

PECULIARITIES OF PASSENGER FLOWS FORECAST ON THE REDUCED MARKET CONDITIONS

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Abstract. The basic aim of public transport operator - National railway company – to provide passenger transportation services on the territory of network accessibility areas, also to enlarge volumes of passenger transportation and the quality of services necessary to satisfy needs of publicity and to reduce working loss. Accomplished overhaul of railway transport strategy and economic analysis of present passenger transportation activity allow defining features related to the selection of forecasting methods. Important socio-economic indicators selected as a frame for railway passenger transportation forecasts were influenced by present statistic data and indicator reliability during the period of economic crisis. Both economic and social factors have influence on passenger demand. Such indicators as GDP, average wages, level of automobilization, domestic income and expenditures, demographical indicators, changes on urban territories, economic changes, crisis cycle and other were evaluated. The forecasts on passenger volumes transported by trains and routes of JC Lithuanian Railway are prepared for local and international transportations. The priority is given to satisfaction of passenger market demands offering qualitative and quantitative balanced services. The forecasts on passenger transportation demand are prepared according to three scenarios of basic passenger transportation supply.

Keywords: local passenger transportation, railway transport operator, analysis of passenger prognostication providences and projections, transportation forecasting.

1. Introduction

It is complicated to forecast railway passenger transportation volumes from a long-term perspective for a period of positive economic development according to methodical approach. Forecast is more difficult to be performed for a period of general economic depression and economic crisis. Since sectors of National economy are still not recovered after international crisis it is not a time to forecast further development of them. Social sector which potential directly reflects on consumption and market is in deeper and more complicated situation.

However it is necessary to predict processes of National economic development, strategic planning, and preparation of priority projects, investment planning and implementation. It determines urgent modelling of perspectives on National economy and transport sector, specific forecast of key railway activities. In order to gain this aim the methodology applied for the forecasting of passenger flows transported by railway transport from a long-term perspective is prepared. Internal and external factors, duration of preparation and implementation of priority investment projects and necessity of their

substantiation have influence on selected period for a long-term perspective.

In order to solve problems of application of forecast methodology it is necessary to refer on integrated factors determining opportunities of simulating situation. Since substantiation of perspective projections is an assessment of current situation and retrospective development, detailed analysis of object activity and its change is carried out. From one hand, it is an analysis of quantitative change of substantial indexes; from another hand, it is a qualitative analysis of their causality and effects. Applying this principle of quantitative and qualitative development in this case, railway transport services, it is obviously that quantitative change of transportation activity indexes can also be analyzed qualitatively.

Forecasts of passenger volumes transported by JC Lithuanian Railways (further – the Company) are performed for local and international transportation routes and trains. Due to the longer period necessary to recover social sphere after the economic crisis the forecasts of passenger volumes are more moderate, but basically optimistic.

One of key tasks of the Company activity is to assure high transport speed on international corridors; this is related to the implementation of infrastructure projects (for example - Rail Baltica). Very important task is to electrify Trans-European transport corridors. Also priority is given to establishment and modern equipment of logistic centres.

One of the most important trends of the EU and Lithuanian transport policy is a pursuit to reinforce interaction between different transport modes. In order to develop passenger transportation it would consist of coordination of separate route services and implementation of "united ticket" conception. Moreover a program of renewal and modernization of passenger rolling-stock having influence on passenger trains to drive faster (speed 160 km/h) but more safety still continues to be implemented (*The Lithuanian Railway Strategy... 2008*).

2. Providences and Strategic Tasks for Local Passenger Transportation

Results of analysis of passenger transportation on local market showed that a number of passengers using railway services permanently decreased even during a period of positive economic development. This is concerned to:

- ✓ demographic changes in the country;
- ✓ decrease of inhabitant transport mobility;
- ✓ territorial redistribution of work places away from railway lines;
- ✓ territorial expansion of small business and industrial objects;
- ✓ decrease of number of employees;
- ✓ decrease of leisure passenger market due to high employment;
- ✓ disadvantageous railway routes and time schedules;
- ✓ too small flexibility of railway transport comparing to possibilities of road transport means, especially public transport.

In Lithuania separate transport modes and passenger transport operators still are in high competition. Recently road transport has the biggest part of passenger transportation on regular routes, – approx. 97,3 %. Railway transport has only 2.2 % of total passenger transportation volumes. Time and endeavour are necessary for the Company to recover and attract passengers.

The reinforcement of National position is necessary for the maintenance and the development of passenger transport. In order to implement guideline of strategic development and particular means governmental and public institutions have to focus more attention to support harmonized formation of whole transport system and the development of separate transport modes. In this sphere social reasons exceed economic ones; therefore decision makers have to be prepared for this activity.

The priority is given to the satisfaction of passenger market demands offering quantitatively and qualitatively

balanced services. It would be purposeful for the Company to coordinate orders on passenger transportation with municipalities, local authorities and the Ministry of Transport and Communication of the Republic of Lithuania (Griškevičienė D.; Griškevičius A. *at al.* 2005, Griškevičienė D.; Heinitz F. M. *at al.* 2008). Key tasks remains – to form and to motivate service demand according to social-economic aspects (Butkevičius 2002, Butkevičius *at al.* 2008).

It is purposeful complexly plan implementation of a policy on passenger and public transport support – to perform harmonized coordination of all land transport modes for local and international transportations (Griškevičienė *at al.* 2006, Griškevičienė *at al.* 2008):

- ✓ to connect local railway and bus routes in space and time;
- ✓ to offer adequate services for passengers travelling by few transport modes;
- ✓ to improve discount system, persistent and united tickets seeking to attract constant passenger flow.

It is purposeful to reinforce positions in the market in order to improve the activity of passenger transportation (*The Forecast of Freight and Passenger... 2010*):

- ✓ to make a long-term contracts between public railway transport operator and the Government on providing services and financial support allowing methodically develop passenger transportation activity for a longer period;
- ✓ to prepare standards of gradation into classes and quality of railway transportation services according to its potential and good worldwide practice.
- ✓ to modernize existing trains and to add more smaller (automotrice) or quickly changeable modern capacities to rolling-stock fleet;
- ✓ to focus attention and to give more efforts to marketing means seeking to keep constant passenger flow and attract more new passengers;
- ✓ to protect intercity and suburban rail routes for potential passenger to use for:
 - daily journeys;
 - business and work journeys;
 - journeys through the territory of Lithuania combining with other transport modes and urban public transport;
 - leisure and weekend journeys;
 - occasional, holiday, tourism journeys.

In order qualitatively improve passenger transportation services it is purposeful to perform this activity during a middle-term perspective period:

- to enlarge number of intercity and suburban train routes seeking to improve the selection of services on appropriate time; Due to this, a number of trips and trains on route can be planned to be enlarged.
- to introduce new and to recover suspended local routes which were used by persistent passenger flow. Accomplished researches shows that passengers can be attracted again;

- to review the necessity of present routes, to reorganise them meeting passenger needs, adjusting traffic schedules, stops, starting and ending time;
- if it is necessary, introduce seasonal, weekend, occasional routes/ trains showing concern and attention to the passenger needs;
- changes in international train traffic, formation of new routes and start of important intercity trains have influence on changes of local routes. Coherence of different levels of services can help to receive better social-economic effect. Moreover, the harmonization of railway service – route schedules - with other transport modes can stimulate the Company qualitatively improve activity and reinforce its competitiveness comparing with other transport modes;
- it is expected that route optimization in a long-term perspective will give positive effect minimizing passenger transportation expenses and also attracting new passengers on the branches, where train traffic will be more compact;
- National support and investment are necessary for the correction of passenger transportation routes. In case of insufficient National finance, the Company will operate only these routes, which will be subsidized;
- it is purposeful to offer steady ticket prices in order to keep present passengers. Decreasing passenger flows as a result of worsen social conditions can be supported applying marketing means;
- Applying flexible system of rolling-stock capacity selection, bying more automatrice and shorter trains, expenditures of maintenance can be minimized in less busy routes, traffic of these small trains can be densified. This could help to recover shorted, reduced in number or suspended local routes.

It is economically purposeful to support and to develop local passenger transportation on the territory of Lithuania due to complete maintenance of available potential on infrastructure and rolling-stock; this potential could be maintain and supervised only using finance of the Company (Butkevičius J.; Jarašūnienė, A, Jackiv, I... 2008).

Applying marketing means, paying more attention to the researches of passenger market and funding investment projects local passenger transportation services can be recovered and developed so, that passenger demand for these services could be recovered and formed again.

3. Forecasts of Local Passenger Transportation Demand

The forecasts of local passenger transportation demand were based on three main scenario of passenger transportation supply. These scenarios consider problems of possible railway supply, implementation of investment projects and marketing means on railway transport, competition of alternative passenger transport modes, development of National economy.

Forecast scenarios. It is expected that transport mobility of inhabitants and public transport demand will increase together with the growth of National economy. The Company will meet challenge to attract as many passengers as possible offering high quality services (*The Forecasts of Freight and Passenger.... 2010*).

The optimistic scenario:

1) Investment projects on infrastructure development, renewal of rolling-stock fleet and improvement of passenger terminals will be prepared and implemented;

2) Due to implementing project of Rail Baltica and new international routes bigger intercity and suburban passenger flows will be formed;

3) “Faster local railway transport” will be developed combining with intensity and urban bus traffic.

4) United ticket and other marketing means, traffic speed acceleration after the electrification of railway will attract new passengers.

The basic scenario:

1) Due to implementation of marketing means railway transport will reinforce its positions on local transportation;

2) Rolling-stock fleet will be renewed progressively;

3) Investment to railway infrastructure will be implemented progressively;

4) The project of Rail Baltica will be implemented without achievement of planned high traffic speed;

5) Number of passengers dealing with tourism and business journeys will increase progressively.

The pessimistic scenario:

1) Investment projects meeting only freight demands will be implemented in railway sector; rolling-stock fleet will not be renewed and no marketing means will be implemented;

2) Due to competitiveness of other transport modes volumes of local transportation will decrease (due to cars and buses);

3) “Faster local railway transport” will not be developed and combined with intercity and urban bus traffic;

4) The project of Rail Baltica will be implemented only till Kaunas City without achievement of planned high traffic speed;

5) Due to political reasons international rail traffic through the territory of Lithuania will decrease.

The „black” scenario:

Passenger transportation volumes on local routes will decrease due to lost National support and cross financing from other activity causing shortening of routes and suspension of unprofitable trips.

According to the *optimistic scenario* local passenger transportation volumes would increase fractionally and would reach approx. 4540 thsd. passengers in the year 2015. Later the increase would be faster and would reach 8958 thsd. passengers in the year 2040.

According to the *basic scenario* local passenger transportation volumes would increase fractionally till the year 2015 – approx. 3874.3 thsd. passengers. Later the

increase would be consistent and would reach 6129.6 thsd. passengers in the year 2040.

According to the *pessimistic scenario* local passenger transportation volumes would decrease constantly and would reach approx. 3013.1 thsd. passengers in the year 2015. Later the increase would be fractional and would reach 4611.6 thsd. passengers in the year 2040 due to usage of active marketing means.

According to the *“black” scenario* local passenger transportation volumes would decrease fractionally and would reach approx. 1688.6 thsd. passengers in the year 2015. Later the decrease would be faster and would reach 81.8 thsd. passengers in the year 2040.

Table 1 shows results of forecasts of passenger transportation by Lithuanian Railways on local routes.

Table 1. Passenger transportation by Lithuanian Railways on local routes, thsd

Forecast	2010	2020	2030	2040
Basic	3 278,3	4 713,7	5 523,4	6 129,6
Optimistic	3 560,4	5 474,3	7 350,1	8 958,0
Pessimistic	3 172,6	3 229,8	3 859,1	4 611,6
“Black”	3 093,4	921,7	274,6	81,8

It is expected that number of passengers on local routes will increase till 6.13 mill. Due to accepted and implementing strategic and tactical means: start of new and renewal of existing routes, trip density; renovation of rolling-stock fleet and modernization of railway infrastructure. Acceleration of traffic speed, development of service variety and improvement of travel comfort also are urgent strategic tasks for the development of passenger transportation. It is expected that balance of passenger demand and service supply will be achieved during a middle-term perspective period. In order to reach these aims internal and external conditions are necessary: high traffic speed, new modern trains, automatrice, flexible time schedules, modern system of ticket reservation and purchase, qualitative marketing system. The effects of external factors are as follows: the maintenance of public transport services; the recovery of transportation by railways; competitive ticket prices, increased fuel prices, new tax of pollution, traffic jams in road and street networks.

4. Providences of International Passenger Transportation

The Company has to ensure the needs of international transportation by railway transport for the period till 2040:

– the needs of local inhabitants, transport connections with the EU and other countries and for transit transport crossing the territory of Lithuania. For this purpose modern equipped railway infrastructure, traffic safety organization and control, appropriate modern trains and flexible schedules, high traffic speed, attractive ticket prices and convenient journey conditions, coordination with other transport modes are necessary.

– same activity to recover after the economic crisis is expected in other countries. Socially this process proceeds longer than restructurization in economy or business sphere.

– marginal positive progress or stabilization of passenger flows are expected. Meanwhile qualitative changes in passenger market are expected together with quantitative development. Redistribution between business, leisure, tourism, cultural and communication journeys is expected too.

– increase of number of passengers on international trains is expected during a middle-term perspective till the year 2020-2025. Expected effect is achieved by a help of development of international transport conditions and specific development of separate directions:

1) Passengers are predicted to be transported on international trains formed by the Company:

- ✓ on routes to East direction of Transport Corridor IX increasing a number of trains or forming new trains;
- ✓ on routes to North-South direction of Transport Corridor I, specially on Rail Baltica, forming new international trains;

2) International trains formed by railway companies of other countries:

- ✓ on routes to West direction of Transport Corridor IX;
- ✓ new fast trains on routes of Transport Corridor I.

– Due to the modernization of international transportation and the acceleration of traffic speed, the improvement of international economic relations with neighbouring and remote countries, an increase of passenger flows is expected during a long-term perspective till the year of 2040.

– Passengers could be transported by international trains formed by the Company and railway companies of other countries:

- ✓ on new routes to East direction of Transport Corridor IX to visit capitals, large cities, ports, industrial centres and resorts;
- ✓ on routes to South direction of Transport Corridor I to visit important cities of the EU countries.

For this purpose it is necessary to ensure convenient conditions and National support for formation of international trains, traffic regulation and service assurance. The National support is expedient during short and middle-term periods as current international transportations are unprofitable (due to relatively low tariffs of passenger transportation and low transportation volumes). Otherwise the Company could implement only pessimistic plans adjusting routes and schedules for the detriment of passengers.

Strategically developing international passenger transportation can attract own context of passengers and increase their flows due to competitive conditions of journey and attractive ticket prices. The establishment and the maintenance of attractive market are permanent activities giving progressively improving results (*Feasibility Study of Railway... 2007, the Forecast of*

Freight and Passenger...2010).

After the implementation of Rail Baltica project and the establishment of transit passenger terminal in Kaunas (and later in Vilnius), new flow of international passengers travelling from neighbouring and remote countries of Asia through the territory of Lithuania to the countries of West Europe can be expected.

5. Forecasts of International Passenger Transportation

Forecast scenarios. Due to adverse economic conditions after the economic crisis both in Lithuania and other surrounding countries substantial changes in international passenger transportation are not forecasted during the early perspective till the year 2015. This period should not have considerable influence on route redistribution or change of their number.

The forecast of international passenger transportation volumes are based on four scenarios. Insignificant positive development and stabilization of passenger flows are expected realizing all scenarios (*Griškevičienė et al. 2006, The Forecasts of Freight and Passenger...2010*).

The optimistic scenario:

- 1) Investment projects on infrastructure development will be prepared, renewal of rolling-stock fleet and marketing means will be implemented;
- 2) New international routes will be opened (for example, Vilnius-Warsaw);
- 3) The project of Rail Baltica will be implemented quicker;
- 4) Transit traffic to Kaliningrad will increase;
- 5) Acceleration of passenger train traffic will reach European standards.

The basic scenario:

- 1) Passenger rolling-stock fleet will be renewed progressively;
- 2) Investment to railway infrastructure and its modernization will be implemented moderately;
- 3) Railway transport will reinforce its positions in international transportation due to an implementation of marketing means;
- 4) The project of Rail Baltica will be implemented without achievement of planned high traffic speed;
- 5) Transit traffic to Kaliningrad will increase progressively.

The pessimistic scenario:

- 1) The implementation of investment project is suspended. Due to a lack of financing the modernization of rolling-stock fleet is stopped and no marketing means are implemented;
- 2) Volumes of international transportation will decrease due to cheaper services in other countries;
- 3) Cheap airlines and road transport will outlive unattractive railway services on international transportation;
- 4) International route Vilnius-Warsaw will not reach planned attraction;

- 5) The project of Rail Baltica will be implemented only till Kaunas City without achievement of planned high traffic speed;
- 6) Due to political reasons transit traffic to Kaliningrad will decrease;
- 7) International transportation will remain slow having inflexible time schedules.

According to the **optimistic scenario** international passenger transportation volumes would increase till 1084 thsd. passengers in the year 2015. Later the increase would be till 2466.9 thsd. passengers in the year 2040.

According to the **basic scenario** international passenger transportation volumes would increase till 888.9 thsd. passengers in the year 2015. Later the increase would be till 1836.6 thsd. passengers in the year 2040.

According to the **pessimistic scenario** international passenger transportation volumes would increase till 725.7 thsd. passengers in the year 2015. Later the increase would be till 1177.7 thsd. passengers in the year 2040.

According to the **“black” scenario** international passenger transportation volumes would decrease till 672.3 thsd. passengers in the year 2015. Later the decrease would be till 44.2 thsd. passengers in the year 2040. Other transport modes should be prepared to accept passenger flows from railway transport. Therefore a car usage would increase more to the complete congestion of road highway network. Table 2 shows forecasts of international passenger transportation by Lithuanian Railways till the year 2040.

Table 2. Forecasts of international passenger transportation by Lithuanian Railways till the year of 2040, thsd

Forecast	2010	2020	2030	2040
Basic	789,6	1 245,2	1 704,4	1 836,6
Optimistic	857,5	1 672,6	2 289,3	2 466,9
Pessimistic	764,1	801,2	985,6	1 177,7
„Black“	735,2	592,9	288,4	44,2

Expected effect of a middle-term perspective can be achieved by the help of development of international transport conditions and specific development of separate directions:

1) International trains formed by the Company can transport passenger on:

- ✓ routes to East direction of Transport Corridor IX:
 - Vilnius–Moscow (enlarge number of trains);
 - Vilnius–Minsk (enlarge number of trains);
 - Vilnius–Sankt Petersburg;
 - Vilnius–Kiev (form new train);

✓ routes to North-South direction of Transport Corridor I:

- Vilnius–Riga (form new train);
- Vilnius–Kaunas–Warsaw–Berlin (form new train after the implementation of Rail Baltica);
- Kaunas–Marijampole–Warsaw (combine with train Kaunas–Riga–Tallinn after the implementation of Rail Baltica);

2) International trains formed by railway companies of other countries can transport passenger on:

- ✓ routes to West direction of Transport Corridor IX:
– Moscow-Minsk-Vilnius-Kaliningrad.

Expected effect of a long-term perspective can be achieved by the help of international transportation modernization and acceleration of traffic speed, and also improvement of economic relation between Lithuania, neighbouring and remote countries.

Stimulating situation of implementation on fast railway line Rail Baltica till Kaunas City it is determined that this line could redistribute passenger transportation market as follows:

- fast railway could attract about 15-30 % of road transport passengers driving to Warsaw and about 40-60 % of road transport passengers driving to Berlin;
- fast railway could attract about 60 % of air transport passenger travelling to Warsaw and about 20-30 % of air transport passengers travelling to Berlin, Hamburg, Amsterdam and other European cities;
- Fast railway could attract about 40-50 % of bus transport passengers travelling to Warsaw and about 60-80 % of bus transport passengers travelling to Berlin, Hamburg, Amsterdam, Paris and other European cities.
- The opening of train Vilnius-Warsaw-Berlin could also increase international passenger flows.

During a long-term perspective international trains formed by the Company and other railway companies of foreign countries could transport passengers only on sufficiently developed and modernized railway infrastructure:

- on new routes to East direction of Transport Corridor IX: to Ukraine (Odessa-Minsk-Vilnius-Kaunas-Klaipeda), Caucasus, Urals (Moscow-Vilnius-Kaunas-Klaipeda), resorts of the Black Sea, Moldova, countries of Middle Asia.
- on routes to South direction of Transport Corridor I: to Belgium, the Netherlands, Luxemburg, France, countries of Middle and East Europe, coasts of the Mediterranean Sea.

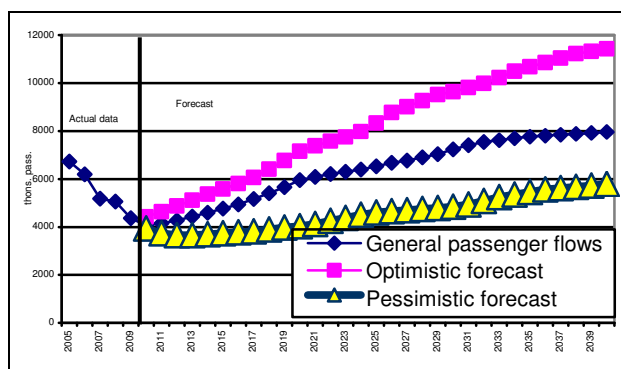


Fig 1. Forecast of general passenger flows transported by Lithuanian Railways till the year 2040 (*The forecasts of freight and passenger ...*)

Various efforts can enable to implement scenario of recommended development which could help to reach and keep 1.8 mills. passengers transported by international trains in the end of forecasted period.

General passenger flows forecasted till the year 2040 are presented in figure 1.

6. Conclusions

1. The analysis of local passenger transportation market showed that the decrease in local transportation is related to both changes of demand and limitation and flexibility of service supply.
2. Railway transport has only 2 % of total passenger transportation volumes. In order to keep present passengers and attract new ones urgent means must be implemented by the Company;
3. Due to adverse economic conditions after the economic crisis both in Lithuania and other surrounding countries substantial changes in international passenger transportation are not forecasted during the early perspective till the year 2015. Meanwhile qualitative changes in passenger market are expected together with quantitative development.
4. The Company has to ensure the needs of international transportation, transport connections with the EU and other countries and for transit transport crossing the territory of Lithuania for the period till 2040. For this purpose modern equipped railway infrastructure, traffic safety organization and control, appropriate modern trains and flexible schedules, high traffic speed, attractive ticket prices and convenient journey conditions, coordination with other transport modes are necessary.
5. According to accomplished analysis and calculations it is recommended for the Company to continue perform and improve activity of local passenger transportation offering attractive services and balancing the question of financing support. It is economically purposeful to support and to develop local passenger transportation on the territory of Lithuania due to maintenance of available potential on infrastructure and rolling-stock; this potential could be maintain and supervised only using finance of the Company.
6. Following basic guidelines of the EU transport policy stimulating the recovery of railway transport and the increase of railway passenger market it is purposeful to increase a number of passengers doubly attracting new passengers from other transport modes having negative impacts on environment and congestion of infrastructure during the period of a long-term perspective.
7. Despite of unprofitable activity of local passenger transportation this activity must be developed as social commitment to local inhabitants and has to be supported by the Government.
8. In order to offer qualitative and more attractive services and adapted rolling-stock fleet to local

transportation it is recommended to renew fast, electrified, short and long capacity trains and automotrices having influence on the improvement on traffic schedules.

9. Accelerating traffic speed a value of travel time will change (decrease) and it will help trains to attract passengers driving by cars during the period of a middle-term perspective. Therefore it is purposeful to accelerate traffic speed on important branches of intercity transportation. This is important to Vilnius-Kaunas branch where traffic speed will reach 160 km/h after the implementation of investment projects.
10. It is purposeful complexly plan implementation of a policy on passenger and public transport support – to perform harmonized coordination of all land transport modes for local and international transportations:
 - to connect local railway and bus routes in space and time;
 - to offer adequate services for passengers travelling by few transport modes;
 - to improve discount system, persistent and united tickets seeking to attract constant passenger flow.
11. In order to improve activity of railway passenger transportations it is purposeful to reinforce its position in the market paying more attention and efforts to implementation of marketing means, opening of seasonal, weekend, occasional routes showing concern and attention to the passenger needs, support of attractive ticket prices, modernization the system of ticket reservation and purchase.
12. Strategically developing international passenger transportation can attract own context of passengers and increase their flows due to competitive conditions of journey and attractive ticket prices. The establishment and the maintenance of attractive market are permanent activities giving progressively improving results. After the implementation of Rail

Baltica project and the establishment of transit passenger terminal in Kaunas (and later in Vilnius), new flow of international passengers travelling from neighbouring and remote countries of Asia through the territory of Lithuania to the countries of West Europe can be expected.

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