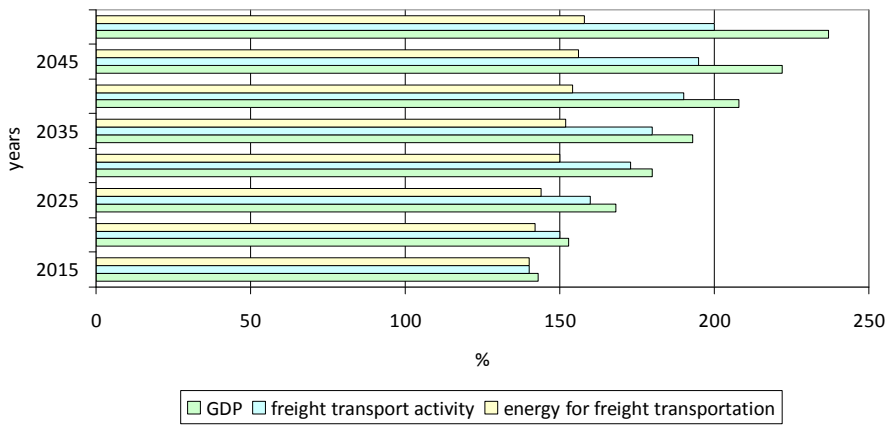


Fig. 1: Trends in transport activity and energy consumption. (European Commission, 2016)

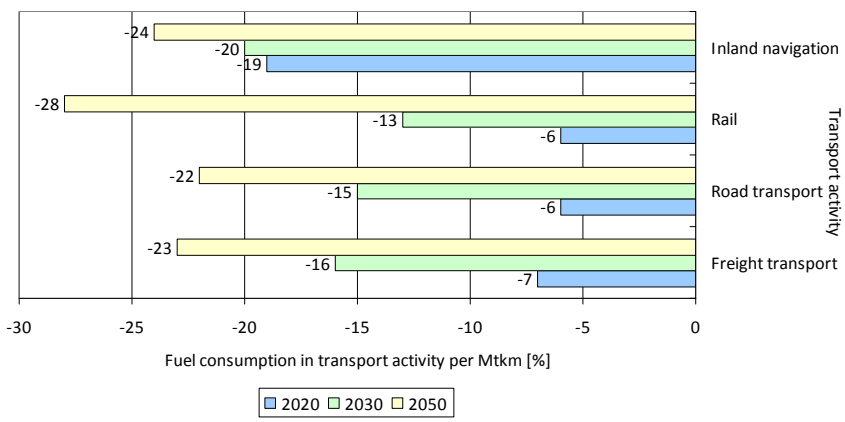


Fig. 2: Transport efficiency improvement. (European Commission, 2016)

through the forecast time record more than 80% of energy consumed in freight transport, undertake development in particular fuel consumption driven specially by the rising fossil fuel prices. Fuel costs stand for a significant component of operational costs of HGVs and their minimization is one of the major goals of HGV producers and fleet operators. Development in technology, associated among others to vehicle design or vehicle powertrain, aspires to decrease vehicle specific fuel consumption. The decreases in vehicle specific energy consumption of HGVs turn out to be more noticeable in the long term, as the renewal rate of the HGV fleet is slow. LCVs on the other hand, confirm high efficiency gains already by 2020 as a consequence of CO_2 emissions rules, but their consequence on energy demand of freight road transportation is not important appropriate to their little share in energy demand. In general, fuel consumption in road freight transport per Mtkm is predictable to lessen by 6% in 2020, 15% in 2030 and 22% in 2050 comparative to 2005.

The forecast of Central Statistical Office and International Monetary Fund

The research into the economic situation carried out by Central Statistical Office (Główny Urząd Statystyczny, 2018) indicates that in 2016 the situation of transport companies in Poland (Wojewódzka-Król and Rolbiecki, 2013) remained stable. The average general business climate indicator in the (land and pipeline) transport sector amounted to 1.6 points whereas in 2015 it equaled 1.3 points. However, in the first quarter of 2017 there was recorded a significant increase in the value of the indicator – its level amounted to 7.6 points compared to -1.2 points in the first quarter of 2016. Moreover, the economic indicator concerning management of the prices of transport services has indicated an upward trend since the first quarter of 2016 but it is still below zero. This means that the falling number of entrepreneurs record the drop in the current prices of their services. In 2017, the situation on the road freight transport market was expected to remain stable, mainly due to the continuous high demand for international carriages. According to the data by International Monetary Fund (IMF, 2018), in 2017 the average GDP growth in the European Union was to amount to 2.0%. It was a slightly slower growth than in 2015, however, the environment favorable for the consumer demand should drive exports and, at the same time, the demand for transport services of enterprises. The forecasts by IMF concerning the falling economic growth rate in Germany, which is the main direction of the Polish transport enterprises, can be disturbing. However, in 2017, a decrease in the demand was not expected yet. The forecasts by IMF concerning the GDP growth in Russia are optimistic since it should amount to 1.4% (-0.2% in 2015). According to the forecasts by DESAMA, (2017), the GDP growth in Poland in 2017 was to amount to 3.2% (2.8% in 2016), which created positive prospects for the development of the national transport sector (Table 1). The economic growth was to be driven both by the good situation of households (falling unemployment, low level of interest rates) and growing investments, particularly in the infrastructural segment.

Margins in the sector may be under pressure from rising fuel prices. Although, according to the forecasts by Energy Information Administration (EIA, 2018), in 2017 the average level of BRENT diesel fuel prices BRENT was to amount to 54.5 USD/bbl compared to 45.1 USD/bbl in 2016 it was to be significantly below the level of 2014. However, along with the predicted rate of exchange of USD/PLN, this could be reflected in the rising fuel prices, although that pressure was not to be very high. It should be noted that the road transport sector in Poland is highly competitive and the legal environment poses many challenges to

Table 1: The forecasts for the GDP growth in selected countries (%) (IMF, 2018; DESAMA, 2017)

	2016	2017	2018	2019
EU	2.4	2.0	2.0	1.8
Poland	2.8	3.2	29	3.0
Czech Republic	2.4	2.8	2.2	2.3
France	1.2	1.4	1.7	1.7
Germany	1.8	1.6	1.5	1.4
Great Britain	1.8	2.0	1.5	1.6
Russia	-0.2	1.4	1.4	1.5

transport companies' management. In particular, this takes place in the field of protectionist practices of the countries of Western Europe, such as introducing the minimum wage in Germany in 2015 and in France in 2016. In December 2016 both countries raised the rate of the minimum wage, which may also adversely affect the operating costs of Polish transport companies. Moreover, the sector is still coping with the problem of shortage of labor force, which also increases labor costs.

The forecast by Burnewicz and Motor Transport Institute

The forecast by Burnewicz (2007a) (Table 2 and Fig. 3), including the demand for road freight transport in Poland by 2020, was introduced, among others, on the basis of transport trends for years 1985-2003 and the factors creating the demand along with the basic one, i.e. GDP. The forecast indicates that the growth rate of the transport volume will be significantly lower than an increase in the volume of GDP, i.e. 1.5 % - 2.4% for road transport, whereas the volume of transport performance will correspond with the complex growth rate of GDP, i.e. 5.9% - 6.8%. An increase in transport resulting from the given forecast in years 2003-2020 will amount to nearly 28% in the minimum option and over 49% in the maximum option. On the other hand, transport performance will increase in the minimum option in that period by about 165%, and in the maximum option by about 208%, which results from an increase in transport on rather long distances (Burnewicz 2005, 2007b). MTI, (2018) produced the forecast for the demand for road freight transport (Table 2 and Fig. 3) on the basis of

Table 2: The forecasts for the demand for freight transport by 2020 by Burnewicz and Motor Transport Institute (*Burnewicz, 2005; **MTI, 2018)

Years	Forecast by Burnewicz*				Forecast by MTI**	
	transport in million tons		transport performance in billion tkm		transport performance in billion tkm	
	min option	max option	min option	max option	min option	max option
2003	993,0	993,0	87,4	87,4	-	-
2005	1032,5	1047,1	99,9	101,1	119,7	119,7
2007	1080,0	1120,0	115,0	119,4	132,2	132,3
2009	1109,3	1172,6	128,6	136,2	138,9	139,4
2011	1120,4	1203,4	140,3	150,7	146,1	147,1
2013	1149,3	1257,4	156,5	171,2	154,8	156,5
2015	1184,4	1320,6	175,6	195,8	164,1	166,7
2017	1219,9	1385,8	196,6	223,2	174,1	177,8
2019	1254,1	1450,5	219,4	253,4	184,6	189,9
2020	1270,6	1482,6	231,5	269,5	190,3	196,4
Annual growth rate 2003/2020	1,5 %	2,4 %	5,9 %	6,8 %	3,2 %	3,7 %

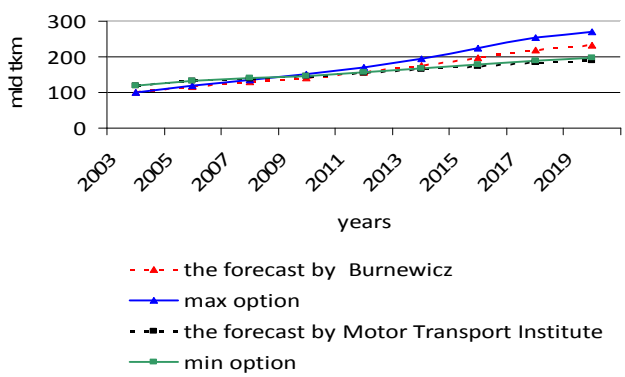


Fig. 3: The forecasts for transport performance in road freight transport by Burnewicz and Motor Transport Institute. (*Burnewicz, 2005; **MTI, 2018)

a range of social-economic phenomena which have significant impact on the development of transport performance and management, among others, the changes in the structure of generating GDP or factors that constitute the present shape of the economy and management of transport enterprises, both by stimulating and hampering its development. In the first (minimum) option, there was taken into account the impact of all the

adopted factors, and in the other (maximum) option, there was omitted the impact of internalization of external costs of transport. It is predicted that, in the projected period of 2006-2020, transport performance in the minimum option will increase by 47.5%, and in the maximum option – by more than 52%. MTI, on the basis of transport tasks specified for the future, introduced the projection of the number of trucks (Dong *et al.*, 2017) by loading capacity groups. According to different options of capacity, the total number of trucks would range from 2848 thousand to 3218 thousand in 2020, including the share of vehicles of up to 3.5 t GVW ranging from 75% to 80% (Bentkowska-Senator and Kordel, 2007).

The forecast by the analysis of WiseEuropa Institute of Warsaw Transport Institute

The report on potential challenges in the field of transport development in Poland by 2030, prepared by WiseEuropa Institute (Dorosiewicz, *et.al.*, 2006), includes three alternative scenarios of changes, the result of which will be mostly reduction in the amount of greenhouse gases emitted by transport. According to the forecasts by the analysts of WiseEuropa Institute, the continuous growth of the Polish economy by 2030 will lead to an increase in the demand for all forms of transport. This will result in greater demand for fuels: petrol, diesel and LPG. Technological progress, however, will allow effective responding to that demand, therefore this will not affect higher consumption and emissions from transport. At the same time, it is assumed that there will be the renaissance of the rail and the emergence of electric vehicles on Polish roads, which will lead to the doubling of the demand for electricity from transport. The assumed freight transport in the reference scenario is presented in Fig. 4. The reference scenario, in the perspective of 2030, assumes the balanced development of all transport types (among others, rail, road, sea and air) and an increase in transport performance. The transport of freight will increase from about 152 billion tkm in 2010 to 229 billion tkm in 2030. This will be mostly due to road transport (an increase by 58 billion tkm in the whole period) and rail transport (an increase by 17 billion tkm).

The analysts of WiseEuropa Institute considered three alternative scenarios assuming the concentration of administrative and managerial actions in the following areas: improving fuel efficiency of conventional engines, promoting alternative fuels, supporting logistic changes towards less emissive sources of transport (Centobelli, *et al.*, 2017). For each scenario, also including the reference scenario, there was presented the detailed forecast for the demand for energy and fuels by 2030 (Table 3).

In the report, there were considered three

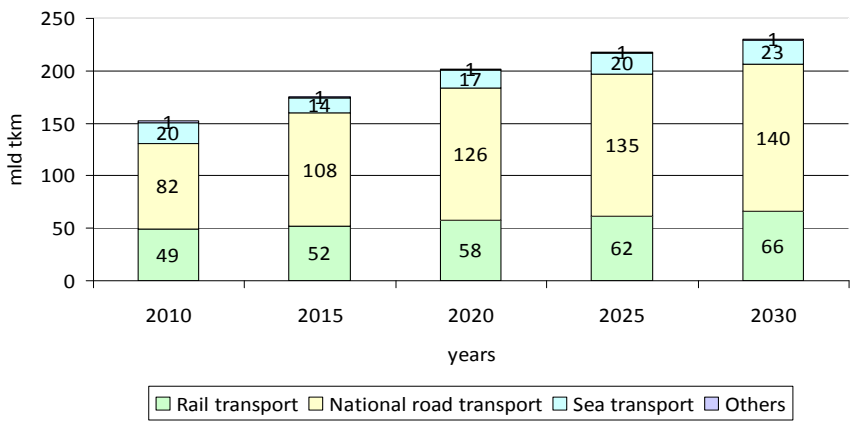


Fig. 4: Freight transport in the reference scenario by 2030. (Dorosiewicz, *et al.*, 2006)

Table 3: Consumption of fuels and energy in transport in the reference scenario and in alternative reduction scenario in 2030 (Dorosiewicz, *et al*., 2006)

		References		Fuel efficiency	Alternative fuels	Logistic changes
		2010	2030	2030	2030	2030
Petrol	Mg	3947742	4609483	3989506	4171981	4413811
Diesel		9414179	11935876	10189831	10462897	11134721
Liquefied gas (LPG)		1660000	1802760	1573388	1589843	1693090

alternative scenarios of intervention aimed at reduction in emissions of carbon dioxide (Piecyk and McKinnon, 2010) and other greenhouse gases from transport. Two of them (fuel efficiency and alternative fuels) lead to reduction in emissions of 9-9.5 MtCO2e in the horizon of 2030, the third one (logistic changes) is of a lower potential reaching 3.7 MtCO2e. The average cost of reduction of one ton of carbon dioxide ranges between the scenarios from 85 EUR in the scenario of fuel efficiency, through 103 EUR in the scenario of logistic changes to 123 EUR in the scenario of alternative fuels, translating into additional investments and managerial changes in years 2016-2030 of respectively, 36, 19 and 38 billion euros.

The forecast by other experts

According to Kordel (Bukowski, *et al.,* 2015), in the coming years, the role of road transport in Europe will be substantially limited. At present 68000 carriers from Poland provide transport of goods, including nearly half – in the area of more than one country. According to the forecasts, by 2031, 30% of the routes of the distance of more than 300 kilometers covered by vehicles of more than 3.5 ton GVW will be "transferred to railroad tracks". The progress in intermodal transport is already present. Moreover, for some time, carriers have actually run on the same routes (Czarnecki, 2016). Apart from Poland, Czech Republic and Slovakia, there are established few larger production centers from which goods can be collected/received – in this respect, the market is characterized by stagnation. Kordel also demonstrates protectionist measures on the Old Continent, which have been actually present for a few years. Practically, all over Europe, there are being introduced the regulations adversely affecting the profitability of work of carriers and there will be more regulations like this and not only related to the minimum wage but also ecology (Browne, *et al.,* 2012) or road tolls. It is possible that very soon, in Poland, for vehicles of over 3.5 tons GVW, nearly all roads will be toll roads. Italians take into account the withdrawal from the European Union, which would also influence an increase in operating costs of transport companies. It is also hard to formulate general conclusions allowing for counteracting these problems. Everyone must estimate the risk of conducting a transport activity, analyze the costs and profits, find their own strategy and managerial directions. According to the predictions by Pieriegud (Burak, 2015), one should expect that the role of transport enterprises in the Polish economy will be still significant. Investments in transport infrastructure bring measurable economic effects – both in a short and a long term – they positively influence the economic growth and trade, and also increasing mobility and welfare of citizens. In transport, like in other sectors of the economy, there is technological progress, there emerge new business models management like Uber companies. Also noticeable is dynamic development of the segment of courier services, among others, caused by the development of e-commerce.

CONCLUSION

Despite temporary economic downturns, the demand for freight transport is steadily growing and, as shown by the forecasts, it will grow in the future. The demand for transport is closely linked to the economic and managerial situation of Polish enterprises; in the periods of growth there is an increase in the scale of production, more goods are transported. Transport is still significantly dependent on fossil fuels, in particular petrol and diesel fuels. The impact of transport on human health, the environment or climate changes is closely linked to the selection of the fuel type. Clean alternative fuels, including electricity, are already available and can be a real option in relation to fuel and diesel fuels. The

interest in cleaner fuels also depends on the level of infrastructure and incentives offered to the potential purchasers (lower taxation, exemption from road tolls etc.). The EU legislation requires that, by 2020, in each Member State, 10% of the demand for energy in transport will be covered with renewable sources (EEA, 2018). In the regulations, there have been indicated some criteria concerning sustainability and, in the understanding of this legislation, only biofuels corresponding with these criteria can be recognized as "sustainable". For Polish enterprises management it is definitely future challenge. The European Union has set a range of objectives associated with reduction in greenhouse gas emissions generated by transport. In the White Paper published in 2017, the European Commission adopted the objective to reduce the emissions by 60% by 2050 in relation to 1990 (European Commission, 2017). This means that the present levels must be reduced by two thirds. Undoubtedly, these assumptions largely create the recalled transport development forecasts in Polish enterprises management.

ACKNOWLEDGEMENT

The study was supported by Faculty of Management, Czestochowa University of Technology in Poland.

CONFLICT OF INTEREST

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been completely observed by the authors.

ABBREVIATIONS

CO_2	Carbon dioxide
EIA	Energy Information Administration
EU	European Union
GDP	gross domestic product
GVW	gross vehicle weight
HGVs	heavy goods vehicles
IMF	International Monetary Fund
LCVs	light commercial vehicles
LPG	liquefied petroleum gas
Mg	milligram
MTI	Motor Transport Institute
$MtCO_2e$	million tones of carbon dioxide equivalents
Mtkm	million tonne-kilometres
p.a.	per annum
TEN-T	Trans-European Transport Networks
Tkm	tonne-kilometres
USD/bbl	United States dollars per barrel
USD/PLN	USD/PLN

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HOW TO CITE THIS ARTICLE

Kadłubek, M., (2019). Freight transport development forecasts in enterprises management. Global J. Environ. Sci. Manage., 5(SI): 96-104.

DOI: 10.22034/gjesm.2019.SI.11

url: https://www.gjesm.net/article_35464.html