Is “Mobile Road” Profitable?

Mateusz Zając
Wroclaw University of Technology, Wroclaw, Poland

The following paper presents a discussion on the profitability of intermodal carriage in the mobile road system. At present only a few European countries use such transport, despite the fact that the costs incurred of this form of freight traffic are much lower than those of standard road transport. The paper answers the question whether the start of regular connections can as well be profitable for a potential investor.

1. INTRODUCTION

In December 2006 it was communicated that in 2007 rail connections Ro – La will be initiated due to the campaign ‘Trucks on tracks’ [7]. The first connection of low-loading rail cars and heavy goods vehicles was expected to start on 700km route Rzepin – Suwałki. At the time PKP Cargo decided to establish one both-ways connection which would carry 40 goods vehicles at one time. The funds for that project of 50m zlotys were stated in government legislated budget for the year 2007. The remaining money was expected to come from European Union. By 2013 Poland is supposed to receive over 100m Euros for the investment. The project anticipated the start of Rzepin - Suwałki train which would carry 20thousand trucks in a year. It was also pointed out that should the connection function properly Polish Railways would run consecutive links. Regrettably, already in July 2007 the pilot project was cancelled. Of 50m zlotys only 15 was provided, whereas without government support it proved more costly to transport goods by railway than by road. According to PKP Cargo estimates, one railway transit of heavy goods vehicles from Rzepin to Suwałki will cost 1 900pln without railway infrastructure charges, which is too much when compared to road transport.

During numerous transport conferences and convents, trade meetings one could hear the opinion that Ro-La system is unprofitable, which makes it practically non-existent in Europe. The following paper is a discussion on investment profitability and costs comparison as well as the time of load carriage in road transport and via Ro-La system in the direction east – west in transit through Poland.

2. TRADE EXCHANGE ANALYSIS BETWEEN THE STATES: GERMANY – LITHUANIA, GERMANY – RUSSIA AND GERMANY – UKRAINE

Poland is a transit country, it is located in the centre of Europe at the crossing point of the most important transportation routes. It is certainly a great advantage which allows the state to profit from the location and to develop by it.

Transit of goods with Poland’s contribution in 2004 developed as follows [6]:

- In transit from Germany to Russia 700 000 tons/year,
- In transit from Russia to Germany 200 000 tons/year.

Assuming that one truck carries 25 tons of load at one time, 28 000 trucks pass in a yearly transit through Poland from Germany to Russia.

On the basis of these assumptions in table 1, the number of loads transferred between particular countries is presented. It was assumed that a train set is comprised of 25 flatcars which can carry an equal number of goods vehicles. The estimation encompassed 252 working days in a year.

Tabela 1. Transit of goods with Poland in 2004. Source: own analysis by [8].

From	To	Trucks in thousand /year	Train sets/year	Train sets/day
D	PL	80	3 200	13
Pl	D	400	16 000	63
RU	PL	188	7 520	30
PL	RU	16	640	3
PL	B	12	480	2
B	PL	100	4 000	16

3. EVALUATION AND ANALYSIS OF TRUCK TRAFFIC IN TRANSIT VIA POLAND

Consecutive sections of the following paper present traffic trends for transportation. Both with railway crossings and road-rail passages west-east routes were taken into consideration. Three major routes running through Poland were distinguished:

- northern: Hamburg (Germany) – Riga (Latvia),
- central: Ruhr coalfield (Germany) – Moscow (Russia),
- southern: Stuttgart (Germany) – Kiev (Ukraine).

The starting points are significant industrial centres in Germany. Target cities are the capitals of east border countries, also important economic points in Europe. It is estimated that northern route leads from Hamburg via Stettin, the Tricity area to the border and further through Lithuania to Latvia. Central route runs in accordance to international route E – 30. Southern route, in its Polish section, runs along E – 40 route from Zgorzelec to Medyka.

Due to various toll rates in Europe it was estimated that in road transport a truck tractor from the year 2006 is used, which meets exhaust fumes emission standards EURO 5 with a standard semi-trailer. It was considered in the estimation that on average it uses up 30l/100km of diesel oil which is ON (diesel oil) 3,60pln/l and 40l AdBlue per 1200 litres of ON, AdBlue cost 2pln/litre. It was estimated that the unit travels with the average speed of 80km/h on motorway and dual carriageway, 65km/h on local roads and 55km/h on local roads with damaged surface.

As for the drivers' working time in Poland a directive 561/2006 is in force, whereas from the Polish border eastward an AETR convention is in effect. The distances between particular route points are given according to the application Mapa Europy (Europe Map), computer program Sony Route Planner, 1999. They are collectively presented in table 2.

It can be noticed that central route is the longest, from Ruhr coalfield (Dortmund) to Moscow. It is the most costly as well. The fastest way, only 44hours 42 minutes, is from Hamburg to Riga. This route is also the cheapest. The road transport cost is 1 902,04pln.

Table 2. Summary table of the most important route defining parametres in road traffic. Own analysis.

Route	Kilometres covered [km]	Transit time	Transit cost [pln]
northern	1 435,9	44h 42min	1 902,04
central	2 296,5	67h 29min	3 224,46
southern	1 922 8	49h 29min	2 727,09

Most loads are in practice transported via central route. It is the longest way and transit time and cost are maximum.

4. RO – LA TRAINS DRIVE TIME EVALUATION

Ro-La system denotes that the section between the route start and the nearest terminal is run by

means of road transport, afterwards from one terminal to another 'mobile road' system is employed. From the second terminal to the destination point road transport is used again.

On applying driver's working time regulations it appears that road vehicles drivers should finish daily working time shortly after (ten to twenty or tens of kilometres) crossing the Polish border. Then the drivers would start an 11 hour regular rest. However, when the trucks are loaded on rail platforms and the drivers have access to couchettes, then the load can be transported further on, while the drivers can make use of due rest. Three Ro-La terminals located near the west border are suggested to start, as well as 3 terminals on the east side of Poland. The map included in figure 1 depicts the potential localisation of 'mobile road' terminals in Poland.

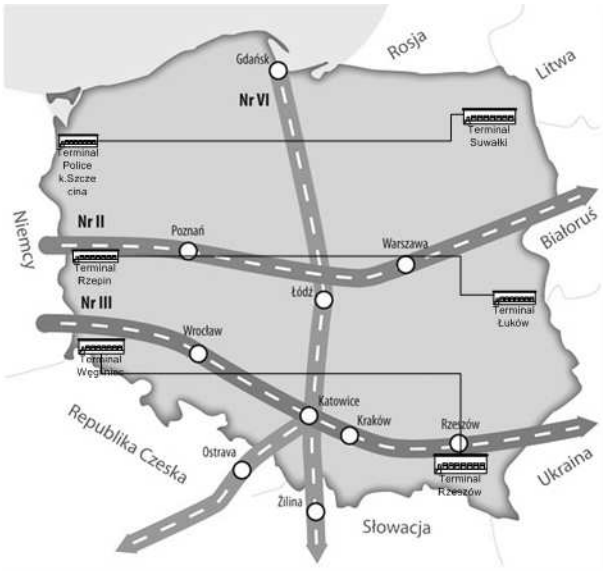

Figure 1. Suggested locations for 'mobile road' terminals in Poland. Own analysis.

Niemcy – Germany, Republika Czeska – Czech Republic, Słowacja – Slovakia, Ukraina – Ukraine, Białoruś – Belarus Litwa – Lithuania, Rosja – Russia

Terminal points in western region:

- Police near Stettin,
- Rzepin,
- Węgliniec.
- Selected terminals in eastern region:
- Suwałki,
- Łuków,
- Rzeszów.

Transit times of freight trains were estimated on the basis of information by PKP Cargo S.A. The summary of transit times and costs between suggested terminals with railway crossings included in a distributed system are comprised in table 3.

Table 3. Transit times and costs summary in 'mobile road' system. Own analysis.

Route	**Transit time**	**Transit cost [pln]**
northern	37h 45min	10 238,17
central	50h 44min	9 395,66
southern	35h 56min	9 377,19

Summing up the abovementioned estimation on covering three routes by means of 'mobile road' system, one can conclude that the most costly is the northern route: Hamburg – Riga, however most time consuming is the transit from Ruhr coalfield to Moscow. Whereas the cheapest and the shortest route is the southern: Stuttgart – Kiev using the Rzepin – Łuków connection. Table 4 displays the relation between transit time and costs, and transport type.

Table 4. The relation between a single truck transit time and costs and transport type. Own analysis.

Route	**Transport type**	**Time**	**Cost [pln]**
Hamburg - Riga	Ro-La	37 h 45 min	10 238,17*
	Road transport	44 h 42 min	1 902,04
Ruhr coalfield – Moscow	Ro-La	50 h 44 min	9 395,66*
	Road transport	67 h 29 min	3 224,46
Stuttgart – Kiev	Ro-La	35 h 56 min	9 377,19*
	Road transport	49 h 29 min	2 727,09

*- transit cost in distributed/diffused traffic in accordance with [3]

As can be seen with the use of railway wagons in distributed traffic, 'mobile road' is on average 3.7 times more costly than standard road transport. However, intermodal transport helps save a lot of time. The greatest difference in transit time can be

noticed with the route from Stuttgart to Kiev. In this case one can observe that a contractor using Ro – La system saves as much as 13.5h on a single transit. It is the time which can be used for loading and starting the return journey. With northern and central routes the difference in transit time is still in favour of 'mobile road' and equals nearly 7hrs.

5. RO – LA INITIATION REQUIREMENTS LIST.

The start of 'mobile road' system in Poland is, as any enterprise, associated with costs. In order for Ro - La system to operate there need to be terminals, specialist equipment and people to operate it and to monitor its working. With relation to building six transfer terminals an investor has to adapt a considerable area. Each transfer point needs to cover the area of at least a few hectares [1]. For the terminal to be started the following investments are in order:

- purchase and reclassifying of the ground,
- terminal construction,
- access roads construction.

Various sources provide different infromation on the costs of terminal foundation and functioning. In September 1999 a pilot project was designed to build transfer terminals for intermodal transport in Węgliniec and Medyka, which was associated with the start of the route Zgorzelec – Medyka on railway line E-30. Works to adapt the area for a terminal were priced for 2 183 000 pln [1]. Enterprises based on constructing the necessary road and rail infrastructure were estimated at 2 356 000 pln per single terminal. Thus the cost of area adaptation and a single terminal infrastructure construction reached the total of 4 539 000 pln. Incidental costs are estimated at 10% of the investment value which gives terminal construction total cost of 4 992 900pln [1].

In the suggested terminal system every transfer point is connected by access roads completed at the expense of the investor, whose total length equals 30 km. In building scheme for the clearway S8 at the distance Augustów – Suwałki, 50km of access roads were estimated at 944 000 pln [4]. Thereby, it was assumed in the calculations that 1 km of such a road is 18 880pln, thus 30km will cost 566 400 pln. Table 5 comprises terminals building costs in purchased area along with access roads.

Table 5. Ro-La terminals building cost. Own analysis by [1], [4].

Investment type	**unit**	**Unit cost [pln]**	**Number of units**	**Single terminal cost [pln]**	**Six terminals cost [pln]**
ground	1ha	100 000	6	600 000	3 600 000
terminal	1pc.	-	6	4 992 900	29 957 400
Access roads	1km	18 880	30	94 400	566 400
TOTAL	-	-	-	5 687 300	34 123 800

The estimation shows that the building cost of one terminal with access roads on purchased ground equals 5 687 300pln, whereas six terminals 34 123 800pln.

Next stages are the purchase or lease of railway cars and engines as well as employing operating staff and drivers, which is closely related with the number of initiated transit. The quantity of carried loads was discussed earlier. The estimation uses data from the year 2004 on transit via Poland from Germany to Russia.

In a yearly transit from Germany to Russia 700 000 tons of loads are transferred [6]. A goods vehicle carries 25tons at one time. Assuming that one train set comprises 25 flatcars, it will consequently hold 25 trucks. With such assumptions there would have to be 4 train sets started on each route every day. Therefore in further estimation the two way coursing of 4 train sets was assumed. In regard to railway transit times, to cover the northern and southern routes both ways 8 train sets are required, whereas to do the central route, as it is the shortest, 6 sets are needed. In order for the system to be operational, the total number of sets running on all 6 connections is 22. Railway vehicles comprise 6 diesel - shunting locomotives, 22 electric, 22 sleeping cars for drivers and 550 flatcars (22 train sets, 25 cars each) to transit goods vehicles. Table 6 comprises routes lengths and the number of train sets required to service them.

Table 6. Routes lenghts and train sets employed. Own analysis.

route	Section length [km]	Total route length [km]	The length of all three routes [km]	The number of train sets on the route	Total number of train sets
northern	759,37	1518,74	3822,02	8	22
central	557,18	1114,36		6	
southern	594,46	1188,92		8	

Rolling stock must use PKP PLK infrastructure, which results in considering infrastructure access charges which are comprised in table 7.

Table 7. Railway infrastructure access charges. Own analysis.

The length of full three routes [km]	Charge for 1 ckm [pln]	ckm / day [pln]	Number of workdays a month	ckm / month [pln]
3822,02	5,57*	21 288,65	21	447 61,68

*- charge valid in 2008. ckm – covered kilometre

This estimation anticipates a purchase of all necessary railway vehicles. Table 8 comprises purchase costs of railway engines and wagons required to start six terminals full-time. It also presents the cost of employing 30 terminal operatives and 40 engine-drivers. Each person employed will receive 3 200pln of monthly pay (gross national average).

The total cost of opening six terminals encompasses:

- terminal construction together with access roads – 34 123 800 pln,
- railway engines and wagons purchasing – 559 500 000 pln,
- six terminals promotion – 57 302 pln a month,
- employees and engine-drivers maintenance – 224 000 pln a month,
- railway infrastructure access charges – 447 061 pln a month.

Table 8. Project realization costs in account 1. Source: own analysis by [1], [5].

	Number of items	Unit cost [mln pln]	overall cost [mln pln]
Shunting engines	6	8,00	48,00
Electric engines	22	12,00	264,00
Sleeping cars	22	0,50	11,00
Flatcars	550	0,43	0,236
Terminal operatives	30	0,003	0,096
Engine drivers	40	0,003	0,128

To sum up, fixed costs amount to 593 623 800 pln, other equal 728 363 pln. By putting the above data into an equation and dividing it by 12 months in a year, a monthly amortization was obtained which is 4 946 865pln, while fixed cost of a single truck is merely 428 pln. It is unlikely though to think of an investor ready to put in nearly 600 mln pln. In practice railway charges and rating are different.

6. ALTERNATIVE COSTS ESTIMATION OF RO-LA TRANSIT IN POLAND.

For comparison, below is presented an alternative cost estimation where the investor bears the costs of:

- purchase of ground for a construction site,
- terminals and access roads construction,
- wagons and engine-drivers lease,
- 30 terminals operatives maintenance cost,
- infrastructure access charges,
- freight expenses,
- promotion costs.

Compared with the previous estimation the investor does not bear the costs of purchasing railway engines and wagons. The charges which may concern him are so called 'freight' and railway infrastructure access. In 2008, according to the agent of one of the rail carriers, both costs reached about 12 euros for each covered kilometre.

Thereby, the costs incurred on each route equal accordingly:

- northern route has the length of 759.37km, which multiplied by 12euro gives 9112.44 euro, (1 euro = 4.54pln after the exchange rate of Jun 6th 2009), hence 'freight' and

infrastructure access charges on northern route equals 41 370.48pln.
- central route has 557.18km and was calculated analogically – the value acquired was 30 355.17pln,
- southern route is 594.46km long, so the its cost is 32 386,18pln.

Each of those values refers to one complete train set. Every contractor is interested in the cost of 1 transported goods vehicle. The cost is the total of 'freight', infrastructure charge and fixed cost.

The fixed cost equals 24.73pln. It was calculated through adding up all fixed costs of the investment – 34 277 102pln and dividing it by the following values:

- 10 – amortization time in years,
- 12 – number of months in each amortization year,
- 21 – working days in a month,
- 22 – number of daily transit in operation,
- 25 – number of goods vehicles transferred in one set.

The results are compared in table 10.

A contractor who owns terminals, just like in the first account, is obliged to employ 30 people to operate transfer points, however he does not bear engine-drivers maintenance costs because they are associated with locomotives and paid together with the 'freight'. Additional cost which was also present in the previous calculation is the promotion cost of 57 302pln for six terminals. The costs mentioned are comprised in table 10.

Table 9. 'Freight' and railway infrastructure access costs on particular routes. Own analysis.

route	**'Freight' and infrastructure access cost per 1 train set [pln]**	**Fixed cost added to every transported vehicle [pln]**	**Single vehicle transportation cost in Ro –La system [pln]**
northern	41 370,48	24,73	1 679,55
central	30 355,17	24,73	1 238,94
southern	32 386,18	24,73	1 320,18

As estimated above, Ro-La transport cost of a single goods vehicle concerns only railway transit through Poland from western to eastern terminals on each route. One must also add to this amount the cost of covering road sections. Collectively, with individual routes recognized, estimated costs are comprised in table 11.

Table 10. Construction and maintenance costs of six terminals in Poland in account 2. Own analysis.

	Number of units	**Unit cost [mln pln]**	**Collective cost [mln pln]**
Terminals building grounds	6	0,6	3,6
Terminals construction	6	4,992	29,957
Access roads construction	6	0,018	0,566
'freight' and infrastructure access	1 911,01	12euro/1km	0,104
Terminal operatives	30	0,0032	0,096
promotion	-	-	0,057

Table 11. Transit costs comparison of a single goods vehicle in road and 'mobile road' transport. Own analysis.

route	**Road transport cost [pln]**	**'mobile road' transport cost [pln]**
northern	1 902,04	2 933,72
central	3 224,46	3 741,80
southern	2 727,09	3 377,37

Comparing these two ways of freight traffic one can notice that Ro – La system is more costly, however at the same time it is faster. Central route on the entire section from Ruhr coalfield to Moscow generates the smallest difference of around 500 pln, still against intermodal transport. The difference in price is on average 730pln for motor transportation.

7. CONCLUSIONS.

The paper is intended to present the difference in costs of Ro-La transport and in standard road service. On seeking solutions to optimize freight traffic in transit via Poland, one

may conclude that 'mobile road' is an interesting alternative to road transport. However, the author does not suggest to oppose Ro-La system with road transport and to consider railway transport supplementary. The opposition of road and rail – road transport reveals that, despite many disadvantages connected with environment pollution, high accident rate and noise emission, road transport appears more profitable. Despite 'greener' and faster freight traffic, railway transport (Ro-La) is much more costly.

The decision to start the suggested transit should be preceded by thorough economic analysis, not an estimation presented in the paper. However, the estimation included in the paper explicitly suggests that at present Ro – La system in Poland cannot have any economic grounds. Comparing the transit from Hamburg to Riga, road transport is cheaper than 'mobile road' by as much as 1000pln. With two remaining routes – from Rzepin to Łuków and from Węgliniec to Rzeszów the difference in price is lower and equals on average 583pln.

Considering the above, a necessary condition to start such connections is a considerable grant from the State and European Union.

BIBLIOGRAPHY

[1] *Analiza programowa transportu intermodalnego na linii kolejowej E – 30 (Węgliniec – Medyka) oraz budowy terminali w Węglińcu oraz Medyce*, 1999.
[2] Niedźwiedź K., *Projekt systemu sieci terminali typu „ruchoma droga" na terenie Polski*. Praca magisterska, Politechnika Wrocławska, 2009
[3] Taryfa Towarowa PKP Cargo S.A.
[4] http://www.gddkia.gov.pl, stan na dzień 17.03.2009
[5] http://www.intercity.pl/pubfile/taryfa%20/23_03_2009/wykaz_innych_doplat_dodatkowych.pdf, stan na dzień 17.03.2009).
[6] http://www.spedycje.pl, stan na dzień 17.06.2009.
[7] http://www.tur-info.pl, stan na dzień 06.06.2009.
[8] http://www.wnp.pl, stan na dzie16.03.2009.