THE FEASIBILITY STUDY TO TRANSFER GOODS BETWEEN PORTS OF KLAIPEDA AND SWINOUJUSCE

***Ilona Jaržemskienė*[1], *Jurgita Barysienė*[2], *Vytautas Jaržemskis*[3], *Andrius Jaržemskis*[4]**

Vilnius Gediminas Technical University
Sauletekio av. 11, Vilnius-16, LT-10105, Lithuania
Ph.: +370 52370605. Fax: +370 52370555
E-mail: [1]ilona@ti.vgtu.lt, [2]bjurgita@ti.vgtu.lt, [3]vytautas.jarzemskis@ti.vgtu.lt, [4]andrius.jaržemskis@ti.vgtu.lt

The purpose of this article is to present results of the research of feasibilities of freight transportation by ferry between Klaipeda Seaport in Lithuania and Swinoujusce Seaport in Poland. The study is related to the BSR Interreg III B NP project Baltic Gateway PLUS. The study includes the following researches: (1) to specify freight flows to Region Berlin via Klaipeda Seaport; (2) to specify freight flows to Region Berlin via Kalvariju cross border check point. The applied method is the collection of official statistical data for years 2005 and 2006 from legal statistical bureaus and some freight operators. The study concluded that freight flow via Klaipeda port and Kalvariju check point (incl. Lazdiju) to the so-called Region Berlin defined as the destination point in which freight was unloaded was 199,59 thousand tons in 2005 and 229,96 thousand tons in 2006. Freight flow via Klaipeda port and Kalvariju check point (incl. Lazdiju) from the so-called Region Berlin defined as origin point in which freight was loaded was 48,88 thousand tons in 2005 and 78,45 thousand tons in 2006. About 10 % of freight flow in axis Kalvariju-Berlin is loaded/unloaded in the so-called Region Berlin. About 90 % of flow in the mentioned axe is a cross trade flow of Region Berlin.

***Keywords**: intermodal transport, transport statistics, short sea shipping, freight flows, trailer, ferry*

1. Introduction

A short description of the background to this article, its purpose and scope and some definitions of important terms used as well as a method of the research is presented. The purpose of this research is to study feasibilities of freight transportation by ferry between Klaipeda Seaport in Lithuania and Swinoujusce Seaport in Poland. The study is related to the BSR Interreg III B NP project Baltic Gateway PLUS. Study aims to evaluate the existing demand for ferry line and contribute to the Motorways of the Sea concept.

The scope of the study is defined by Research Contract. The study includes the following researches:

- to specify freight flows to Region Berlin via Klaipeda Seaport;
- to specify freight flows to Region Berlin via Kalvariju cross border check Point.

The study not includes technical or economical characters that are relevant to the planning and pre-estimating of Klaipeda -Swinoujusce ferry connection.

Moreover the backward flow from Region Berlin is evaluated in the study.

Definitions. The Region Berlin as destination point is defined as three Federal lands in Germany – Berlin, Brandenburg, Mecklenburg-Vorpommern.

Method. Lithuania, Latvia, Estonia, Poland as well as other six countries join the European Union since 1st May, 2004. The last period for statistical freight trucking data based on Customs Manifests was April, 2004. In the past three years many changes happened. GDP, international trade and freight traffic increased dramatically in the new EU countries. The method selected is the collection statistical data for years 2005-2006 from official statistical bodies of Federal Lands of Germany as well as official statistical bodies of Lithuania. Statistical data on goods flow between Kalvariju Border/Klaipeda Seaport and Berlin Region was not founded in any known statistical bodies. The all necessary statistical issues that concerned the mentioned link was successfully collected for year 2005 and 2006. The interviews with Lithuanian freight operators contribute to the methodology of the project. The statistical data from DFDS Lisco Company that operates ferry lines from Klaipeda to Germany (Kiel and Sassnitz) is also evaluated.

2. Freight Origin and Destination Approach and Design

Theoretical assumption of freight origin and destination and origin and destination design for our research is presented.

Typical approach to freight flows distribution is based on origin-destination pairs. The point of origin is point of loading and point of destination is point of unloading or reloading. The points of origin and destination could be defined as manufactory, city, country, region or continent.

Figure 1. "Origin – Destination" approach

The task of our research is to identify road freight flow to Berlin Region:
- from Kalvariju/Budzisko (Lithuanian/Poland) Cross Border point and
- from Klaipeda Sea port.

So we have the destination point – Berlin Region. Unfortunately we have no certain origin point. The Klaipeda Ro-Ro terminal and Kalvariju/Budzisko border is only transit points. Theoretically and practically freight origin could be placed in very wide geographically area.

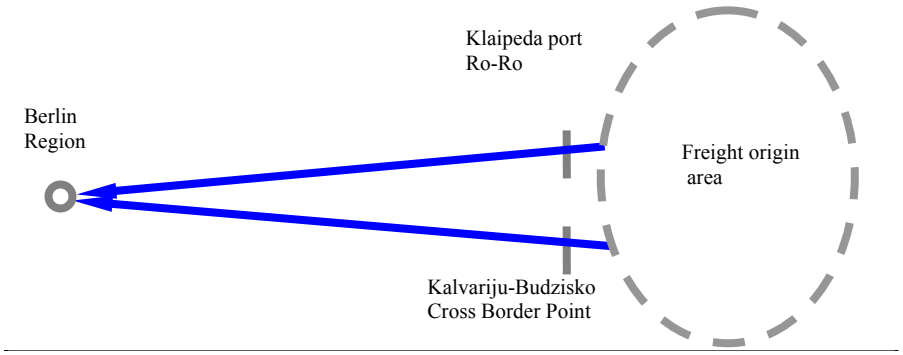

Figure 2. "Origins are – Destination point" approach

Identification of destination point. At first we identify destination point – Berlin Region. There is no unambiguous definition of Berlin Region in official documents and scientific literature. First definition of the Berlin is the Capital City of the Germany, second one – Federal Land (Bundesland) of the Country. The geographical positioning of Federal Lands of Germany is showed on Figure 3. Berlin Federal Land is very small in comparison with others. The definitions of Berlin Federal Land as Berlin Region do not match the aim of the research that is to evaluate possibility to open new ferry line to Swinoujusce. The wider approach of the Berlin Region is neighbouring Federal Lands. The Federal Land of Brandenburg is only one neighbouring Land of Berlin. The definition of Berlin and Brandenburg Lands as Berlin Region is also too narrow, such both of them is not-marine lands and do not match our aim.

Figure 3. Federal Lands of Germany*

*Federal Lands:
1 – Berlin; 2 – Hamburg; 3 – Bremen; 4 – Saarland

Here the 200 km radius from Swinoujusce approach we apply to identify the so-called Region Berlin that could be significant related with aim of the research.

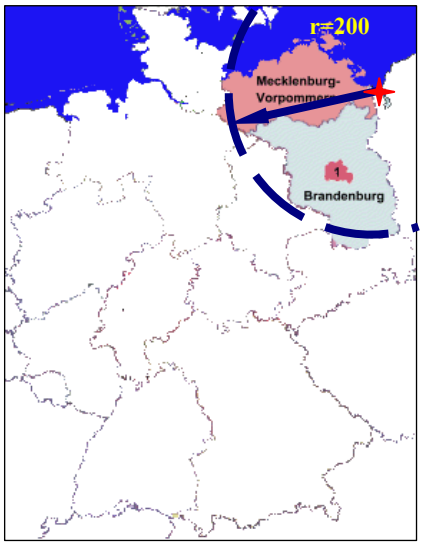

Figure 4. 200 km radius from Swinoujusce

Figure 5. The so-called Region Berlin

Region Berlin is defined territory as Federal Land Berlin, Federal Land Brandenburg and Federal Land Mecklenburg-Vorpommern.

Identification of origin area and transit routes

We should use the origin area approach instead of the origin point. In that case the origin area covers 5 countries – Lithuania, Latvia, Estonia, Belarus and Russia.

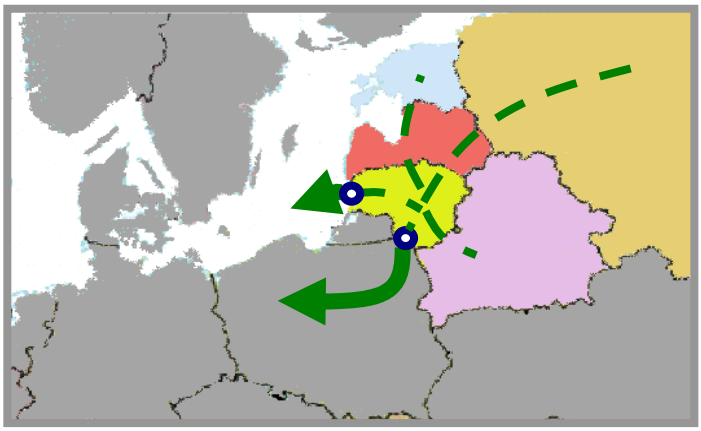

Figure 6. The origin area and Lithuanian cross points Kalvariju (incl. Lazdiju) and Klaipeda Seaport

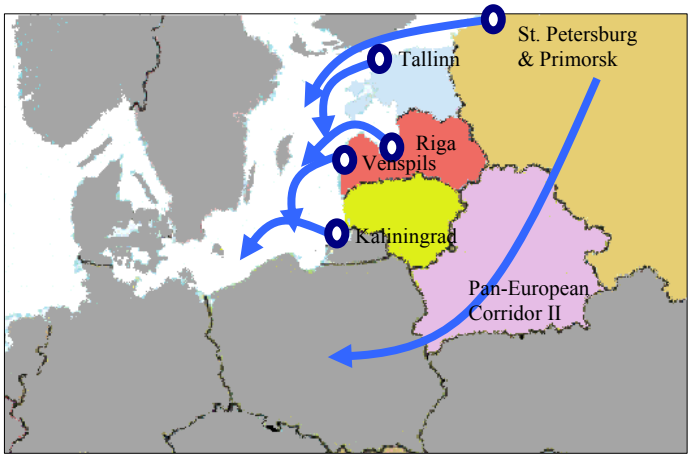

Figure 7. Alternative routes for the origin area

3. Cargo Flows Statistics From/To the So-Called Region Berlin

Here the statistics collected from German Federal Lands, from Lithuanian Statistical Department and ferry operator is numerically and graphically presented and overviewed.

Statistics from German Federal Lands

The statistics of freight flows is collected from Official bodies of Federal Land of Germany [1-6, 9-10]:

- Berlin Federal Land,
- Brandenburg Federal Land;
- Mecklenburg-Vorpommern Federal Land.

Table 1. Freight to the so-called Region Berlin in 2005, in thousand tons

Origin / Destination	Lithuania	Latvia	Estonia	Belarus	Russia	Total
Berlin	15,98	1,40	5,45	7,80	20,45	**51,08**
Brandenburg	23,61	12,96	37,17	14,53	14775,91	**14864,18**
Mecklenburg-Vorpommern	80,54	6,10	329,24	15,56	1829,23	**2260,67**
Region Berlin Total	**120,13**	**20,46**	**371,86**	**37,89**	**16625,59**	**17175,93**

Table 2. Freight from the so-called Region Berlin in 2005, in thousand tons

Destination / Origin	Lithuania	Latvia	Estonia	Belarus	Russia	Total
Berlin	12,36	2,53	1,17	2,53	72,43	**91,02**
Brandenburg	11,88	4,64	8,51	11,52	114,35	**150,9**
Mecklenburg-Vorpommern	13,89	18,64	6,74	1,91	79,01	**120,19**
Region Berlin Total	**38,13**	**25,81**	**16,42**	**15,96**	**265,79**	**362,11**

Table 3. Freight to the so-called Region Berlin in 2006, in thousand tons

Origin / Destination	Lithuania	Latvia	Estonia	Belarus	Russia	Total
Berlin	22,52	1,44	4,86	4,20	974,60	**1007,62**
Brandenburg	12,95	6,53	28,95	12,35	14749,42	**14810,2**
Mecklenburg-Vorpommern	95,25	21,14	344,59	14,50	2493,62	**2969,1**
Region Berlin Total	**130,72**	**29,11**	**378,4**	**31,05**	**18217,64**	**18786,92**

Table 4. Freight from the so-called Region Berlin in 2006, in thousand tons

Destination / Origin	Lithuania	Latvia	Estonia	Belarus	Russia	Total
Berlin	13,97	2,41	2,72	4,52	82,59	**106,21**
Brandenburg	20,45	18,41	7,33	14,51	116,43	**177,13**
Mecklenburg-Vorpommern	25,59	19,56	9,13	2,88	105,52	**162,68**
Region Berlin Total	**60,01**	**40,38**	**19,18**	**21,91**	**304,54**	**446,02**

On Figures 8–11 the distribution of freight flow is presented with focus to eastern side.

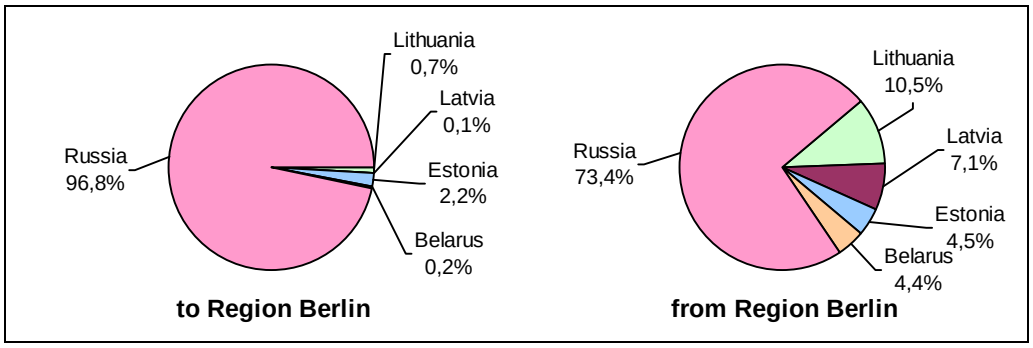

Figure 8. Freight flow between the so-called origin area and Berlin region in 2005

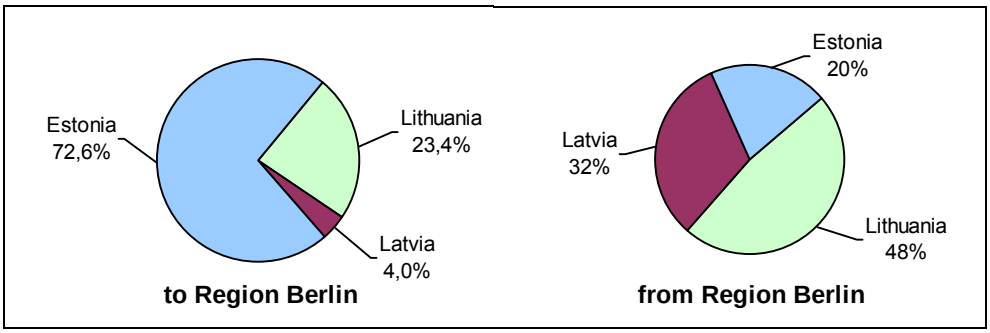

Figure 9. Freight flow distribution among LT/EE/LV and Berlin region in 2005

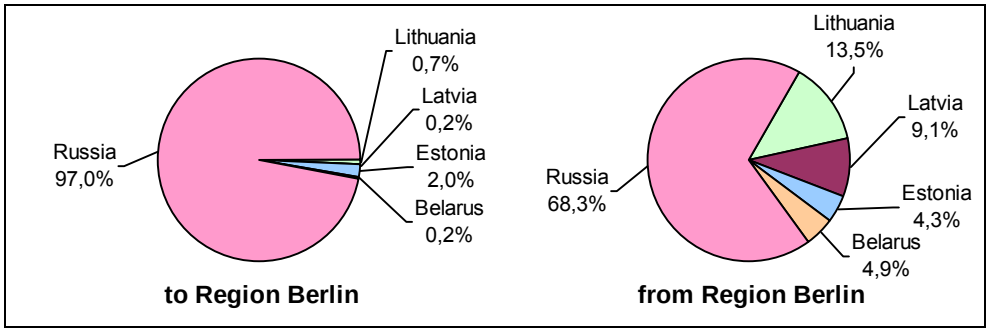

Figure 10. Freight flow between the so-called origin area and Berlin region in 2006

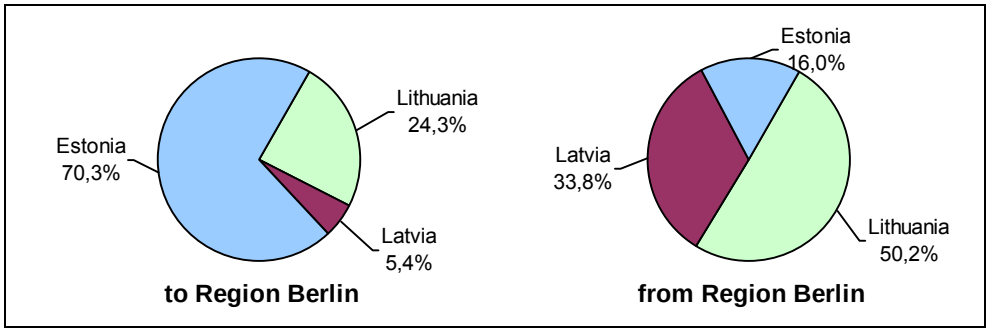

Figure 11. Freight flow distribution among LT/EE/LV and Berlin region in 2006

Cargo flow crossing Kalvariju (incl. Lazdiju) and Klaipeda Seaport

Table 5. Number of cargo vehicles

	2005	2006
Klaipeda Port [12, 13]	118492	147489
Lithuania/Poland Border*	649197	1462420
Total	767689	1609909

*Data from Ministry of Transport and Communication of Lithuania
*Data including Kalvariju and Lazduoju Boeder Check points

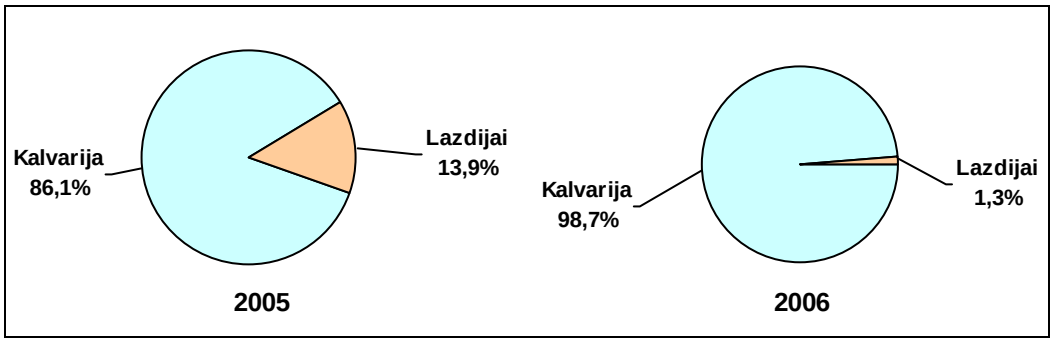

Figure 12. Cargo vehicles crossing Kalvariju and Lazdiju check points in 2005 and 2006

Table 6. Cargo vehicles registered in Russia and Belarus crossing Kalvariju (incl. Lazdiju) check points*

	2005			2006		
	Russia	Belarus	Total	Russia	Belarus	Total
Total	14395	5162	649197	35481	12114	1462420

*Data from Ministry of Transport and Communication of Lithuania

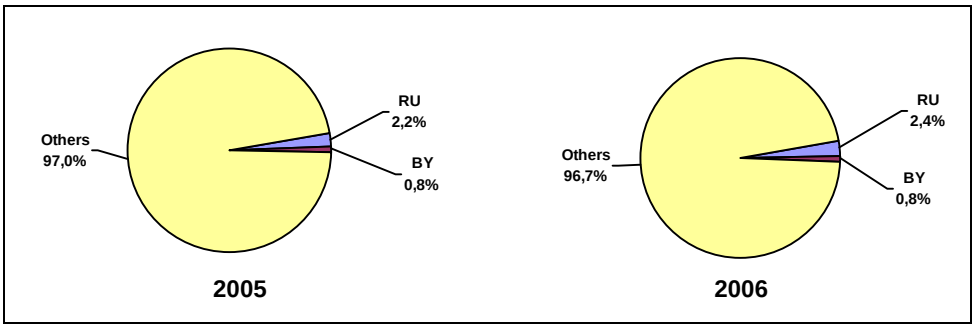

Figure 13. Cargo vehicles registered in Russia and Belarus crossing Kalvariju (incl. Lazdiju) check points

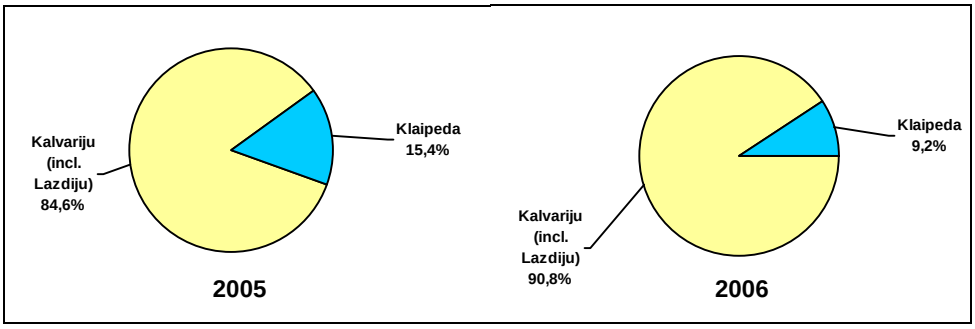

Figure 14. Cargo vehicles crossing Kalvariju (incl. Lazdiju) and Klaipeda check points

Table 7. Cargo flow by roads between Lithuania and Germany [12, 13]

In thousand tons	2005	2006
Loaded to Germany	579,9	667,3
Unloaded from Germany	668,4	776,8
Total	1248,3	1444,1

Cargo flow crossing Klaipeda Sea port to and fro Germany

Table 8. Cargo flow crossing Klaipeda Seaport to and fro Germany [12, 13]

In thousand tons	2005	2006
To Germany	2073,9	2065,7
From Germany	1517,0	1829,7
Total	3590,9	3895,4

Table 9. Cargo flow carried in vehicles crossing Klaipeda Sea [12, 13]

In thousand tons	2005	2006
To Germany	694,8	876,8
From Germany	909,4	1127,8
Total	1604,1	2004,5

*13,6 m trailers mostly

Table 10. Number of cargo vehicles crossing Klaipeda Sea to and fro Germany [12, 13]

In units	2005	2006
To Germany	54346	68059
From Germany	64146	79430
Total	118492	147489

Table 11. Average neto weight of cargo per vehicle crossing Klaipeda Sea to and fro Germany

In tons	2005	2006
To Germany	12,78	12,88
From Germany	14,18	14,20
Total	13,54	13,59

Table 12. Containers flow crossing Klaipeda Sea to and fro Germany [12, 13]

In TEU	2005	2006
To Germany	40596	44116
From Germany	60587	60422
Total	101183	104538

Evaluation of distribution of the cargo flows. The most significant transport flows between Russia and the EU are directed through the central ports of the Baltic Sea (the Gulf of Finland and the Baltic countries). The ground transport route through Byelorussia, Poland and Germany has a very modest role [7, 11]. The significance of this route will not be great in the future either due to barriers caused by the infrastructure and public authority activities in Byelorussia.

Evaluation of cargo flows via Klaipeda and Kalvariju (incl. Lazdiju)

Because there is no data accessible for Klaipeda and Kalvariju it could be calculated on simply proportional basis.

The whole flow F_{WhB} between the so-called Region Berlin and check points Klaipeda&Kalvariju (incl. Lazdiju) could be assumed as:

F_{LtB} – the sum of goods imported and exported from/to Lithuania to/from Region Berlin and

F_{CrB} – Lithuania cross trade flow between the so-called Region Berlin and Latvia, Estonia, Russia and Belarus.

Seeking to estimate cross trade flow is pragmatic to use the proportion between Lithuanian import, export and cross-trade expressed in tons.

Table 13. Import, export and transit by road in Lithuania [12, 13]

In thousand tons	2005	2006
Import Lithuania	2657,0	3164,37
Export Lithuania	3313,8	3705,06
Transit Lithuania	3403,5	4239,97

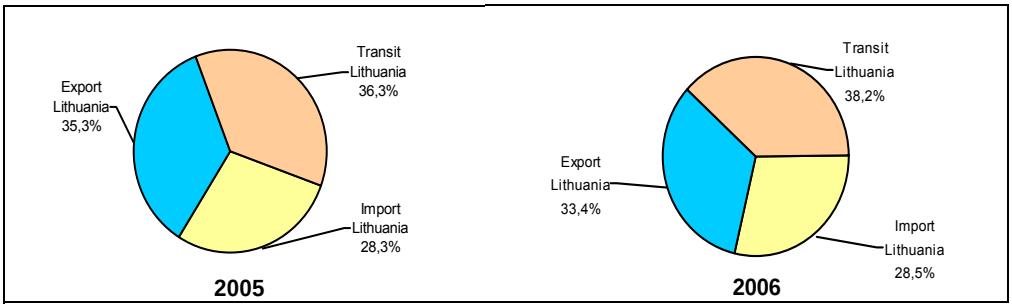

Figure 15. Distribution of international Lithuania related freight flow by road transport [12, 13]

36,3 percent in 2005 and 38,2 percent in 2006 international road traffic flow in Lithuania was transit or cross-trade based.

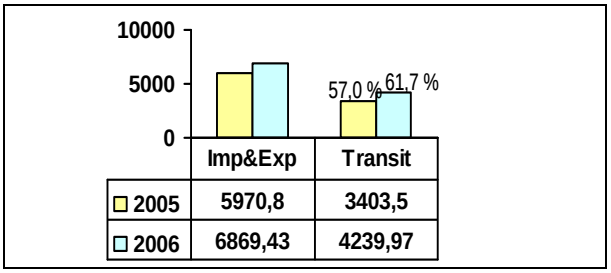

Figure 16. Share of transit comparing to import and export in Lithuania by roads [12, 13]

The share of transit comparing to import and export in Lithuania by roads could be expressed as transit coefficient T_{coef}.

So total freight flow between the so-called Region Berlin and check points Klaipeda&Kalvariju (incl. Lazdiju) in both directions could be expressed as:

$F_{CrB} = F_{LtB}$ x $T_{coef.}$

$F_{WhB} = F_{LtB} + (F_{LtB} \, x \, T_{coef})$

$F_{WhB} = F_{LtB}$ x $(1 + T_{coef})$

Thus

$F_{LtB} = F_{LtBE} + F_{LtBI}$,

where

F_{LtBE} - export from Lithuania to the so-called Region Berlin;

F_{LtBI} – import to Lithuania from the so-called Region Berlin.

Consequently –

in 2005: $F_{LtB} = F_{LtBE} + F_{LtBI}$ = 120,13+38,13 = 158,26 thousand tons;

in 2006: $F_{LtB} = F_{LtBE} + F_{LtBI}$ = 130,72 + 60,01 = 190,73 thousand tons;

in 2005: F_{WhB} = 158,26 x (1+0,570) = 248,47 thousand tons;

in 2006: F_{WhB} = 190,73 x (1+0,617) = 308,41 thousand tons.

And

F_{CrBE} – export from Estonia, Latvia, Russia and Belarus to the so-called Region Berlin via Klaipeda&Kalvariju (incl. Lazdiju);

F_{WhBI} – import to Estonia, Latvia, Russia and Belarus from the so-called Region Berlin via Klaipeda&Kalvariju (incl. Lazdiju);

$F_{CrB} = F_{CrBE} + F_{crBI}$

Evaluated Latvian, Estonian and Belarus export/import proportion to/from the so-called Region Berlin are 7,39/1 in 2005 and 5,38/1 in 2006. Because of big number of Russian crude oil export the Russia export and import was not be taken in to account seeking to avoid an error.

F_{WhBE} – whole flow crossing check points Klaipeda&Kalvariju (incl. Lazdiju) to the so-called Region Berlin

F_{WhBI} – whole flow crossing check points Klaipeda&Kalvariju (incl. Lazdiju) from the so-called Region Berlin.

$F_{WhB} = F_{WhBE} + F_{WhBI}$

$F_{WhBE} = F_{LtBE} + F_{CrBE}$

$F_{WhBI} = F_{LtBI} + F_{CrBI}$

In 2005: F_{CrBE} / F_{CrBI} = 7,39

In 2006: F_{CrBE} / F_{CrBI} = 5,38

In 2005: $F_{CrBI} = F_{CrB} - F_{crBE} = F_{crB} - (7,39 \times F_{CrBI}) = F_{crB} / 8,39 = F_{LtB} \times T_{coef} / 8,39 = (F_{LtBE} + F_{LtBI}) \times T_{coef} / 8,39$ =(120,13+38,13) x 0,570 / 8,39 = 10,75 thousand tons

In 2006: $F_{CrBI} = F_{CrB} - F_{crBE} = F_{crB} - (5,38 \times F_{CrBI}) = F_{crB} / 6,38 = F_{LtB} \times T_{coef} / 6,38 = (F_{LtBE} + F_{LtBI}) \times T_{coef} / 6,38$ =(130,72+60,01) x 0,617 / 6,38 = 18,44 thousand tons

In 2005: $F_{CrBE} = F_{CrB} - F_{CrBI} = F_{LtB} \times T_{coef} - F_{CrBI} = (F_{LtBE} + F_{LtBI}) \times T_{coef} - F_{CrBI}$ = (120,13+38,13) x 0,570 – 10,75 = 79,46 thousand tons

In 2006: $F_{CrBE} = F_{CrB} - F_{CrBI} = F_{LtB} \times T_{coef} - F_{CrBI} = (F_{LtBE} + F_{LtBI}) \times T_{coef} - F_{CrBI}$ = (130,72+60,01) x 0,617 – 18,44 = 99,24 thousand tons

In 2005: $F_{WhBE} = F_{LtBE} + F_{CrBE}$ = 120,13 + 79,46 = 199,59 thousand tons

In 2006: $F_{WhBE} = F_{LtBE} + F_{CrBE}$ = 130,72 + 99,24 = 229,96 thousand tons

In 2005: $F_{WhBI} = F_{LtBI} + F_{CrBI}$ = 38,13 + 10,75 = 48,88 thousand tons

In 2006: $F_{WhBE} = F_{LtBI} + F_{CrBI}$ = 60,01 + 18,44 = 78,45 thousand tons

The next task is to analyse the freight flow distribution between Klaipeda and Kalvariju (incl. Lazdiju). Two Ro-Ro ferry lines are operated by DFDS Lisco Company: (a) Klaipeda-Kiel and (b) Klaipeda-Sassnitz.

Table 14. Lithuanian-Germany Ro-Ro freight

	2005	2006
In loading meters [8]		
Klaipeda-Kiel	718161	870451
Klaipeda-Sassnitz	54257	66122
Total	772418	936573
Average number of loading units		
Klaipeda-Kiel	43525	52755
Klaipeda-Sassnitz	3288	4007
Total	46813	56762
Average netwt (net weight) of freight in cargo vehicles in thousand tons		
Klaipeda-Kiel	587,59	717,46
Klaipeda-Sassnitz	44,39	54,50
Total	631,98	771,96

According to calculation of loading meter by DFDS Lisco, trailer is equate to 14 loading meters, and the truck&trailer is equate to 17 loading meters. The share of trailers without truck is 15-20 %. So the average length of transport unit is 16,5 meters.

Table 15. Total Ro-Ro freight loaded/unloaded in cargo vehicles in Klaipeda [12, 13]

	2005	2006
In thousand tons (without vehicles weight)		
Loaded	694,8	876,8
Unloaded	909,4	1127,8
Total	1604,1	2004,5
In units (vehicles)		
Loaded	54346	68059
Unloaded	64146	79430
Total	118492	147489
Average weight per unit (in tons)		
Loaded	12,8	12,9
Unloaded	14,2	14,2
Total	13,5	13,6

Table 16. Ro-Ro freight loaded/unloaded in cargo vehicles in Klaipeda in Sassnitz link

	2005	2006
Total Ro-Ro freight from Klaipeda	43 %	44 %
Total Ro-Ro freight to Klaipeda	57 %	56 %
Klaipeda-Sassnitz total	44,39	54,50
From Klaipeda	19,09	23,98
To Klaipeda	25,30	30,52

The evaluation of distances and routing peculiarities as well as notes of transport operators let us to formulate assumption that the flow via Sassnitz is related to the so-called Region Berlin. The flow via Kiel is related to the are outside the so-called Region Berlin. So having common freight flow from and to the so-called Region Berlin via Klaipeda and Kalvariju (incl. Lazdiju) and having separated freight flow via Klaipeda we calculated the part of flow via Kalvariju (incl. Lazdiju).

F_{KlBE} – flow crossing check point Klaipeda to the so-called Region Berlin,
F_{KlBI} – flow crossing check point Klaipeda from the so-called Region Berlin,
F_{KaBE} – flow crossing check point Kalvariju (incl. Lazdiju) to the so-called Region Berlin,
F_{KaBI} – flow crossing check point Kalvariju (incl. Lazdiju) from the so-called Region Berlin.
$F_{WhBE} = F_{KlBE} + F_{KaBE}$
$F_{WhBI} = F_{KlBI} + F_{KaBI}$
In 2005: $F_{KaBE} = F_{WhBE} - F_{KlBE}$ = 199,59 – 19,09 = 180,50 thousand tons
In 2006: $F_{KaBE} = F_{WhBE} - F_{KlBE}$ = 229,96 – 23,98 = 205,98 thousand tons
In 2005: $F_{KaBI} = F_{WhBI} - F_{KlBI}$ = 48,88 – 25,30 = 23,58 thousand tons
In 2006: $F_{KaBI} = F_{WhBI} - F_{KlBI}$ = 78,45 – 30,52 = 47,93 thousand tons

Conclusions

The so-called Region Berlin is defined as territory of three Federal Land of Germany – Berlin, Brandenburg and Mecklenburg-Vorpommenrn. The freight flow via check point Kalvariju is assumed as freight flow via cross border points Kalvarijų as well as Lazdiju.

Freight flow **via Klaipeda port and Kalvariju** check point (incl. Lazdiju) **to the so-called region Berlin** defined as destination point in which freight has been unloaded is as follows:
in 2005 – 199,59 thousand tons (**14,78 thousand trailers annually, ~40 per day)**;
in 2006 – 229,96 thousand tons **(16,91 thousand trailers annually, ~46 per day).**

Freight flow **via Klaipeda** port **to the so-called region Berlin** defined as destination point in which freight has been unloaded is as follows:
in 2005 – 19,09 thousand tons (**1,41 thousand trailers annually, ~4 per day)**;
in 2006 – 23,98 thousand tons (**1,76 thousand trailers annually, ~5 per day)**.

Freight flow **via Kalvariju** check point (including Lazdiju) **to the so-called region Berlin** defined as destination point in which freight has been unloaded is as follows:
in 2005 – 180,50 thousand tons (**13,37 thousand trailers annually, ~36 per day)**;
in 2006 –205,98 thousand tons (**15,14 thousand trailers annually, ~41 per day)**.

Freight flow **via Klaipeda port and Kalvariju** check point (incl. Lazdiju) **from the so-called region Berlin** defined as origin point in which freight has been loaded is as follows:
in 2005 – 48,88 thousand tons (**3,62 thousand trailers annually, ~10 per day)**;
in 2006 – 78,45 thousand tons (**5,77 thousand trailers annually, ~16 per day)**.

Freight flow **via Klaipeda** port **from the so-called region Berlin** defined as origin point in which freight has been loaded is as follows:
in 2005 – 25,30 thousand tons (**1,87 thousand trailers annually, ~5 per day)**;
in 2006 – 30,52 thousand tons (**2,24 thousand trailers annually, ~6 per day)**.

Freight flow **via Kalvariju** check point (including Lazdiju) **from the so-called region Berlin** defined as origin point in which freight has been loaded is as follows:
in 2005 – 23,58 thousand tons (**1,75 thousand trailers annually, ~5 per day)**;
in 2006 – 47,93 thousand tons (**3,52 thousand trailers annually, ~10 per day)**.

Seeking to check results the NEA Consulting Company was asked to provide freight flow in axe Kalvariju-Berlin. In year 2004 the flow in both directions consisted of 2,7-2,9 million tons (~**200 thousand trailers**). According to our calculation, the flow in axe Kalvariju-Berlin that are loaded and unloaded in the so-called Region Berlin consists of 248,47 thousand tons (**18,4 thousand vehicles**) in 2005 and 308,51 **(22,7 thousand vehicles)** in 2006. Consequently the share from **9 to 11** percent of freight flow in road axe Kalvariju-Berlin is **loaded and unloaded in the so-called region Berlin**. About 90 percent of that flows are originated or destinated in other Federal Lands of Germany as well as in Belgium, Luxemburg, Netherlands, North France, Spain, Portugal.

The existing freight flow between Kalvariju and Klaipeda cross border check point and the so-called Region Berlin is not enough for ferry line Klaipeda-Swinoujusce (**62 vehicle per day in both directions**).

The potential freight flow for ferry line Klaipeda-Swinoujusce is much wider than the flow crossing Kalvariju check point and Klaipeda Seaport. It is important to evaluate the Russian and Belarus cargo on corridor II and freight which goes through neighbouring ports. Also attention should be paid on that fact, that the view to the **so-called Region Berlin as destination point is too narrow**. The freight could be delivered to other regions of Germany by Klaipeda-Swinoujusce ferry line, as well as to Berlin Region. The analysis of prices, time of delivery should be done for transit concept "Polen vs. Baltic Sea".

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