Security Improvement Potential of Rail Baltica Investment

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1. Introduction

Buchhofer (1995) forecasted that in Baltic States (Estonia, Latvia and Lithuania) railways are about to lose their volume for road transports, and particularly in freight this is about to happen. He was correct in this suggested scenario, with assumptions to make this were also interesting. He showed with statistics that roads were in much better condition after Soviet era than rails. Volumes at roads have grown thereafter enormously (Ojala et al., 2005; Kovacs & Spens, 2006; Hilmola, 2011). Buchhofer (1995) also argued that in Baltic States only one north-south corridor would exist, and this is Rail Baltica. Kovacs & Spens (2006) continued Buchhofer's research with extensive literature review from occurred changes during decade time period. They concluded that road took very significant position in this time period, but its sustainability is big question mark, since maintenance and investments to roads have been minimal (compared to volume growth). Kovacs & Spens (2006) did not see big potential in rail based solutions, and were a bit doubtful for the realization of Rail Baltica project, as it is in the 27th place in TEN-T priority list of EU's railway / road projects.

Theme of road transports has continued recently (Keshkamat et al., 2009; Komornicki & Miszczuk, 2010); interestingly Keshkamat et al. (2009) saw that it would be vital to have Rail Baltica line near-by Via Baltica road to enable intermodality in regions. Among this Keshkamat et al. (2009) revealed that route of Poland for Rail Baltica (or in article analyzed Via Baltica) is not simple question as major green areas of Poland exist in north-east region (four national parks, 12 landscape parks and 10 national reserve areas). Especially authors saw going through Bialystok as problematic item (and eventually making journey longer). However, from spatial economics perspective, large-scale implementation of infrastructure investments in this area of Poland are seen vital, since it is poorest region in the country (Komornicki & Miszczuk, 2010) with low value added per employee. In recent years due to EU and Schengen area enlargement, traffic to Belarus and Ukraine has decreased considerably (trucks and passengers), but on the other hand Lithuanian (Baltic) traffic is on significant and continuous increase.

Komornicki & Miszczuk (2010) estimate this to have been approx. 4000 trucks per day between Poland and Lithuania in year 2007. It no wonder that Laisi and Saranen (2013) argued based on city/town level interviews (upper management) in Baltic States (theme was possible effects and drivers of Rail Baltica) that especially in Lithuania expectation for freight was high, while going to up north, the importance of passenger transport increased. This only the view inside of Latvia and Estonia, that only passenger transports side have volume up north, while private sector in Finland and North-West Russia sees Rail Baltica as attractive alternative, if realized (Henttu et al., 2012; Karamysheva et al., 2013).

Even if investments have been made in the road infrastructure (Schwab, 2011 & 2013), it is in poor shape within international rankings in e.g. Latvia and Poland. General cargo transported in roads is heading to east, and typically Russia and its capital, Moscow. However, road condition does not get any better in this eastern end. This even in the current situation, where significant improvements have been made on road network. Road maintenance also takes a huge share of budget in e.g. Poland (PKP PLK, 2011), and can be really caveat within long term.

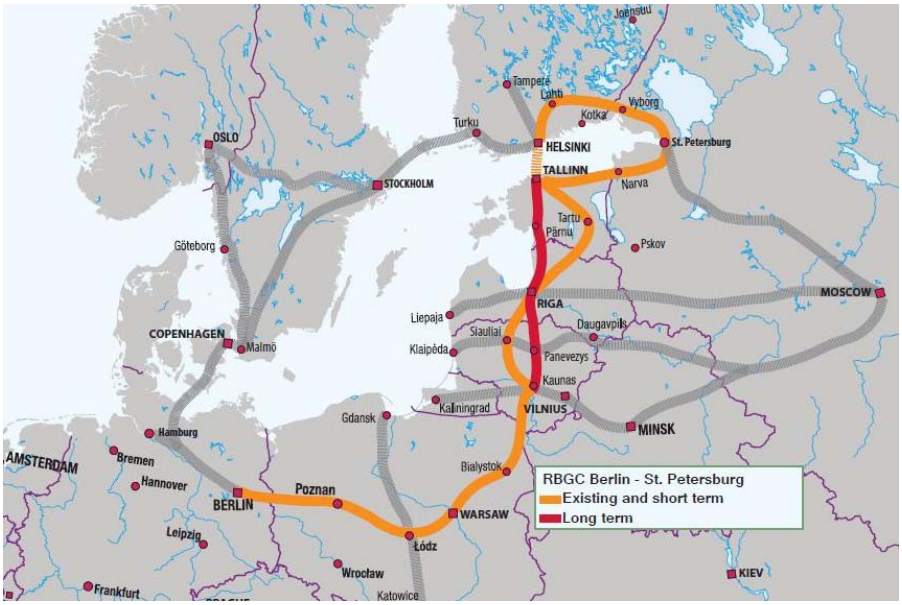

Figure 1. Rail Baltica alignment using old route (yellow) and plan for totally new straight railway line (red). Source: Karttakeskus Oy/Aalto University, Cemat

During the years we have witnessed numerous investment calculations and cost benefit analyses (CBA) from Rail Baltica connection. Jonaitis & Butkevicius (2005) argue that in business wise investments required in Lithuanian soil are simply unprofitable, but encouragingly Bröcker et al. (2010) argue that overall investment is well justified, if EU wide and societal issues are taken into account. Bröcker et al. (2010) even conclude that Rail Baltica is one of the few projects (similarly to European Commission, 2007), which will without a doubt increase the wealth in its influence area (using existing railway networks, which make it a bit longer as compared to direct option, see Figure 1). On the downside, Rail Baltica is having very low "spillover" effects on larger areas or other within longer distance existing European Union countries. Position and argumentation of lower priority role of Rail Baltica (e.g. Kovacs & Spens, 2006) comes in odd light based on these more fresh, independent and neutral calculations. European Union and Baltic States have made several own ordered studies from Rail Baltica profitability in society. Most recent AECOM (2011a & 2011b) study argued it to be profitable within different CBA calculations, and coefficient was 1.75. AECOM recommends direct alignment through Baltic States (see Figure 1) – this serves lead time performance, which is critical for both passengers and freight, and key to societal benefits. Direct alignment also supports intermodality as main international road, Via Baltica, is in close proximity (Keshkamat et al., 2009).

In this chapter we are interested to build foresight with thorough analysis of second hand statistics on multimodal security in Rail Baltica alignment, connecting Tallinn, Estonia to Warsaw, Poland. Current multimodality is basically unused or not used at all, since Baltic States and Poland do not have official and operating international passenger train connection. Only domestic trains end in the border areas, and these are tried to be optimized to serve also international transports. However, travel times are really long, and average speeds occasionally go above biking speed with this option (Hilmola, 2011; Lüttmerding and Gather, 2013). Also frequency of passenger trains is one of the lowest in the whole Europe. Situation is similar in freight side. Mostly railways carry domestic or international raw materials, and all the rest is given to road (general cargo). So, any real-life case study from the use and potential (passenger or freight) of new railway alignment is impossible to have. Therefore, we have built this chapter in a manner that

situation and multimodal cargo security is observed from the number of different angles, and mostly relying on secondary statistics. This to reveal weaknesses in current transportation system based on road transports, and to discuss points, where Rail Baltica investment could make the difference. However, this chapter also utilizes past projects of the author, which have dealt topic of Rail Baltica from different point of views, and research projects have been executed with various consortiums.

Already in year 1999 Baltic States, and Poland four years earlier (1995), became the members of the World Trade Organization. Baltic States countries are also all members of the European Union (joined 2004 as full members), and they also belong to military alliance Nato (since 2004). Poland is having similar status, with the only exception that Nato membership became effective five years earlier, during year 1999. Even if Baltic States and Poland are members of European Union, they are not all part of Euro currency area. Actually during year 2013 only Estonia was part of common currency, and from year 2014 onwards Latvia will join European currency system. Lithuania and Poland still hold national currencies, although, in Lithuanian case currency valuations are tightly coupled on Euro (and fluctuations are not great, at least in the last decade time period). In case of Poland this can not be said, and currency valuation fluctuations have existed in the past. All the above mentioned means that transportation sector regulation and norms follow closely decisions made in European Union as directives. Guidelines of Brussels are just converted to national legislation. Also being Nato member, together of sharing borders with non-EU countries, means that border control is tightly regulated to non-EU countries with best possible technical equipment (like x-rays as well as detectors of chemicals and radioactive material). However, please do note that inside of EU area (Schengen EU area, nearly all EU countries belong to it), freight and passenger movements are not under constant and direct control (only in cases of emergency or security threats, old style practices are applied, if needed).

This Chapter is structured as follows: In Section 2 transportation sector development in Baltic States is being analyzed within long term from both viewpoints, passengers and freight. This is followed in Section 3, where mostly fatalities at road are being analyzed in these countries. Comparison is made to neighbourhood as well, and analysis is also

made from the Rail Baltica alignment area regarding both fatalities and injuries. In Section 4 economically challenging situation within national accounts and dependency of oil are being discussed. Railway security and control are introduced through lack of implementation of European level agreed standards in Section 5. Threats of crime are analyzed based on international studies in Section 6. After this in Section 7 potential of road transport to continue its growth is analyzed by measures of private car intensity and amount of trucks serving freight segment as well as readiness of railway sector to take care of south-north general cargo transports. Chapter is concluded in Section 8.

2. Transportation Sector Characteristics and Change in Baltic States and Poland

During Soviet era all Eastern Europe was operated through rail based transportation systems, and of course most of the freight movements were related to raw materials and military items. People did not have access to automobiles and individual consumer was not the key factor in economy by anyhow. Therefore public transport, and namely the use of railway was basically only viable alternative (together with bus in some routes). After this, situation has changed to completely opposite, and current style favours road transports, and this in both freight and passenger segments. As implication of this change was the demand collapse of railway transports in the early 90's (concerning both, passengers and freight; see e.g. Blackshaw and Thompson, 1993; Tanczos, 1999; Lukasiak, 2001), and substitute for this was earlier mentioned road transports (Baltic States, see Buchhofer, 1995).

For long term change in freight side, please see growing market share of road transports in Figure 2. All examined countries record clear market share growth in the observation period, but very recently this growth has started to a bit slow down (and graphs show leveled off development). Situation is similar in passenger transports and Figure 3 – private car use is currently at level of 80-90 % from passenger transports in all examined countries and has long term growth component involved in every case.

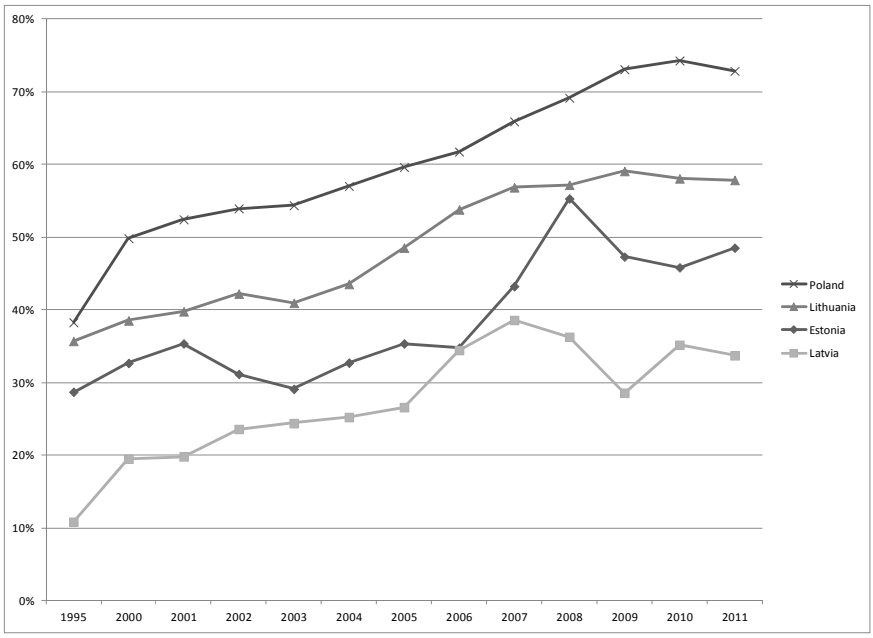

Figure 2. Market share of road transports from hinterland freight transports in three Baltic States and Poland. Source (data): European Union – Eurostat (2013)

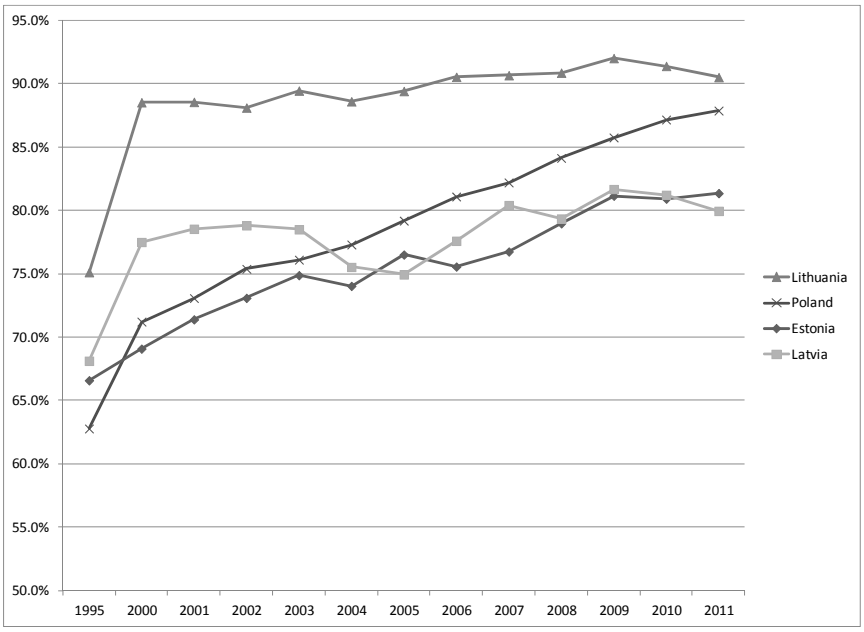

Figure 3. Market share of private car use from passenger transports in three Baltic States and Poland. Source (data): European Union – Eurostat (2013)

Baltic States and Poland have both been extreme examples from road freight transportation growth within period of 1995-2008/2009, and it has been ranging from 200-300 % (e.g. see Komornicki & Miszczuk, 2010). In Poland growth has progressed

without any delay, even if crisis year 2009 severely affected nearly all other aspects of transportation systems globally. Change in road freight is illustrated in Figure 4, from where could be detected quadrupling of transportation activity from base year 1995. Baltic States have not progressed that differently as transportation volume was 4.6 times higher in year 2011 than in base year. However, growth in Baltic States was much brisker before the crisis, and road freight experienced 23 % decline during 2008-2009 crisis time. Even this large-scale decline, and growth back to year 2008 level in four years later, Baltic States is still recording higher growth than Poland. Reason for growth could be detected to international transports as manufacturing base in Baltic States is limited.

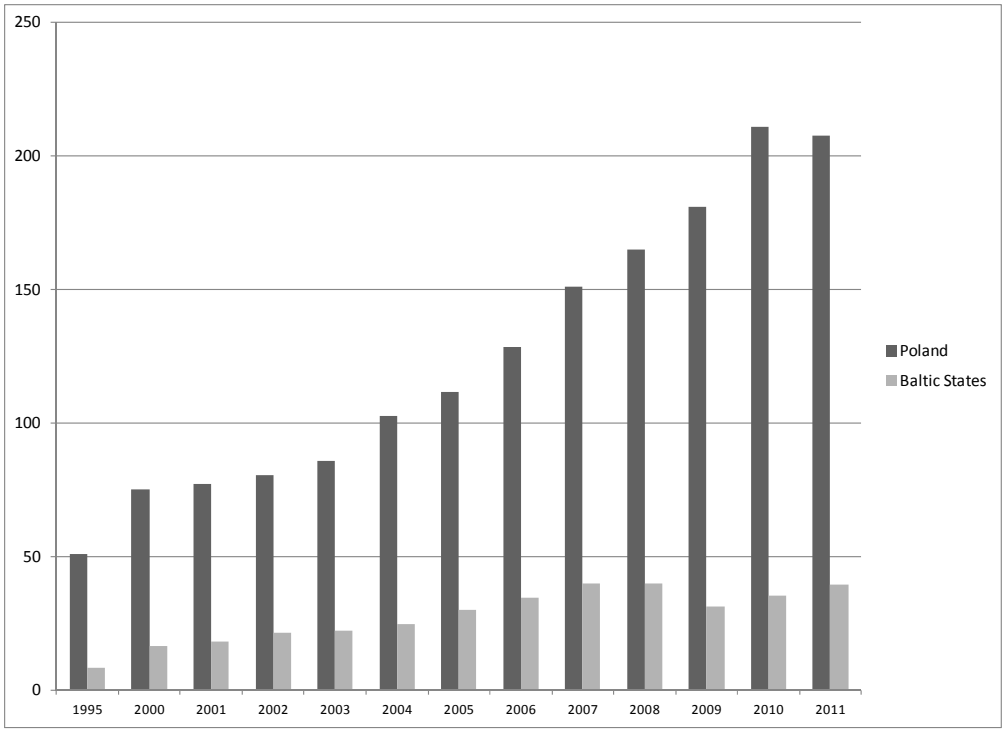

Figure 4. Road freight transport (1000 mill. tonkms) in Poland and three Baltic States during period of 1995-2011. Source (data): European Union – Eurostat (2013)

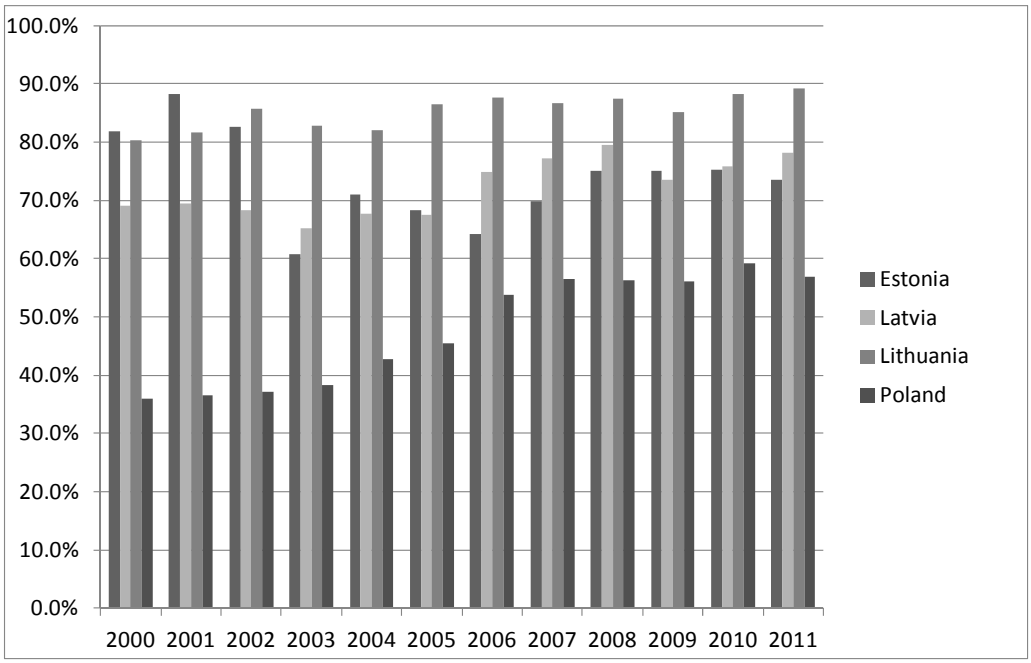

Figure 5. International road transport from total road freight transport tonkms in Baltic States and Poland during years 2000-2011. Source (data): European Union – Eurostat (2013)

Even if Polish international road freight share has increased from 36 % in year 2000 to approaching 60 % in the last observation years, situation is one or even two steps further developed in Baltic States. Currently Estonia is having well above 70 % share of international transports as Latvia is approaching 80 % mark and Lithuania is really close of 90 %. As Figure 5 shows, at typical international transport share is in growth track, and in growing road freight volumes this means that international transports is growing with double speed as compared to domestic transports (e.g. in Poland during period of 2000-2011 it has more than quadrupled, and in Latvia as well as Lithuania approx. tripled). Only exception is Estonia ("only" 35 % growth in period of 2000-2011), but this only with limited number of sub-periods in Figure 5 – years 2000 to 2008/2009 were a bit difficult time (even period of 2000-2011), but again in longer-term observation period (base year 1995 and year 2011 as last observation point) growth is higher than domestic transports.

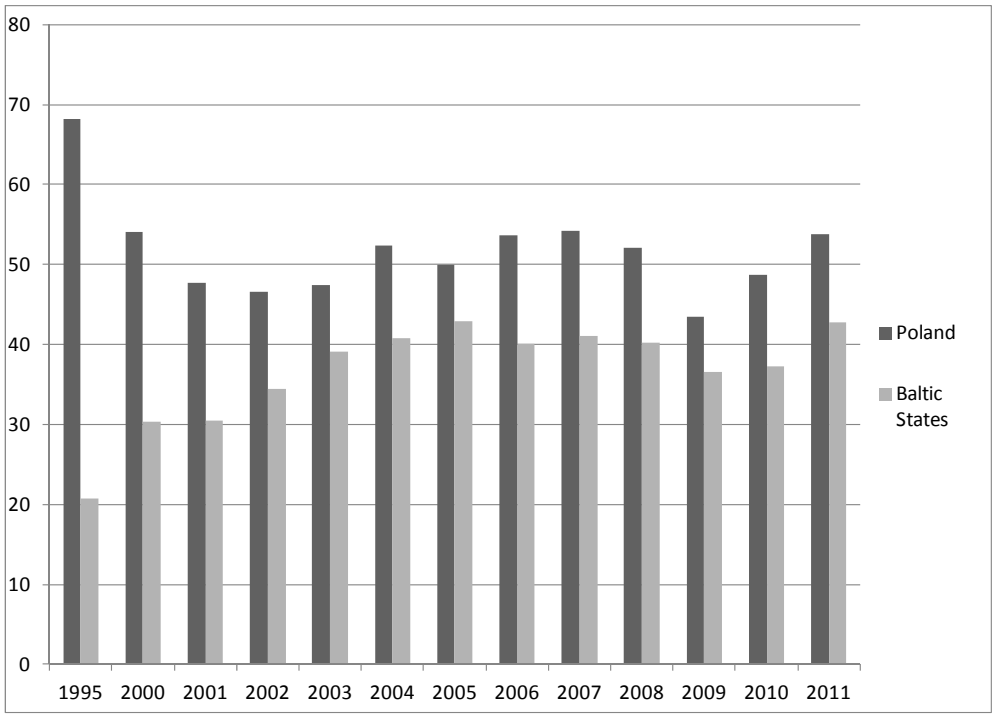

Figure 6. Railway freight transport (1000 mill. tonkms) in Poland and three Baltic States during period of 1995-2011. Source (data): European Union – Eurostat (2013)

Weakness of railway sector demand collapse is still present in Polish railway freight markets as shown in Figure 6. Freight volumes of year 2011 are still 21 % lower than in base year 1995. In comparison, Baltic States were able to utilize their valuable hinterland position in raw material transports from east (Russia, Belarus and Ukraine), and after demand collapse of early 90's, volumes increased rather rapidly and also efficiently (Hilmola, 2007). They are actually double nowadays to base year level. Of course political situation with neighbour countries and world market changes in raw material prices as well as the construction of own logistics capacity by Russians have caused fluctuations and leveled off development in the nine year period of 2003-2011.

Examining situation of sea ports gives support for hinterland transport outlook in the sustainability of volumes concerning forthcoming years. As Table 1 illustrates, sea ports in Poland and Baltic States are relatively small in size as e.g. compared to northern neighbour at Baltic Sea, Finland. Except of Latvia, all Finnish sea ports handle roughly 1.7-2.3 times more cargo than sea ports of these countries of interest. Typically Polish

and Baltic States sea ports are strong in raw material handling of dry bulk and liquid bulk (e.g. Hilmola, 2011). These are in most cases transported to sea ports by freight trains, which will mean that railway freight remains as relatively strong in the future (as e.g. year 2012 sea port handling is examined). As checking container handling, Finland (Finnports, 2013) is still outperforming individually both, Polish sea ports (Central Statistical Office of Poland, 2013) and Baltic States (Port of Klaipeda, 2013). Difference is getting smaller, but it still exist. Larger container transportation flows would mean that hinterland transports by road would decline as direct shipments by road from hub sea ports of Germany and Netherlands would decline. Own sea port handling in turn would mean shorter road freight legs or even using railways in hinterland transports to inland terminals. Basically sea port handling growth for containers in the forthcoming years will show what the state of road freight growth is. Short sea shipping at Baltic Sea is getting dearer, e.g. after stiff IMO sulphur regulation change during early 2015, and this could give advantage again back to road freight (Kalli et al., 2009; Delhaye et al., 2010).

Table 1. Sea ports freight handling in Poland, Baltic States, and Finland during years 2001, 2008, 2009, 2011 and 2012. Source: Statistics Estonia (2013); Statistics Lithuania (2013); Central Statistical Bureau of Latvia (2013); Central Statistical Office of Poland (2004); Statistical Office of Szczecin (2009); Central Statistical Office of Poland (2013); Finnports (2013)

Country	Tons (2001)	Tons (2008)	Change	Tons (2009)	Change	Tons (2011)	Change	Tons (2012)	Change
Poland	46210	54558	18.1%	49760	7.7%	57738	24.9%	58825	27.3%
Lithuania*	22359	38950	74.2%	36255	62.1%	45527	103.6%	43762	95.7%
Latvia	56918	63649	11.8%	61980	8.9%	68821	20.9%	75193	32.1%
Estonia	41317	36217	-12.3%	38470	-6.9%	48457	17.3%	43519	5.3%
Finland	89904	108488	20.7%	89598	-0.3%	109845	22.2%	102224	13.7%

'* Lithuanian sea port handling is showing a bit higher growth rates as oil is not any longer transporter to refinery by pipeline system (some small part could have been transported with railways). Basically sea port handling is having 10 mill. tons higher volume therefore (as compared to year 2001).

Story with passenger transports repeats that of freight (see Figure 7). Only exception is that in Poland private car use has continued to grow, even in the most recent years. Growth to base period is 2.8 times during year 2011. In comparison Baltic States have grown in same period 1.8 times larger in passenger car use. However, change in growth trajectory has taken place very recently. If observation period in private car use would

be limited to 1995-2007, then Baltic States would have shown higher rate as compared to Poland. Economic crisis was so severe in Baltic States that it reduced private car use significantly (approx. -20 % during years 2007-2011), and this decline is still on-going. Oppositely in Poland growth only increased from year 2007 during the year 2008, and has recorded growth thereafter, even if global financial crisis effects are detected in nearly everywhere else with struggling growth rates. However, it should be noted that Baltic States are not homogenous group in passenger car use after the crisis – in Estonia volumes have sustained, where Lithuania (-23.5%), and especially Latvia (-28.9%), have recorded severe declines.

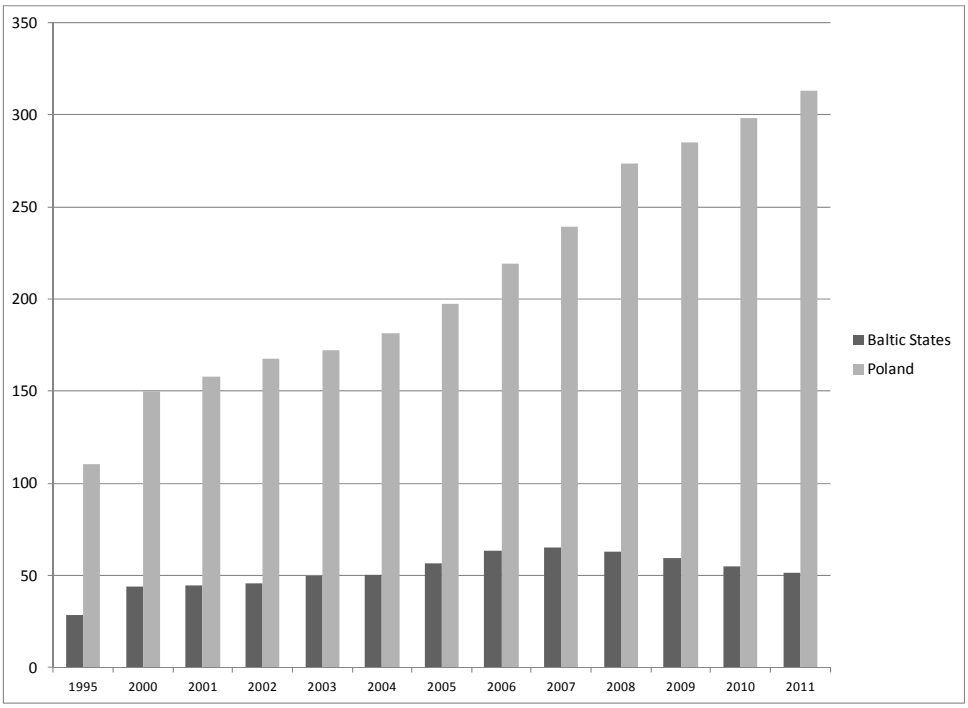

Figure 7. Private car passenger transport (1000 mill. passkms) in Poland and three Baltic States during period of 1995-2011. Source (data): European Union – Eurostat (2013)

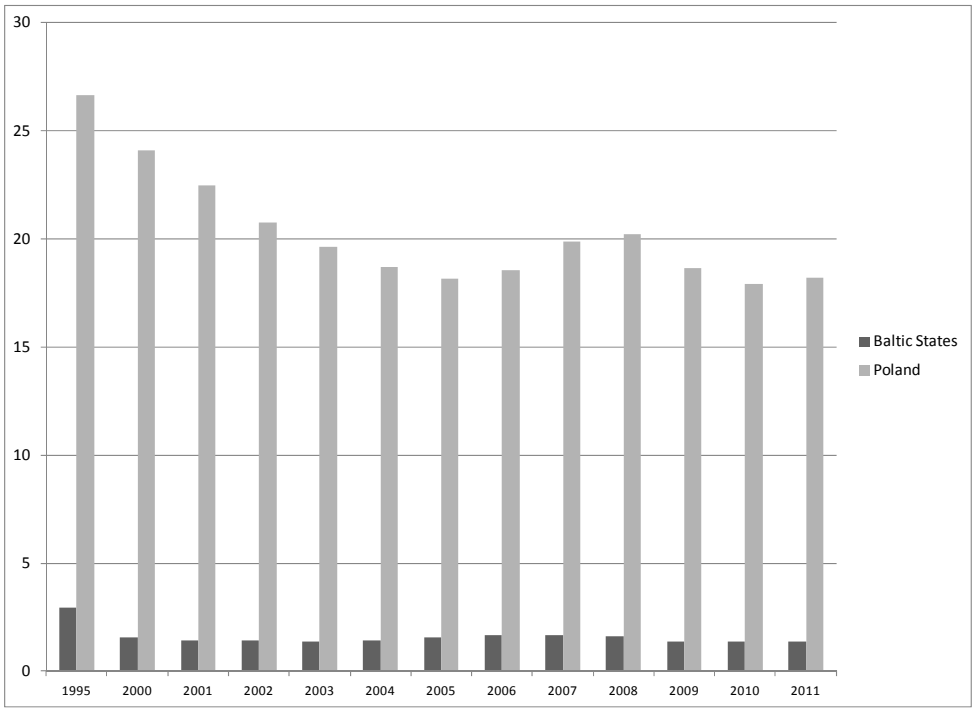

Figure 8. Railway passenger transport (1000 mill. passkms) in Poland and three Baltic States during period of 1995-2011. Source (data): European Union – Eurostat (2013)

Railway passenger transport is consistently sad story in all examined countries. As Figure 8 is examined in details, no upswing or tendency to greater volumes is being present. Both Baltic States and Poland are at moment recording lowest possible performance in at least two decades time. Situation is the most challenging in Lithuania, where only one third of railway passenger volumes are left as compared to base year 1995. In railway use Estonia is strongest from Baltic States countries (57.9 % left from year 1995 vol.), followed by Latvia (54.1 % from year 1995 vol.). Poland still has some advantage over these three as decline from base year has been roughly one third.

As a final conclusion from Baltic States and Poland we could state that current freight and passenger transports are increasingly and tightly coupled to road. Even if this sounds like feasible, fast and flexible arrangement, it has its downside. All of these countries are really dependent on oil imports, and increased trade deficit for oil producers from respective countries (due to scarcity of oil and price hike caused by it; Sandalow, 2008; from peak oil see, Maggio and Cacciola, 2009). If oil price continues

to be high, it is very difficult for these countries to sustain trade account performance. Actually deficits e.g. in Baltic States have increased simultaneously after crisis year – hand in hand with transportation volume recovery and oil price hike in global markets (see Hilmola, 2013). Even if Poland is great success story for attracting manufacturing units to its territory, its trade account is still hardly showing surplus.

3. Fatalities of Transportation in Baltic States and Poland

From earlier research and general press articles it is known that in Eastern Europe safety of road transportation is great challenge (Marquez & Bliss, 2013). This was verified with the analysis of main Rail Baltica countries of interest, namely Estonia, Latvia, Lithuania and Poland. Although situation is still challenging, it has improved over the years. As illustrated in Figures 9 and 10, fatalities have declined in Baltic States and Poland impressively; in former general improvement is approx. 75 % reduction in period of 23 years (in year 2012 in total 565 persons died), while in case of Poland level is now roughly half from year 1990 (in year 2012 in total 3577 persons died). Even if improvement sounds like remarkable, difference to neighbour countries, like Germany (4152 died in year 2009), Sweden (355 died in year 2009) and Finland (255 died in year 2012) is apparent (European Union – Eurostat, 2013). Based on Eurostat difference scaled to the amount of population is roughly three times, if comparison is made to safety leader of comparison countries, Sweden. If comparison is made to Finland, four Rail Baltica countries are on the average twice as dangerous as northern neighbour. However, it should be remembered that all former Soviet bloc countries still carry heritage from the past – situation with fatalities in Russia (scaled to population) is still much higher than in Poland, nearly double based on official statistics (Russia in Figures, 2012).

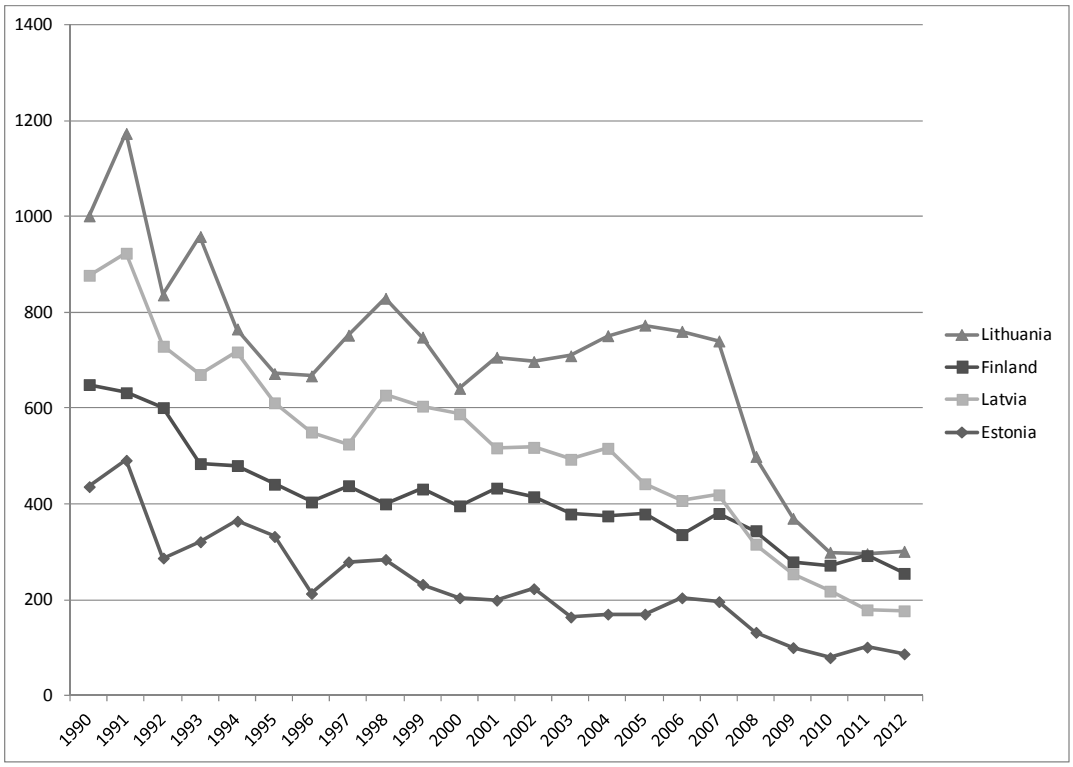

Figure 9. Fatalities of Road Transport in each Baltic States individually and in Finland. Source: Statistics Estonia (2013); Central Statistical Bureau of Latvia (2013); Statistics Lithuania (2013); Lithuanian Road Administration (2013); Statistics Finland (2013)

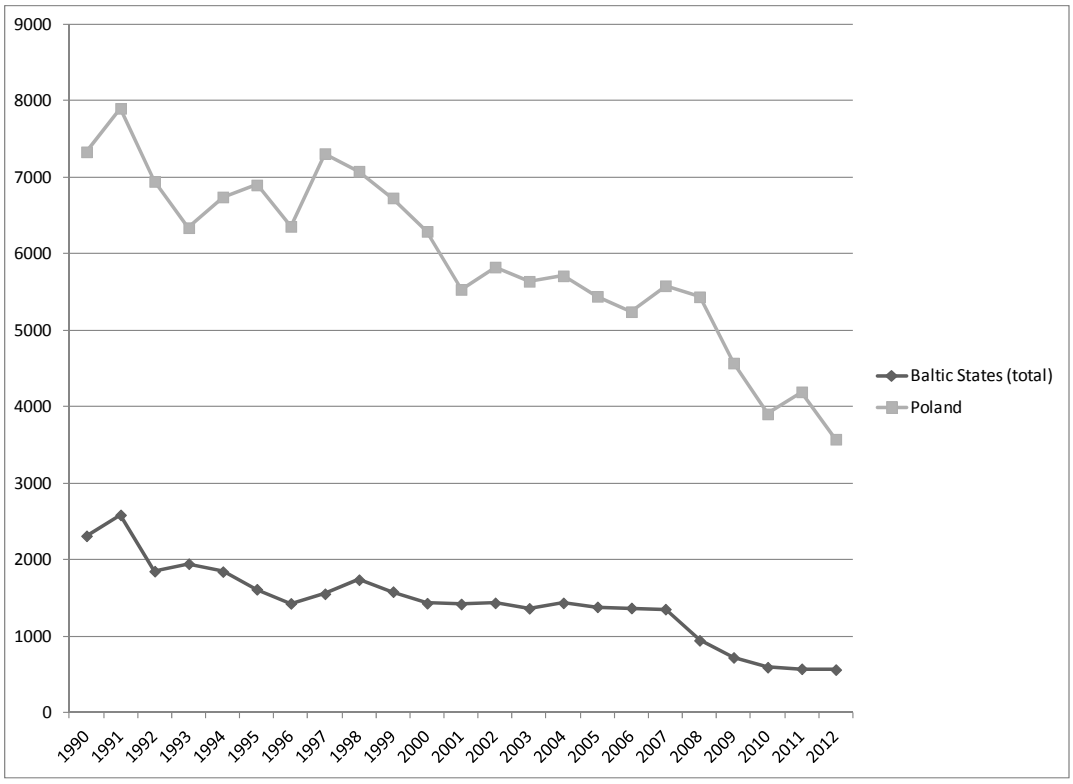

Figure 10. Fatalities of Road Transport in Baltic States and in Poland. Source (data): Statistics Estonia (2013); Central Statistical Bureau of Latvia (2013); Statistics Lithuania (2013); Lithuanian Road Administration (2013); Statistics Finland (2013); European Union – Eurostat (2013); Statistical Office in Szczecin (2013)

From the viewpoint of fatalities, global recession started in years 2008-2009 improved significantly road safety, this especially in all Baltic States (all recorded decline in deaths of more than 55 % as year 2012 is compared to year 2007 level). Of course from earlier analysis it is known, that volumes in freight transportation at roads as well as private car use have declined in these countries. This must be one reason, however, second reason might be the more careful driving due to economically hard times, and high gasoline prices. Nowadays fuel costs take significant part from trucking company costs as well as from individual employee earnings. It could be argued that in the case of Poland, where road transports at freight side, and particularly individuals using cars, continued to grow without any interruption – reduction is 35.9 % to year 2007. So, it could be assumed that at least one third from improvement in lower amount of fatalities was due to declining volumes in Baltic States. Fuel prices have had same effect in Poland to trucking companies as well as to private persons. Of course economically

Poland survived much better from global credit crunch, and therefore they did not have that many unemployed persons. In Baltic States unemployment during year 2011 increased to abnormally high, roughly to 17-20 % area.

Table 2. Fatalities in the areas / districts within current Rail Baltica alignment (Tallinn-Warsaw railway route, Rail Baltica). Source (data): Statistics Estonia (2013); Central Statistical Bureau of Latvia (2013); Statistics Lithuania (2013); Statistical Office in Szczecin (2013)

Country	Area / District	2005	2006	2007	2008	2009	2010	2011	2012
Estonia	Harju county	47	56	65	33	25	22	28	26
	Pärnu county	15	16	11	17	8	3	6	9
	Rapla county	9	12	13	1	3	4	6	4
Total	Estonia	71	84	89	51	36	29	40	39
Latvia	Bauska district	13	10	11	8				
	Limbazi district	7	10	12	11				
	Riga district	88	61	82	48				
Total	Latvia	108	81	105	67				
Lithuania	Kaunas county					77	43	49	54
	Marijampole county					25	34	29	26
	Panevezys county					37	39	34	26
	Siauliai county					33	29	25	23
Total	Lithuania					172	145	137	129
Poland	Podlaskie						146	152	131
	Mazowieckie						655	712	587
Total	Poland						801	864	718
Total		179	165	194	118	208	975	1041	886
Total	As Latvia's year 08 is used						1042	1108	953
Total	As Latvia's aver. from years 05-08 is used						1065.3	1131.3	976.3

Table 3. Injuries in the areas / districts within current Rail Baltica alignment (Tallinn-Warsaw railway route, Rail Baltica). Source (data): Statistics Estonia (2013); Central Statistical Bureau of Latvia (2013); Statistics Lithuania (2013); Statistical Office in Szczecin (2013)

Country	Area / District	2005	2006	2007	2008	2009	2010	2011	2012
Estonia	Harju county	1136	1197	1081	828	670	607	723	729
	Pärnu county	210	262	266	189	143	162	141	89
	Rapla county	102	85	138	78	69	58	44	40
Total	Estonia	1448	1544	1485	1095	882	827	908	858
Latvia	Bauska district	114	94	113	125				
	Limbazi district	75	86	114	121				
	Riga district	589	496	691	660				
Total	Latvia	778	676	918	906				
Lithuania	Kaunas county					1213	1060	722	642
	Marijampole county					324	349	300	278
	Panevezys county					358	424	396	374
	Siauliai county					466	420	423	441
Total	Lithuania					2361	2253	1841	1735
Poland	Podlaskie						1125	1006	970
	Mazowieckie						6339	6148	5354
Total	Poland						7464	7154	6324
Total		2226	2220	2403	2001	3243	10544	9903	8917
Total	As Latvia's year 08 is used						11450	10809	9823
Total	As Latvia's aver. from years 05-08 is used						11363.5	10722.5	9736.5

Country wide statistics is one way to observe safety and security aspect of new railway investment, but going deeper to local areas and districts from where railway connection Rail Baltica is planned to operate, gives much better view. From all, except Latvia, we got up to date statistics from fatalities (Table 2) and injuries (Table 3). It is difficult to say from overall development as Latvian statistics are lacking, but in general during three observation years 2010-2012 slowly improving situation at road safety and security was recorded. It could be estimated that during year 2012 amount of fatalities was slightly below 1000, while injuries were ten times higher (just below 10,000). Within total amounts primary cause for both fatalities and injuries is Poland and district (voivodship) around Warsaw, Mazowieckie. From Baltic States highest absolute amounts are recorded in Kaunas, whether we talk about fatalities or injuries. However, other Lithuanian counties do not show that good performance either. Actually in Panevezys county injuries have clearly increased during four year observation period as in Marijampole county deaths have slightly increased. Similar development could be found from Harju county of Estonia, where both fatalities and injuries have increased in the same observation period.

4. Oil Dependency at National Accounts

Together with accidents and really undesired effects of fatalities and injuries, road transportation ties economies increasingly in oil use. This has really undesired effects, as oil prices have hiked for last ten years globally. Cheap days of oil being 10-20 USD per barrel are over and currently oil is trading nearly 100-110 USD per barrel. So, economic model, where road network builds societies, economies and growth is much over. It is less discussed topic, but economic problems in Southern Europe were quite much triggered by trade and current account deficits, and these again were driven in 2010-2011 by high prices of oil. Even if Baltic Sea Region is typically seen in economic reports as surviving and competitive, it has its weak side too. Quite much of this is related to oil and significant dependency on road transports.

Even if Poland has been economic success story in recent years, and earlier analyzed transportation statistics also in part support this, downside for growth is apparent in Figure 11. Poland has attracted many factories (Greenfield or transfers from elsewhere), but still its trade account shows significant deficits. These are by large part explained with oil price and oil dependency, especially in most recent years. Even if export has increased from year 2007 to 2012 by nearly 30 %, trade account is still negative. Finland shares similar story, but this in situation, where exports is declining (-20 % in observation period). High tech manufacturing is mostly lost in Finland, and old mass manufacturing still requires its oil for transports.

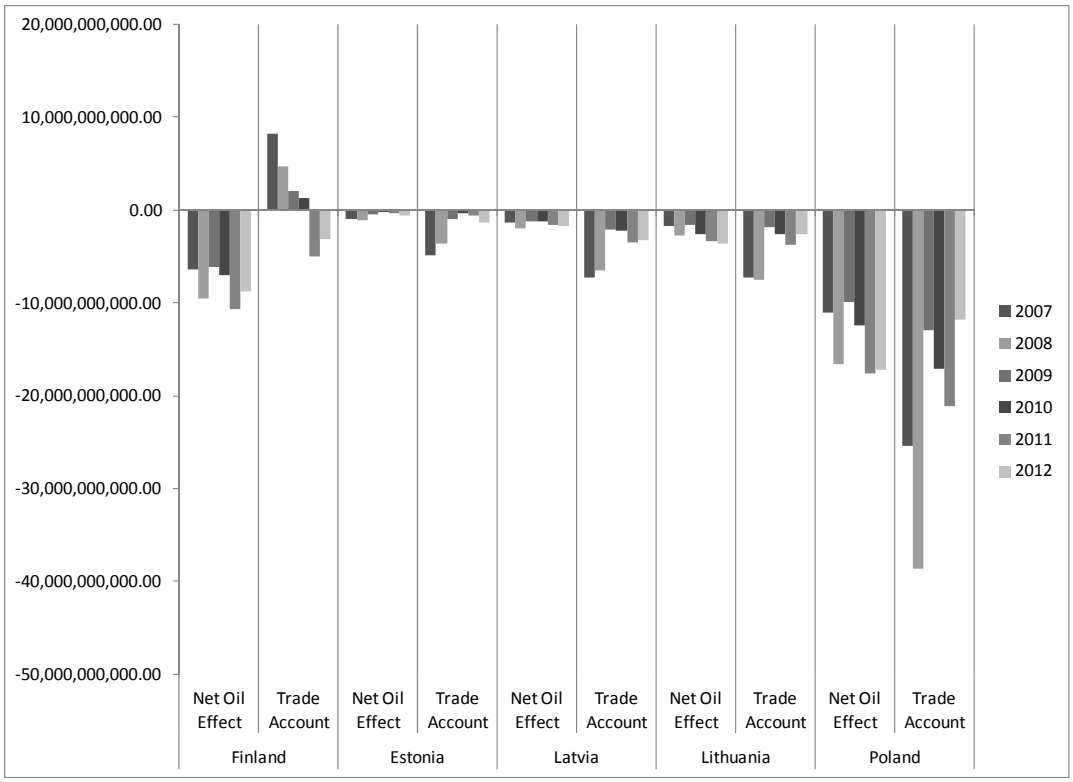

Figure 11. Net oil effect (export less imports), trade account performance (total, surplus or deficit) in Finland, Baltic States and Poland (all in USD). Source (data): UN Comtrade (2013)

Baltic States perform similarly, but mostly repeating export growth model of Poland. This is especially the case with Lithuania. Net oil effect in most recent year is much larger than trade deficit, and exports have grown from base year by more than 70 %. In Estonia and Latvia export growth is similar, but on the range of 50-60 %. Net oil effect explains half from trade deficits.

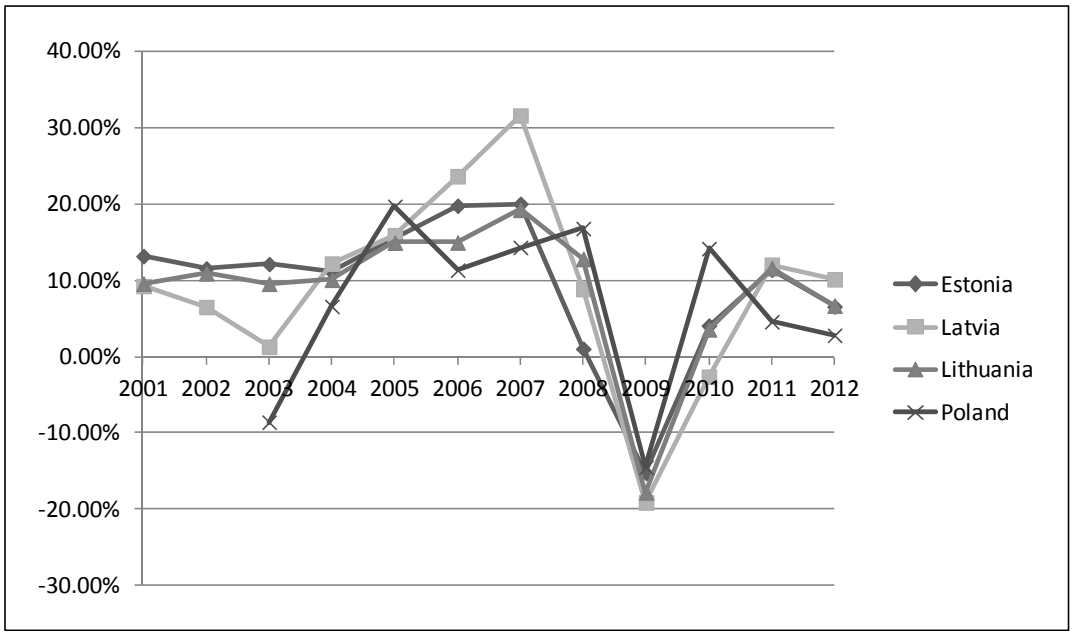

Figure 12. Gross Domestic Product (GDP) change in Baltic States and Poland during years 2001-2012 (GDP at current prices converted to Euros with BOF, 2013). Source: Statistics Estonia (2013); Central Statistical Bureau of Latvia (2013); Statistics Lithuania (2013); Central Statistical Office of Poland (2013)

This analyzed situation is very vulnerable for the changes in the prices of oil and availability of it. If oil prices continue to increase, it is questionable whether Poland may continue its economic growth without major recessions. Same applies to Finland. Even if Finland is outside of Rail Baltica alignment, much of its maritime transport uses oil dependent roro and ropax ships to Central Europe, and functional long-distance electricity using railway option would be more than welcome. Weakness of Baltic States and also Poland was well apparent in GDP development of these countries in the crisis of 2008/2009 (Figure 12). All recorded declines of 14.5-20 % in Euro terms during year 2009. Of course Poland did not officially enter any recession in year 2009 as country devaluated currency Zloty so significantly (approx. 25 % devaluation against EUR) – in year 2009 GDP showed mild positive sign still. However, this with the use of devaluation as weapon against recession. Baltic States in general held on strong currencies and national economies suffered effects in full-scale.

From passenger transport perspective, road is one option together with air transport from Baltic States and Poland to foreign countries. In case of dear oil options are few, and again railway option is more than in demand. Volcano eruption in Iceland during April-May 2010 resulted in situation, where long-distance passenger transport was quite much in bloc within the area of Rail Baltica. Without international railway transport options, it is really difficult to find substitute for journey to Berlin or further.

5. Railway Security and Control

It is not surprising to find out that all Baltic States and Poland are lacking seriously behind implementation of common signaling and traffic control system, European Rail Traffic Management System (ERTMS). This would ease interoperability in international railway transports, increase real-time tracking and tracing as well as efficient control of railway traffic. Even basic communication module, GSM-R, digitalized mobile network for railways has not received significant actions in Baltic States nor in Poland (situation reported in year 2012; see European Commission, 2014). Already in year 2007 Estonia and Latvia clearly indicated that such system will not be implemented in the near future (ERTMS, 2014). In Lithuania and Poland some plans existed, but these were long-term oriented (ERTMS, 2014). Typically countries had realized that Rail Baltica should and would be equipped with ERTMS, but this investment was in the post year 2015 world and did not concern that greatly presented near-term plans.

Reasons of not having ERTMS or even GSM-R at use are at least caused by three different factors. First of all, railway freight transports in Baltic States is greatly influenced by 1520 mm Russian standard railway system – there is no need to use common, modern and in European level accepted railway communication and management standard. Countries such as Russia, Belarus and Ukraine will continue to use their own older standards in the future and only incompatibility is the end result, if system is changed in the other side of the transportation chain. Second reason is the lack of significant railway traffic in south-north corridor, whether it is passengers or cargo. Thirdly, these countries do not have high speed passenger transports at rails or higher

speed cargo transports, which both would accelerate implementation period considerably. So, from systems perspective railway safety and security at national level is somewhere between old Soviet standard and isolated new investments made to arrangement yards and railway lines (and modern automation, like mobile railway switch control taken into use). However, situation will improve step-wise in one section as new and direct Rail Baltica using European 1435 mm railway standard will be built. This corridor shall overcome all earlier mentioned three points representing the constraint of ERTMS implementation.

Transition to new system, even to that of GSM-R, at once is full of question marks. For example, in Finland GSM-R has been invested to nearly all trains (European Commission, 2014), and is currently used to make online and real-time communication possible with railway control and management systems. However, as GSM is so widely used nowadays by general public and passengers at trains use communication devices extensively, quality of daily communication has declined. Therefore, in the end of year 2013 in Finland as one alternative was suggested by Ministry of Transports and Transport Agency task force that GSM-R will be replaced in trains with Finnish governmental communication network, Virve (Ministry of Transports, 2013). This of course requires approval from European Union as it differs from generally approved implementation plan in the entire Europe concerning GMS-R. European standard of GSM-R could of course be used in the future, but it would require large-scale additional investments for network capacity.

6. Crime and Costs for Business

Earlier countries of Rail Baltica showed high crime and violence costs for business, and in World Competitiveness Report e.g. Polish ranking was below 90 (this in year 2008; Schwab & Porter, 2008). In the same time Russia was within range of 80-100. This meant that crime situation in Poland was not in control, and most of the world's countries showed much safer environment to operate. Similar finding was reported in large-scale international road transportation survey conducted during years 2005-2006, that Poland was in same high cargo criminality level with Russia and Hungary (IRU,

2008). Situation has changed and improved after this, at least if Schwab (2013) results are concerned, as only five years have progressed. In general crime situation in Baltic States and Poland is worse than in Finland, but better than in Russia (Table 4). Best performance currently is present in Estonia from Rail Baltica alignment countries.

Table 4. Level of organized crime and costs of crime and violence on business (with one to seven scale, ranging from high to low). Source: Schwab (2011 & 2013)

	Year 2013		Year 2011	
Country	Organized crime	Business costs of crime and violence	Organized crime	Business costs of crime and violence
Estonia	6.4	5.6	6.6	5.5
Latvia	5.7	5.4	5.5	5.2
Lithuania	5.5	5.1	5.7	5.4
Poland	5.7	5.4	5.7	5.5
Russia	4.2	4.5	4.0	4.2
Finland	6.6	6.3	6.6	6.3

Level of crime currently is not alarming, but gives impression that complex and numerous multimodal stations for freight can not be implemented without having proper security systems and physical surveillance at place. Typically cargo thefts take place, when rolling stock does not move and is parked for some reason (IRU, 2008). Based on IRU (2008) survey completed during years 2005-2006, Poland and its capital Warsaw together with Latvia's Riga were considered as one of the most probable places for criminal activity to trucks in Europe. Based on annual statistics from regions, this argument still catches ground, since "Region Centralny" in Poland (surrounding Warsaw) is having more than 4000 robberies in a year, which is roughly 2.7 times that of Finland, but less than half of all robberies taking place in Sweden (population in Region Centralny is two million inhabitants lower than that of entire Sweden, but it is roughly two million inhabitants higher than that of Finland). Even threat or potential of these cargo thefts increases the costs of intermodality, and even if it is possible that situation is getting better (Schwab, 2013), it should be developing favourably for longer periods of time to make it a trend and translate on cost savings of operating companies (lower preventive costs and actual cargo loss). It should be highlighted that robberies are not turning to significantly lower in other possible Rail Baltica intermodal terminal places in Poland; Eastern district of Region Wschodni reports high level of robberies too.

Table 5. Amount of robberies in the key regions of Rail Baltica alignment during years 2008-2010 and comparison on totals of Finland and Sweden. Source: Eurostat (2014)

	2008	2009	2010
Tallinn (Estonia)	505	354	308
Riga (Latvia)	904	945	660
Kauno apskritis (Lithuania)	598	629	504
Region Centralny (Poland)	4,591	4,281	4,063
Total	6,598	6,209	5,535
Share of Region Centralny (Poland)	70 %	69 %	73 %

Finland	1,696	1,640	1,508
Sweden	8,909	9,570	9,219

It should be highlighted that using unimodal road transportation without stops is not necessarily solution any longer. Currently driving regulation in European Union is so strict that with single driver and truck daily progress is at max. 9-10 hours (leads into distance of 500-600 km travelled, so from Tallinn, Estonia could be in best situation Kaunas, Lithuania reached). This means that after maximum daily progress truck must stop for 11 hours of free and resting time of a driver. Of course situation could be avoided by using two truck drivers, where maximum amount of hours at road is 20, and then possibly Warsaw, Poland could be reached from Estonia (this at very best and problem free transport journey case). All delays at road, and especially ones having several hours, lead to possibility to crime (freight being stolen) or violence (on fleet or driver).

Because of possibility for harmful crime and restrictions on road for daily progress by working time regulation, it would be really feasible to place intermodal centers in the very ends of Rail Baltica route. Of course capitals, manufacturing sites, logistics flows and already made warehousing placements drive the final locations, but within north most feasible place would be in Estonia or at very south of Estonia and/or Northern Latvia. In southern side of Rail Baltica these loading and unloading places should be in Lithuania (e.g. Kaunas) or North-East Poland (e.g. Bialystok). These would in theory drive multimodality most – having cost efficient, lead time wise and long railway

freight journey, but enabling on the other hand local distribution with trucks. In EU project Rail Baltica Growth Corridor expert group (Härkönen, 2013), having strong connection to practice, suggested in turn that in Baltic States most feasible places for intermodal terminals of Rail Baltica would be located in Tallinn (Estonia), Riga (Latvia) and Kaunas (Lithuania). Polish intermodal terminal ought to be located in short proximity of Warsaw. Reasoning for this is mostly related to small countries and their weight to have operations near of capital cities. Should be reminded that north-east Poland and Baltic States are in general still following other countries from distance with the standard of living, and this combined to low population, creates its implications on real-life logistics solutions.

Table 6. Amounts of motor vehicle thefts in the key regions of Rail Baltica alignment during years 2008-2010 and comparison on totals of Finland and Sweden. Source: Eurostat (2014)

	2008	2009	2010
Tallinn (Estonia)	361	344	290
Riga (Latvia)	732	773	554
Kauno apskritis (Lithuania)	651	550	710
Region Centralny (Poland)	5,221	4,917	5,087
Total	6,965	6,584	6,641
Share of Region Centralny (Poland)	75 %	75 %	77 %

Finland	13,804	12,188	11,150
Sweden	44,717	40,359	35,009

For passenger transports situation with crime does not create that much challenge. Stopping points at alignment are anyway planned to be few as emphasis is on high performance and short lead time between cities. Therefore, passenger terminals should be located in populated city areas (or within proximity), and these should have surveillance or personnel working for most of the time to increase the security (e.g. robberies in some places are high, see Table 5). However, with city areas problematic part becomes from the integration of private car use – parking areas should be available for long term parking needs (like in airports). These parking places should also be secure for cars using them, even if the current motor vehicle thefts are low in Rail

Baltica alignment (Table 6). However, it is typical that these sorts of thefts are done from economically more advanced countries in Europe such as Germany, France and UK (Barry, 1996; Allen, 2012; The Economist, 2013) and are eventually transported e.g. to Poland, Lithuania and Russia for sales and use (The Economist, 2013). Large transportation infrastructure investment will without a doubt attract people from more wealthy countries to use parking facilities in Rail Baltica alignment, and could potentially be major security threat. Also connections for public transport should be available with appropriate frequency. For example, in Riga this is major challenge, since direct option of Rail Baltica passes capital from east side, and there have to be built appropriate passenger connections to support this station (AECOM 2011a & 2011b). Also in Tallinn starting point is not "problem-free" as station is planned to be located from distance of current railway station, and Estonian capital city does not have centralized travelling centre (where all public transportation modes would be integrated). These themes are discussed further in case research of Rail Baltica at public sector by Laisi et al. (2011).

7. Does Road Transport Have More Room to Grow?

Earlier in 1990's it was easy to predict that as transition economies in Eastern Europe develop economically, so does increase road transportation sector and its activity. However, currently seeing future after crisis of 2008/2009 and dear oil prices, it is difficult to foresee the future development. Due to very strong development taken place in previous decades, amount of private cars scaled to amount of inhabitants shows in Figure 13 that Baltic States (with exception of Latvia) and Poland have reached the level of Germany, Finland and Sweden. Actually in Lithuania there exist highest amount of cars in Figure 13, closely followed by Finland and Germany.

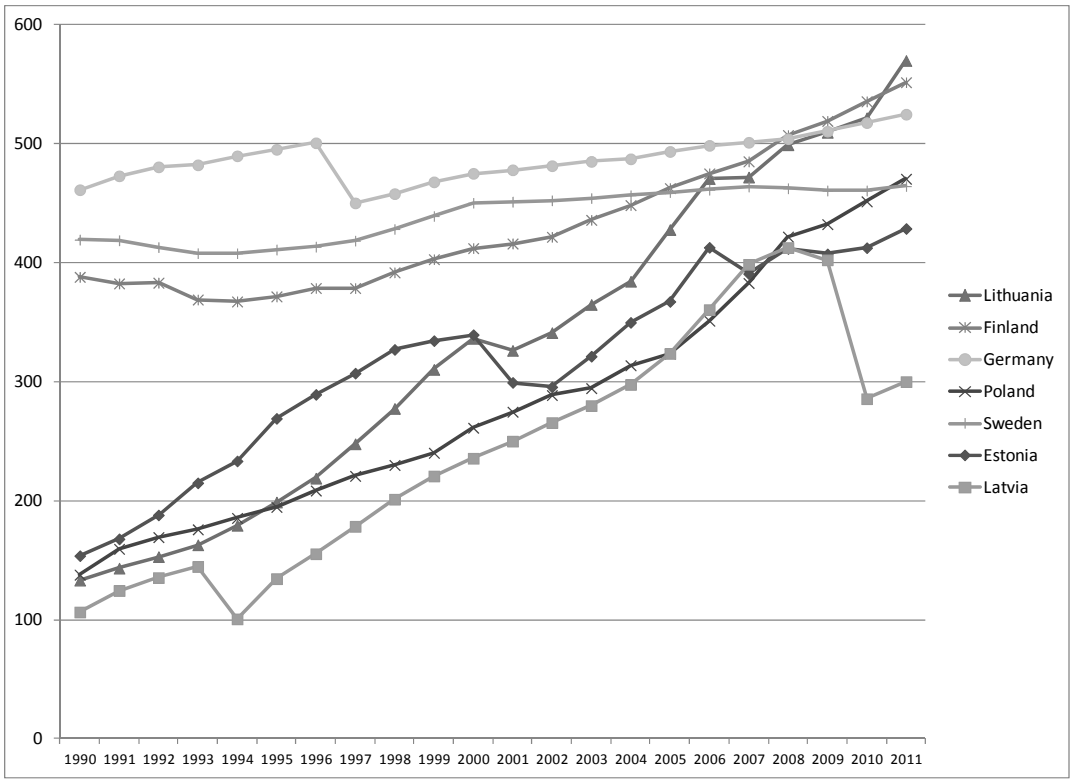

Figure 13. Amount of passenger cars per 1000 inhabitants of each country. Source (data): European Union – Eurostat (2013)

In a case that future follows "progression" made in recent decades, and no great discontinuities takes place, we could predict based on Figure 13 and shown time series that in Poland and Lithuania cars are going to increase in popularity. This is for the reason that time series data is showing such clear linear movement over the years, with very minor fluctuations. International statistics, however, show e.g. from European Union countries that maximum is around area of 600. So, growth for private cars could continue for some years, but not for decades.

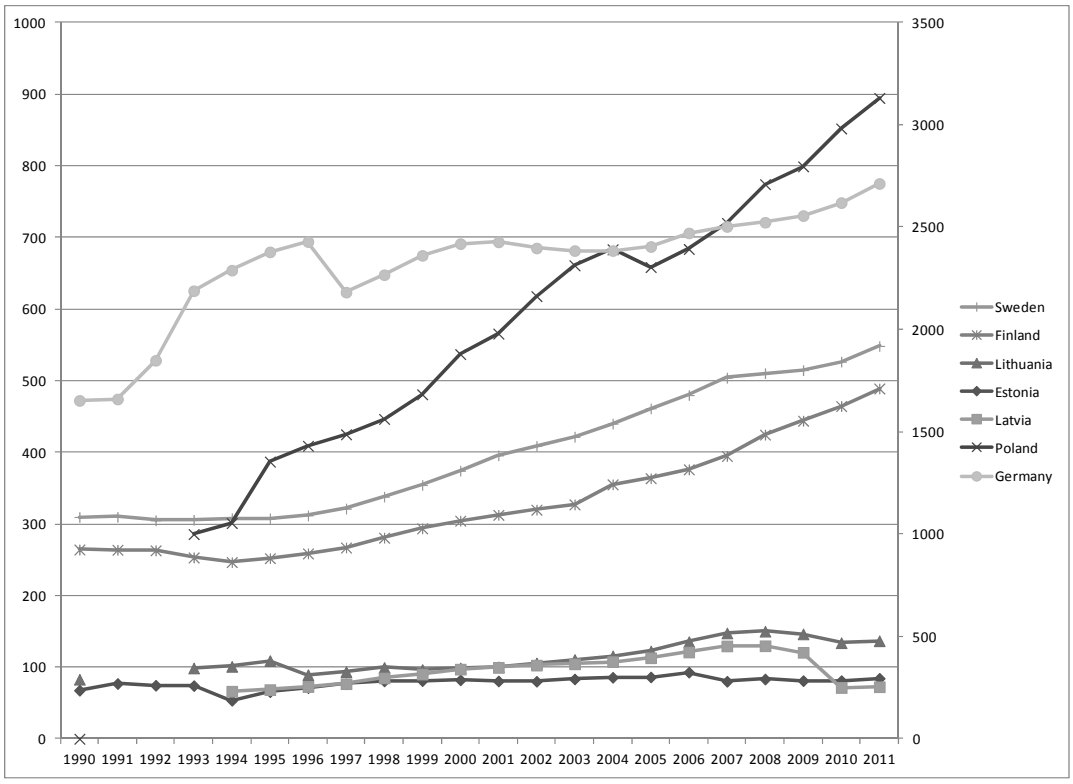

Figure 14. Amount of truck fleet in road transports (goods) – data Poland and Germany on right-hand side y-axis and rest on left-hand side. Source (data): European Union – Eurostat (2013)

In freight transports growth of trucks has been strongest in Poland as Figure 14 illustrates. Already in year 2007 Polish registered fleet by-passed that of German. Polish road transport firms of course serve the whole continent, and are known from their high market share based on previous studies. This mostly has happened due to deregulation within EU level and enlargement of EU itself (Schramm, 2012). Therefore, truck fleet registrations could continue to grow, and some higher registration countries are still showing larger numbers, like Spain and France. Same growth potential applies to Baltic States – registrations have grown over the years, but still they are significantly below of Sweden or Finland. Of course domestic market distances in these two comparison countries are longer than in Baltic States, but still the nearly double amount of truck fleet in Sweden sounds like growth is available. It should also be remembered that in Finland and Sweden trucks have exceptionally high gross weights – these should again decrease the amount of trucks needed (and neutralize the effect of long distances).

Other way to examine road transportation dominance continuance in the future is to check the capacity and capability of other competing modes, like rail for general cargo and especially container transports. Situation inside of countries in domestic transports could be characterized as challenging (Statistics Estonia, 2013): In Estonia during year 2012 nearly 49,000 TEU was transported on rails, but only 6 TEU was for domestic market. Most of the volume is on east direction starting from Tallinn sea port, and eventually ending to Russia's capital, Moscow. Based on Latvian Railways (2011) governmental operator is currently having only 72 flatcar wagons in register for use of container transports (incumbent holds still de facto dominance in the market). However, this does not mean that Latvia would not have containers at rails – based on Latvian Railways (2012), focus on railways and container transports is in long-distance corridors reaching Russia's Moscow, Belarus and Ukraine as well as Central Asia (like Afghanistan and Kazakhstan). These international corridors use typically wagons registered e.g. to Russia and they are also frequently owned by third parties (leasing companies). In year 2012 Latvian railways carried 111,117 TEUs on rails (volume has doubled in five years), but on international destinations, like did also Estonia. So, concerning both Estonia and Latvia, no great shifts or multimodality could be expected within forthcoming three to five year time span on south-north axel on railway transports.

Lithuania is in bit better situation regarding to south-north axis and intermodality, but even in this country volumes are not great. Based on Statistics Lithuania (2013), amount of intermodal transports at rails (only containers, no road transportation trailers were carried at rails) has increased significantly in period of 2005-2012 (+127%), and during year 2012 roughly 75,000 TEU was carried at rails. However, most of these are again in the direction of east (from typically starting from Lithuanian port of Klaipeda). From previous research works (e.g. Hilmola, 2011) and Port of Klaipeda (2013) statistics we could with some confidence aggregate that 80 % from overall volume is caused by international railway corridor Viking, which starts from Lithuanian sea port of Klaipeda and proceeds through Belarus and Ukraine, and ends on sea port of Odessa. Domestically active and higher volume is Vilnius shuttle, which is again in west-east axel, starting from sea port of Klaipeda and ending to outskirts of capital, Vilnius.

Lithuanian railways has at development agenda Sestokai Express container train, operating between Vilnius-Sestokai-Warsaw route. However, in webpages of Lithuanian Railways (2013) connection continues to Belarus and Russia too. Volumes are very thin on this route (if exist at all). So, in south-north direction options for intermodality start to appear, but how realistic they are, is another question. Also pure container train sales package for only south-north axis does not currently exist, even Sestokai Express is having east bias (instead of Vilnius connecting point in Lithuania should be Kaunas). Therefore, road freight dominance at south-north axis ought to continue.

8. Conclusions

As illustrated with substantial second hand data analysis, Rail Baltica alignment has potential to increase the security and safety in the alignment area. This in substantial sense – transportation logistics and passenger transport is tied upon road transport and has grown a lot during previous decades. Rail Baltica implementation will also enforce Baltic States and Poland to implement modern and standardized railway management, communication and control systems such as ERTMS and GSM-R. In turn increase of road transport will make these countries vulnerable on oil. This does not only concern prices of oil, but also possible availability disruptions of it. Even currently oil takes significant share from trade accounts and is the primary reason for trade and current account deficits. If prices continue to increase and availability is having disruptions, then first macro economical effects are substantial, but also owing possibility that much of the economic activity is being disrupted. So, end outcome of first effect is recessionary, while greater problems could lead into significant depressive economic forces. Increasing multimodality, and higher use of railway transports is having clearly potential in this north-east area of Europe. Currently intermodality is sea port-railway driven corridors to east. These of course should be extended in the future for international road transports heading to east. One challenge is that in east typically railways carry only containers, and semi-trailers and trucks are a bit exotic and not widely used intermodal unit (Karamysheva et al., 2013).

As second area of security effects, is the situation with road transport safety. Even if fatalities have declined in Baltic States and Poland within long term, they still are considerably higher than in other countries of neighbourhood (like Germany, Sweden and Finland). Within Rail Baltica alignment we traced that directly in counties and areas having short proximity to this planned connection, we end into very high amount of deaths and injuries due to road transport. It is estimated that first mentioned is in the area of 1000, while latter is ten times higher. Causes for such high numbers are mostly in the areas of Poland and Lithuania. Therefore, Rail Baltica investment should be seen as much wider alignment, and not only connection through Baltic States. At least it is railway corridor from Tallinn to Warsaw. If alignment is enlarged to take into account Berlin, we may talk that implementation is having significant effect on Polish road safety (being worst in the whole European Union 27 countries in absolute amount of fatalities as well as fatalities scaled to inhabitants).

In our second hand data analysis it was concluded that crime and its economic impacts on business has improved in Baltic States, but there is still room to improve. Poland has only very lately showed some encouraging results on this regard. Therefore, freight terminals should be few, and journeys with freight trains should be prompt and long. However, currently terminal infrastructure is driven by capital city areas within Rail Baltica alignment, which does not necessarily serve multimodality best. Problems also arise from passenger terminals at capitals (like Tallinn and Riga) as distances to current public transportation terminals exist. Also parking facilities of long-term parking for cars and especially their security should receive caution.

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References

AECOM (2011a). *Rail Baltica Final Report: Volume I*. AECOM Limited, Chelmsford.

AECOM (2011b). *Rail Baltica Final Report: Volume II*. AECOM Limited, Chelmsford.

Allen, Kristen (2012). Cross border pilfering: Slow progress in battle against Polish car thieves. *Der Spiegel*, online. 3.Jan.2013. Available at URL: http://www.spiegel.de/international/europe/cross-border-pilfering-slow-progress-in-battle-against-polish-car-thieves-a-806979.html Retrieved: Jan.2014

Barry, James (1996). Poland, a paradise for car thieves, seeks means to fight underworld. *The New York Times*, 3.Dec.1996.

Blackshaw, P. W. and Thompson, L. S. (1993). *Railway reform in the Central and Eastern European Countries*. Policy Research Working Papers, World Bank, WPS 1137.

Bröcker, J., A. Korzhenevych & C. Schürmann (2010). Assessing spatial equity and efficiency impacts of transport infrastructure projects. *Transportation Research Part B*, 44:7, pp. 795-811.

Buchhofer, E. (1995). Transport infrastructure in the Baltic States during the transformation to market economies. *Journal of Transport Geography*, 3:1, pp. 69-75.

Central Statistical Bureau of Latvia (2013). Transport – database of Latvia. Available at URL: http://data.csb.gov.lv/DATABASEEN/transp/databasetree.asp?lang=1 Retrieved: Aug.2013

Central Statistical Office of Poland (2004). *Statistical Yearbook of Maritime Economy 2004*. Central Statistical Office, Warsaw.

Central Statistical Office of Poland (2013). *Transport – Activity Results in 2012*. Central Statistical Office, Warsaw.

Delhaye, Eef, Tim Breemersch, Kris Vanherle, James Kehoe, Mary Liddane & Kevin Riordan (2010). *COMPASS – The Competitiveness of European Short-Sea Freight Shipping Compared with Road and Rail Transport*. Transport & Mobility Leuven: Leuven, Belgium.

ERTMS (2014). *ERTMS - European Deployment Plan and National Deployment Plans*. European Commission, Brussels, Belgium. Available at URL: http://ec.europa.eu/transport/modes/rail/interoperability/ertms/edp_map_en.htm Retrieved: March.2014.

European Commission (2007). *Feasibility Study on Rail Baltica Railways 2007*. Available at URL: http://ec.europa.eu/regional_policy/sources/docgener/evaluation/railbaltica/concl_en.PDF Retrieved: Dec. 2010.

European Commission (2014). *COMMISSION STAFF WORKING DOCUMENT on the state of play of the implementation of the ERTMS Deployment Plan*. Brussels, Belgium, 14.2.2014, SWD (2014) 48 final.

European Union – Eurostat (2013). *Energy and Transport in Figures 2013*. European Union, Brussels.

Eurostat (2014). Crime and criminal justice database. Eurostat, European Union. Available at URL: http://epp.eurostat.ec.europa.eu/portal/page/portal/crime/data/database Retrieved: Jan.2014.

Finnports (2013). Finnish Port Association – Annual Statistics. Available at URL: http://www.finnports.com/statistics.php Retrieved: Aug.2013

Henttu, Ville, Milla Laisi, Olli-Pekka Hilmola, and Teemu Terävä (2012). Northern dimension of Rail Baltica. *Economics and Management*, 17:1, pp. 352-358.

Hilmola, Olli-Pekka (2007). European railway freight transportation and adaptation to demand decline – Efficiency and partial productivity analysis from period of 1980-2003. *International Journal of Productivity and Performance Management*, 56:3, pp. 205-225.

Hilmola, Olli-Pekka (2011). *Rail Baltica Influence Area: State of Operating Environment*. Lappeenranta University of Technology, Department of Industrial Management, Research Report 236. Lappeenranta, Finland.

Hilmola, Olli-Pekka (2013). From Bubble to Sustainable Economy in Baltic States. *Journal of Transport and Telecommunication*, 14:3, pp. 237-249.

Härkönen, Jorma (2013). *WP6, Expert Group, Conclusions (RBGC Project Meeting, Berlin, 13.6.2013)*. Available at URL: http://www.rbgc.eu/media/project-meetings/project-meeting-9-berlin-06_2013/wp6.pdf Retrieved: Aug.2013

IRU (2008). *Attacks on Drivers of International Heavy Goods Vehicles*. International Road Transport Union Publications. Geneve, Switzerland.

Kalli, Juha, Tapio Karvonen & Teemu Makkonen (2009). Sulphur content in ships bunker fuel in 2015: A study on the impacts of the new IMO regulations and transportation costs. *Ministry of Transport and Communications*. No. 31. Helsinki, Finland.

Karamysheva, Marina, Ville Henttu and Olli-Pekka Hilmola (2013). *Logistics of North-West Russia and Rail Baltica: Standpoints of Private Sector*. Lappeenranta University of Technology, Department of Industrial Management. LUT Scientific and Expertise Publications. Research Report 3. Lappeenranta, Finland.

Keshkamat, S.S., J.M. Looijen & M.H.P. Zuidgeest (2009). The formulation and evaluation of transport route planning alternatives: A spatial decision support system for the Via Baltica project, Poland. *Journal of Transport Geography*, 17:1, pp. 54-64.

Komornicki, T. & A. Miszczuk (2010). Eastern Poland as the borderland of the European Union. *Quaestiones Geographicae*, 29:2, pp. 55-69.

Kovacs, G. & K.M. Spens (2006). Transport infrastructure in the Baltic States post-EU succession. *Journal of Transport Geography*, 14:6, pp. 426-336.

Laisi, Milla, Ville Henttu & Olli-Pekka Hilmola (2011, editors). *Enhancing Accessibility of Rail Baltica Influence Area: Standpoints of Public Sector*. Lappeenranta University of Technology, Department of Industrial Management. Research Report 237. Lappeenranta, Finland.

Laisi, M. and J. Saranen (2013). Integrating the Baltic States and Europe – Rail Baltica. *International Journal of Business Excellence*, 6:3, pp. 251-269.

Latvian Railways (2011). *Basic Performance Indicators 2011*. Available at URL: http://www.ldz.lv/?object_id=1928 Retrieved: Sept.2013.

Latvian Railways (2012). *Annual Report of 2012*. Riga, Latvia.

Lithuanian Railways (2013). Container Transportation webpage. Available at URL: http://www.litrail.lt/wps/portal/!ut/p/c1/04_SB8K8xLLM9MSSzPy8xBz9CP0os3h3C2N_VzcPIwMDH3NHAyNTU69gPyd_Q2MvM_1wkA6zeAMcwNEAIo_LhBBDfT-P_NxU_YLs7DRHR0VFANj5CFM!/dl2/d1/L2dJQSEvUUt3QS9ZQnB3LzZfRzgzT0VGSDIwRzgxMDBJNUhETUVPTjA4MTY!/ Retrieved: Sept.2013.

Lithuanian Road Administration (2013). Accident rate information. Available at URL: http://www.lra.lt/en.php/traffic_safety/accident_rate_information/106 Retrieved: Aug.2013.

Lukasiak, M. (2001). Adapting PKP freight services to market economy. *Japan Railway & Transport Review*, February, Vol. 26, pp.46–51.

Lüttmerding, Attila and Matthias Gather (2013). *Level of service on passenger railway connections between European metropolises*. Berichte des Instituts Verkehr und Raum (Erfurt), Band 15.

Maggio, G., and Cacciola, G. (2009). A variant of the Hubbert curve for oil production forecasts. *Energy Policy*, 37:11, pp. 4761-4770.

Marquez, Patricio V. & Anthony G. Bliss (2013). *Dangerous Roads: Russia's Safety Challenge*. Available at URL: http://go.worldbank.org/P4BEJK5ZB0 Retrieved: Aug.2013.

Ministry of Transports (2013). Matkapuhelinten junakuuluvuuteen luvassa parannusta (in Finnish, direct and free translation to English: "Mobile phone train network functionality is promised to improve"). Helsinki, Finland. Available at URL: http://www.lvm.fi/tiedote/4372468/matkapuhelinten-junakuuluvuuteen-luvassa-parannusta Retrieved: March.2014.

Ojala, L., T. Naula and C. Queiroz (2005). *Transport Sector Restructuring in the Baltic States as Members of the European Union*. Proceedings of the 3rd Seminar, Vilnius, Turku School of Economics Publications, Finland.

PKP PLK (2011). *Description of the Activity of PKP PLK S.A. and Development Perspective of Polish Rail Infrastructure*. Presentation given in Rail Baltica Growth Corridor Workgroup Seminar in Bialystok, Poland, 10th of May 2011.

Port of Klaipeda (2013). Port statistics webpage. Available at URL: http://www.portofklaipeda.lt/port_statistics Retrieved: Aug.2013

Russia in Figures (2012). Number of accidents and persons suffered in rolling stock accidents. Available at URL: http://www.gks.ru/bgd/regl/b12_12/IssWWW.exe/stg/d02/18-09.htm Retrieved: Aug.2013.

Sandalow, D. (2008). *Freedom from Oil*. McGraw-Hill: New York, USA.

Schwab, Klaus and Michael E. Porter (2008). *The Global Competitiveness Report 2008-2009*. World Economic Forum, Switzerland.

Schwab, Klaus (2011). *The Global Competitiveness Report 2011-2012*. World Economic Forum, Switzerland.

Schwab, Klaus (2013). *The Global Competitiveness Report 2013-2014*. World Economic Forum, Switzerland.

Schramm, Hans-Joachim (2012). Impacts of Deregulation on International Road Haulage – Final Report of Cash Project. Available at URL: http://www.cash-project.eu/tiedostot/CASH%20Wise%20Men%20Report%202012%20Schramm.pdf Retrieved: Aug.2013.

Statistics Finland (2013). Road traffic accidents claimed 35 lives in July. Available at URL: https://www.tilastokeskus.fi/til/ton/2013/07/ton_2013_07_2013-08-22_tie_001_en.html Retrieved: Aug.2013.

Statistics Estonia (2013). *Transport statistics database*. Available at URL: http://www.stat.ee/transportation Retrieved: Aug.2013

Statistics Lithuania (2013). *Official Statistics Portal*. Available at URL: http://osp.stat.gov.lt/en/statistiniu-rodikliu-analize1 Retrieved: Aug.2013.

Statistical Office of Szczecin (2009). *Statistical Yearbook of Maritime Economy 2009*. Central Statistical Office of Poland, Warsaw.

Statistical Office in Szczecin (2013). *Road Transport in Poland 2010-2011*. Central Statistics Office of Poland, Poland, Warsaw/Szczecin.

Tanczos, K. (1999). Transition of Hungarian railway transport. *Japan Railway & Transport Review*, September, Vol. 21, pp.10-13.

The Economist (2013). Crime in Germany: Car-theft epidemic at the border with Poland. *The Economist*, Charlemagne, European politics. 3.Sept.2013.

UN Comtrade (2013). *International Merchandise Trade Statistics*. Available at URL: http://comtrade.un.org/ Accessed: Aug.2013.