Major mistakes in Rail Baltic CBA made by EY

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Summary introduction

For EU infrastructure projects, discounted revenue (i.e. revenue calculated at the present value) must exceed discounted costs for the project to be feasible. Distinction is made between financial and socio-economic feasibility. It often happens that the project is not directly financially feasible, but it has indirect economic impact when recalculated in terms of socio-economic benefits. Traffic forecasts are used to calculate so-called virtual profit and loss, which are then entered in the same table as the actual financial investments, costs and revenues received from operation.

Ernst & Young (EY) found that the Rail Baltic (RB) project would generate discounted costs of €4.5 billion and discounted revenue of €5.4 billion[1]. This means a difference (net present value or NPV) of €879 million, based on which the project appears to be economically viable. In comparison, the discounted costs of RB according to the calculations made by AECOM 2011 were €1.8 billion and the discounted revenue €3.2 billion[2], the resulting NPV being €1.4 billion.

We do not believe that the freight volumes estimated in the feasibility study are achievable, but let us leave the forecast accuracy aside for now. We concluded that for the forecasted volumes of freight and passenger transport, which are approximately the same as in previous CBA, the socio-economic impact of the future scenario envisaged by EY is positive only due to flawed calculations. The most frequent mistake by EY is picking the wrong assumption from the referenced source. Thus, the calculation of fuel costs and hence the fuel excise is based on the emission class of trucks that are not used for long-distance road transport. The greatest error, however, comes from calculation of truck emissions, where EY based its assessment on the trucks that were manufactured at the end of the previous century, but the impact of pollution of the currently manufactured EURO VI trucks is approximately 25 times smaller; this reduces the positive socio-economic impact of RB project by €3 billion.

Correction of the socio-economic impact of RB project estimated by EY (in € million):

	Undiscounted value	NPV
1. Incorrect percentage of calculated excise duty	-220	-65
2. Increase in excise duty by GDP	-930	-260
3. Truck pollution	-2957	-840
TOTAL	-4107	-1165

Project NPV (€ million) = 879 – 1165 = -268

After correcting the mistakes, the present value of the project appears to be negative by approximately €300 million and is not eligible for financing by EU rules.

Specific mistakes with their estimated monetary impact are presented below. Since EY has not shown the exact calculation in its Cost-Benefit Analysis, we can only provide an estimated impact on the fea-

[1] EY Report, p. 186. *http://railbaltica.org/wp-content/uploads/2017/04/RB_CBA_FINAL_REPORT_0405.pdf*
[2] AECOM: Rail Baltica Final Report. Volume I.
http://www.railbaltica.org/wp-content/uploads/2017/05/AECOM_Final_Report_Volume_I.pdf

sibility. EY should correct the mistakes and publish the corrected results together with detailed calculations.

1. Reduction in the received excise duty on fuel due to RB exceeds the estimation by EY

Transferring of freight from trucks to rail will reduce the fuel excise duty on road transport. For the project operator, it represents a socio-economic impact, because the excise is not received on the account of RB Rail AS. For the owner of RB Rail, the Baltic States, it would mean reduced income from excise duty. This has also been estimated by EY.

EY fails to show the exact calculation, but according to the assumed data sources, the calculation appears to be:

> *Vehicle operating costs per vehicle-km for trucks: 0.8 €*[3]
>
> *Heavy truck EBIT margin: 6%*
> *Heavy truck fuel % of OPEX: 25%*[4]
>
> 0.8 € * 0.94 * 0.25 = 0.19 €

According to that, the fuel consumption of freight carrier is 19 €ct/km

Excise duty received per one vehicle-km (for trucks) is calculated by multiplying the fuel cost and percentage of excise tax:

> *Excise tax: the average assumed pan-Baltic excise tax is 44.8%*[5]
>
> 19 €ct/km * 0.448 = 8.4 €ct/ km received excise

Average estimated freight carrier performance for RB is approx. 6 billion ton-km[6]. On average, one truck carries 13.7 tonnes of freight[7]. Based on the freight volume forecast for RB, the vehicles should annually cover 437 million kilometres.

> 6 billion ton-km / 13.7 tons per vehicle = 437 million vehicle-kilometres

This results in the following calculation for the receipt of excise duty during 30 years:

> 0.084 € / km * 437 million km / per annum = 36.8 million / per annum
>
> 30 years * 36.8 million / per annum = 1,100 million

This is also the number that EY indicated in the table of economic impact.

According to our opinion, EY has made the following calculation mistakes:

The reference table that was used as a source of fuel consumption OPEX 25% provides the percentage of fuel cost for *16–18t rigid* trucks, when the trucks actually used in road freight transport are *38t (2+3) artic* vehicles with the relevant indicator of 30%[8].

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[3] EY Report, p. 146. *http://railbaltica.org/wp-content/uploads/2017/04/RB_CBA_FINAL_REPORT_0405.pdf*
[4] *Ibid., p. 147*.
[5] *Ibid., p. 147*.
[6] *Ibid., p. 152*.
[7] *Ibid., p. 143*.
[8] Appendix 8

When considering 30% instead of 25%, the cost of fuel consumption would be 24 €ct /km, which corresponds to the actual situation today. The difference by five percentage points, i.e. 20%, reduces the undiscounted socio-economic feasibility by €220 million and NPV by €65 million.

2. Correction of the increase in fuel excise according to growth of GDP

The reason for the second major difference is that the data sources for fuel and excise duty originate from 2015 and the values up to 2055 have not been modified. Even at the time when the analysis was published, the excise duty rate in Estonia was higher than what was considered in the analysis. The exact excise duty rate and fuel price or the fuel used by vehicles in the forecasted period is currently unknown. Meanwhile, the calculation of the impact of pollution assumes that the vehicles would use the same fuel and the pollution impact figures have been adjusted in line with GDP growth. It sounds reasonable that the excise tax would increase at the same pace as the estimated increase in the impact of climate change.

The estimated GDP growth has been presented[9] and, pursuant to the Guide to Cost-Benefit Analysis, the calculation of estimated increase includes a coefficient of 0.7 (reduced by 30%). Based on that, the average coefficient for total GDP impact on rail revenue in 2026-2055 is 1.7.

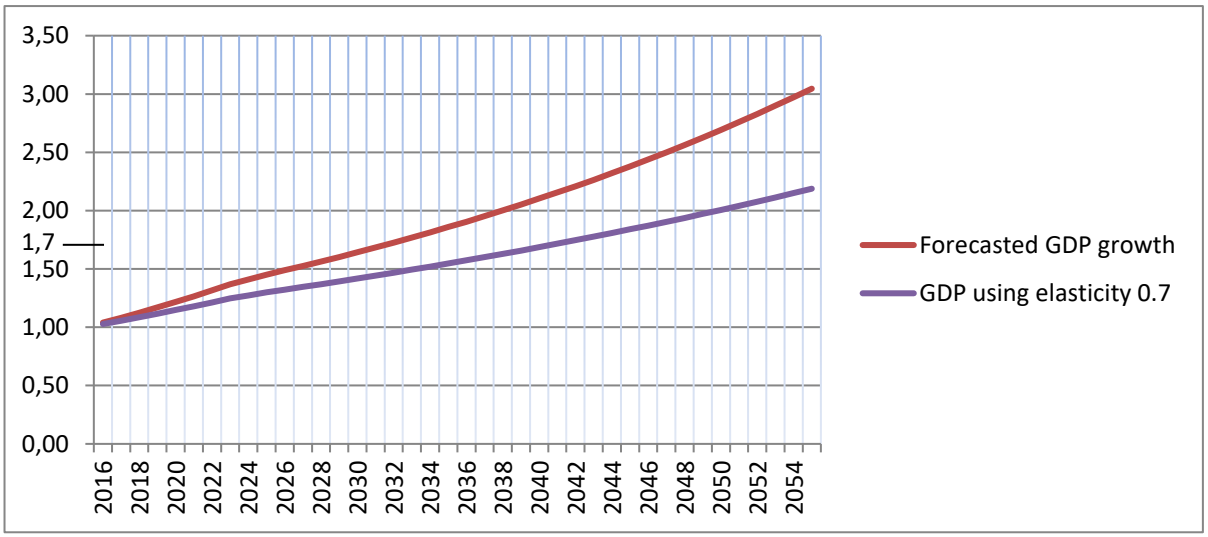


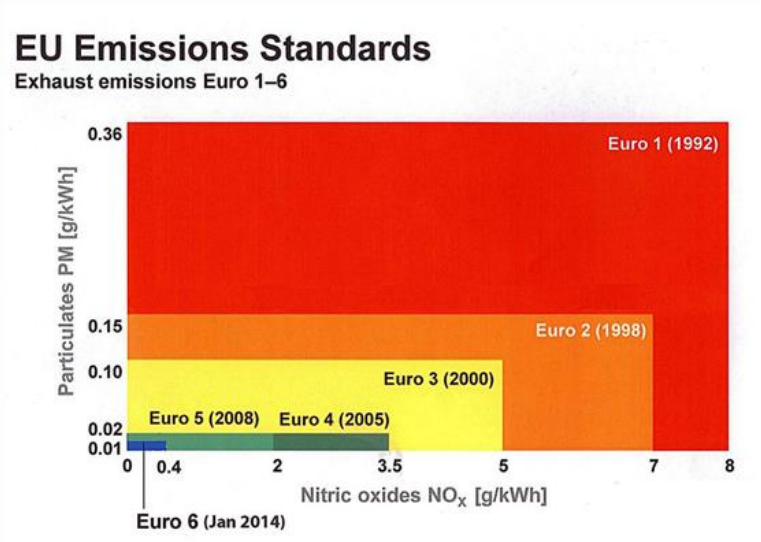
Figure 1. Estimated growth of GDP.

The adjusted reduction in the received excise duty on truck fuel is: €1,098 million * 1.2 * 1.7 = €2,240 million. **Due to the calculations having been made for the wrong truck type, as previously mentioned, the corrected calculated impact of GDP growth is €930 million (€2,240 million – €1,320 million = €930 million) in undiscounted value and NPV is reduced by €260 million.**

[9] EY Report, p. 292. *http://railbaltica.org/wp-content/uploads/2017/04/RB_CBA_FINAL_REPORT_0405.pdf*

3. Inaccurate calculation of actual impact of truck air pollution

The so called "cleaner air" benefit of the railway consists of two parts. The first, climate change, primarily stands for CO_2 emissions, which is inevitable when fossil fuels are used. The second results in the emission of nitrogen and other toxic products of combustion. The reduction in emission of these toxic compounds constitutes the greatest part of the so-called "cleaner air" component in the CBA. It's the biggest component of the socio-economic impact claimed by EY: reduced air pollution due to transferring of freight from trucks to rail. The total socio-economic impact to RB project would be €3.3 billion in undiscounted value (20% of the socio-economic impact estimated in the EY CBA). In recent years, there has been a significant technological advancement to avoid toxic air emissions.



The EURO VI trucks standard that entered into force in 2014 reduced the nitrogen compound emissions by more than 10 times compared to the EURO III standard used at the turn of the century. It also extended the obligation of vehicle manufacturers to ensure compliance with the requirements during the vehicle's entire engine life. The EU is also implementing road inspection, which will significantly reduce truck pollution in the near future. All of the previously mentioned requirements are also present in the truck pollution figures visible today and they are already several times smaller than those used in the calculations by EY and will be even smaller by the time RB is launched.

Considering that the trucks in our region are, on average, less than 10 years old, approximately 100% of trucks will comply with EURO VI standard or better by the time RB launches its rail traffic[10].

The calculation of pollution cost is based on air pollution assumptions shown on page 146, i.e. 10 cents/km for heavy trucks outside city[11].

[10] *Y. Pang.* rtp_fleet_projection_Base2013_v3.0_final. *http://naei.defra.gov.uk/resources/rtp_fleet_projection_Base2013_v3.0_final.xlsx*
[11] EY Report, p. 146. *http://railbaltica.org/wp-content/uploads/2017/04/RB_CBA_FINAL_REPORT_0405.pdf*

Air pollution assumptions

The following assumptions (in 2015 prices) have been used:[153]

	EUR/vkm							EUR per LTO*
	Intercity bus	City bus	Car	Heavy truck	Diesel freight train	Freight /PAX train	Air	Air
Within city	0.20	0.18	0.02	0.22	3.77	0	0.17	87.86
Outside city	0.09	0.08	0.01	0.10	1.50	0		

*Landing and take-off

It is assumed that these costs would grow together with the forecasted real growth of average pan-Baltic GDP per capita. Based on the CBA methodology[154], a coefficient of 0.7 is applied to these growth rates.

Figure 2. Excerpt from assumptions by EY.

Table[12] contains the air pollution source data referred by EY. The values used are concurrent with EU-RO II trucks. There is no reason to believe that trucks manufactured in the previous century would still be driving around in a couple of decades. The impact of pollution of EURO VI trucks is 0.4 cents/km, which is **25 times** smaller than that considered by EY. It is only 10 times smaller in urban traffic, but long-distance freight has only a small share of urban traffic. When considering 10% urban traffic share, the average difference from the values presented by EY would be 23.5 times.

Vehicle	Category	EURO-Class	Urban €c/vkm	Suburban €c/vkm	Rural €c/vkm	Motorway €c/vkm
Articulated HGV	14 - 20 t	EURO 0	28.5	17.6	12.5	11.0
		EURO I	17.9	10.7	7.5	6.6
		EURO II	14.4	10.3	7.7	6.8
		EURO III	12.6	8.6	6.1	5.3
		EURO IV	7.2	5.5	4.2	3.7
		EURO V	6.8	5.1	2.7	1.6
		EURO VI	2.0	0.9	0.4	0.3
	20 - 28 t	EURO 0	32.2	20.4	14.4	12.0
		EURO I	24.4	14.8	10.2	8.6
		EURO II	19.4	13.8	10.1	8.6
		EURO III	16.4	11.4	8.1	6.7
		EURO IV	9.2	7.2	5.5	4.6
		EURO V	7.8	5.8	3.0	2.0
		EURO VI	2.0	0.9	0.4	0.4
	28 - 34 t	EURO 0	34.7	22.2	15.5	12.8
		EURO I	26.2	16.0	10.9	9.0
		EURO II	20.8	14.9	10.7	9.0
		EURO III	17.4	12.2	8.6	7.0
		EURO IV	9.8	7.8	5.8	4.8
		EURO V	7.6	5.5	3.0	2.0
		EURO VI	2.0	0.9	0.5	0.4
	34 - 40 t	EURO 0	40.9	26.3	18.1	14.8
		EURO I	31.1	18.9	12.7	10.4
		EURO II	24.7	17.7	12.7	10.4
		EURO III	20.5	14.4	10.2	8.3
		EURO IV	11.2	9.0	6.9	5.6
		EURO V	8.5	6.2	3.4	2.3
		EURO VI	2.1	0.9	0.5	0.4
	40 - 50 t	EURO 0	46.5	30.2	21.0	17.1
		EURO I	35.4	21.7	14.7	11.7
		EURO II	28.0	20.1	14.5	11.8
		EURO III	23.0	16.4	11.6	9.3
		EURO IV	12.5	10.3	7.9	6.3
		EURO V	8.5	6.1	3.5	2.5
		EURO VI	2.1	0.9	0.5	0.5
	50 - 60 t	EURO 0	56.6	37.2	25.9	20.2
		EURO I	43.1	26.6	17.9	14.0
		EURO II	33.9	24.5	17.5	14.1
		EURO III	27.4	19.7	14.1	10.9
		EURO IV	15.1	12.6	9.5	7.5
		EURO V	9.4	6.7	4.1	3.0
		EURO VI	2.2	1.0	0.6	0.6

Source: own calculations based on COPERT 4 emission factors. Damage cost factors from Table 15.

Figure 3. Source data referred to in the cost-benefit analysis.

[12] Ricardo-AEA: Update of the Handbook on External Costs of Transport. January 2014, p. 57. *https://ec.europa.eu/transport/sites/transport/files/themes/sustainable/studies/doc/2014-handbook-external-costs-transport.pdf#page=57*

The total air pollution impact will decrease accordingly.

Table 90 Air pollution reduction by source

Air pollution reduction	% of total	Effect, M EUR	Total, M EUR
Bus	0.412%	13.5	3 268
Car	7.092%	231.8	
Existing Train	0.002%	0.1	
Air	3.935%	128.6	
Heavy truck	88.559%	2 894.4	
Rail Baltica	0.000%	0.0	

Figure 4. Excerpt from the EY calculation of air pollution impact[13].

Let us divide the estimate of monetary impact of air pollution shown in the table by our calculated difference of 23.5:

€2,894 million / 23.5 = €123 million

Compared to the EY calculations, the socio-economic impact will decrease by 2,771 million (2,894 million – 123 million = 2,771 million)

The same mistake occurs with regard to passenger cars, where EY has estimated the pollution of 0.01 €/km, while the relevant indicator for EURO VI passenger cars as shown in the table referred to by EY[14] is 0.001-0.002 €/km, depending on the engine type. Thus, the difference is fivefold.

€231.8 million / 5 = €46 million

€232 million – €46 million = €186 million

After correcting the mistake in pollution impact calculations, the socio-economic impact will decrease by €2,957 million (€2,771 million + €186 million = €2,957 million) when undiscounted, and the calculated NPV will decrease by €840 million.

Conclusion

Due to limited time and many undisclosed data sources and calculations, it has been impossible to provide a more detailed critique towards the cost-benefit analysis. Here are only a few aspects that demonstrate the negative impact on the state budget even if the volume of the rail traffic would be at the level estimated in the cost-benefit analysis.

After making the estimated corrections in the EY calculations, the discounted NPV would be negative by approximately €300 million. Thus, the project is not socio-economically viable.

[13] EY Report, p. 188. *http://railbaltica.org/wp-content/uploads/2017/04/RB_CBA_FINAL_REPORT_0405.pdf*
[14] Ricardo-AEA: Update of the Handbook on External Costs of Transport. January 2014, p. 53. *https://ec.europa.eu/transport/sites/transport/files/themes/sustainable/studies/doc/2014-handbook-external-costs-transport.pdf#page=53*

To make the Rail Baltic project viable:

1. The freight forecast should be adjusted and only realistic socio-economic revenues should be included in the CBA.
2. Extensive CAPEX reduction should be implemented. Economically feasible technical alternatives are described in the COWI feasibility study[15]

A new revised CBA auditing should be ordered by an independent body not affiliated with the project promoters.

June 8, 2017

[15] Feasibility Study on Rail Baltica Railways. Final Report. January 2007.
http://ec.europa.eu/regional_policy/sources/docgener/evaluation/railbaltica/report.PDF