

# Analysis of Combined Transport in the Czech Republic in relation with CSR

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## Abstract

Article deals with the problematic of combined transport in the Czech Republic in relation with corporate social responsibility (CSR). Article describes theoretical background of combined transport and CSR. CSR concept represents voluntary integration of social and environmental aspects to strategic and everyday routine processes and operations of companies. CSR consists of three pillars – an economic pillar, a social pillar and an environmental pillar. This article is focused on environmental pillar which is directly connected with the need of emission reduction and transport generally is the largest producer of emissions. Article analyses development of combined transport in the Czech Republic between 2005 and 2015 and basic parameters of combined transport terminals in the Czech Republic.

**KEY WORDS:** *combined transport, corporate social responsibility, combined transport terminal*

## 1. Introduction

The quality of life improvement, economic development and environmental protection for the existing and the future generations are the fundamental principles of the existing sustainable development concept. Sustainable development concept includes three areas: the economic area, the environmental area and the social area. Sustainable development must be equitable (interaction between the economic and the social dimension) liveable (the link between the environment and social needs) and viable (economic development must be in accord with ecosystems capacities).

The sustainable development concept is closely related to the concept of corporate social responsibility (CSR). Standard ISO 26000 defines social responsibility as the responsibility for decisions' impacts and activities' impacts on society and on the environment; this responsibility is closely linked to transparent and ethical behavior [1]. This represents the maximum contribution to sustainable development since all three key sustainable development areas are integrated into corporate activities.

Transport has significant economic, social and environmental impacts and represents a significant factor of sustainability [2]. Sustainable transport is characteristic by the fact that it does not represent any threat to public health or to ecosystems, but at the same time it provides for transport needs in such manner that competitiveness and regional development are supported [3]. Greenhouse gases emissions belong among significant environmental aspects; transport systems' sustainability must be thus evaluated also with regard to this indicator [4-6].

Growing performance of road transport has negative impacts on the environment, on public health and on transport safety and it contributes to greenhouse gases emissions and it is energy consumption demanding. Some authors stated that road transport and freight transport in general have great importance for the world economy; but this sector is not social and environmental friendly [7]. This is the reason why corporations' approach to logistics planning must change. In the framework of such logistic planning attention must be given to environmental aspects of transport and to implementation of corporate activities in agreement with CSR principles. In order to meet the objectives in the area of sustainable transport it is essential to focus attention also on larger utilization of multimodal transport, combined transport respectively. Combined transport is concerned with the shipment of commodities from their origin to destination using combinations of transport modes [8].

This article analyses development of combined transport in the Czech Republic between 2005 and 2015 and basic parameters of combined transport terminals in the Czech Republic.

## 2. Materials and methods

Experience from abroad show that, in order to achieve more significant share of combined transport in the total freight transport, one condition must be met. This condition is a suitable design of the framework (legal framework) and of the system of incentives. This represents investment and operations incentives. However, it is essential to define the system in such way that it really provides incentives and motivations and that the provided funding is effectively utilized. To make the combined transport more attractive it is essential to define suitable framework conditions (toll fee in road transport taking into account externalities, increased parameters and capacity of railway infrastructure) and at the same time to provide for a tool for direct support of investment into multimodal transport.

In the Czech Republic in some regions there exists a quite dense network of terminals. Majority of these terminals are operated directly by combined transport train operators. These terminals are not usually located on public transport infrastructure. Transfer of railway carriages between public transport infrastructure and terminals located on trailers represents another cost item. This reduces the competitiveness of the newly introduced combined transport lines. This situation has emerged due to setting aside and privatizing terminals that used to be in the national railways ownership. For further development of in particular continental transports it seems to be favorable to define conditions in such way that also terminals with neutral access are created as a concept of open transport network “terminal to terminal”.

This article analyses development of combined transport in the Czech Republic between 2005 and 2015. Analysis of combined transport in the Czech Republic is divided into three areas according to [9]:

1. Transport of large containers by rail – analyzed parameter: total number of loaded containers transported.
2. Transport of swap bodies by rail – analyzed parameter: total number of loaded swap bodies transported.
3. Unaccompanied transport of trailers and semi-trailers by rail – analyzed parameter: total number of loaded trailers and semi-trailers transported.

Container is large standardized shipping transport unit, designed and built for intermodal freight transport, meaning these containers can be used across different modes of transport – from ship to rail to truck – without unloading and reloading their cargo [10]. Swap bodies are one of the standard freight containers for road and rail transport. These containers type may also be called “exchangeable container” or “interchangeable unit” [11]. Unaccompanied combined transport means that only the load unit is transported, without the motor vehicle or driver [12]. Other definition describes unaccompanied combined transport as a situation when are boarded only semi-trailers onto the vessels, which are loaded/unloaded at the port with special vehicles; semi-trailers are then coupled with the tractor units located at either end, and moved onto their final destinations as complete units [13].

Analysis is focused on presumed development of combined transport in the Czech Republic in years 2018-2022. We assume based on linear regression (relations 1-3) that the total number of loaded containers, trailers and semi-trailers transported in the Czech Republic will have increasing character. Future values  $Y$  will be predicted using linear regression (relation 1), where  $a$  and  $b$  are parameters or coefficients of approximate line:

$$Y = a + bx. \quad (1)$$

Parameter  $a$  was expressed by the relation 2, where  $\bar{y}$  and  $\bar{x}$  are arithmetic means of analyzed values:

$$a = \bar{y} - b\bar{x}. \quad (2)$$

Parameter  $b$  was expressed by the relation 3, where  $\bar{y}$  and  $\bar{x}$  are arithmetic means of analyzed values:

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}. \quad (3)$$

### 3. Results and discussion

In Fig. 1 is presented comparison of total number of loaded containers transported between 2005 and 2015 in the Czech Republic. The curve has a growing character except year 2009, when there was a significant decline. This decline was caused by world economic crisis and reduced demand for this type of transportation. Between years 2005 and 2015 increase the total number of transportation of loaded containers from 300 527 in 2005 to 706 697 in 2015, it is increase between years 2005 and 2015 of 135.15 %. The largest increase was observed between years 2006 and 2007, when there was an increase of 80 227 loaded transported containers. The average increase of loaded transported containers between years 2009 and 2015 is 48 255 of loaded transported containers per year.

In Fig. 2 is presented comparison of total number of loaded swap bodies transported between 2005 and 2015 in the Czech Republic. The total number of loaded swap bodies transported between 2005 and 2015 in the Czech Republic has undergone turbulent development, because between years 2005 and 2009 number of transported loaded swap bodies had decreasing character. In 2005 was transported 13 024 these transport units, but in 2008 it was only 8 968 loaded swap bodies. The growing character can be observed between years 2008 and 2012, when was the increase about 11 759 loaded swap bodies, but from 2012 to 2015 the number of transported loaded swap bodies decreases from 20 727 in 2012 to 5 963 in 2015; it is the relative decline of 71.23 %.

In Fig. 3 is presented comparison of total number of loaded trailers and semi-trailers transported between 2005 and 2015 in the Czech Republic. In 2005 was transported only 65 laded trailers and semi-trailers, but in 2015 was the total number of transported loaded trailers and semi-trailers 31 955; from 2008 to 2015 this value increases. The largest increase was observed between 2012 and 2013, where was the difference of 8 619 trailers and semi-trailers.

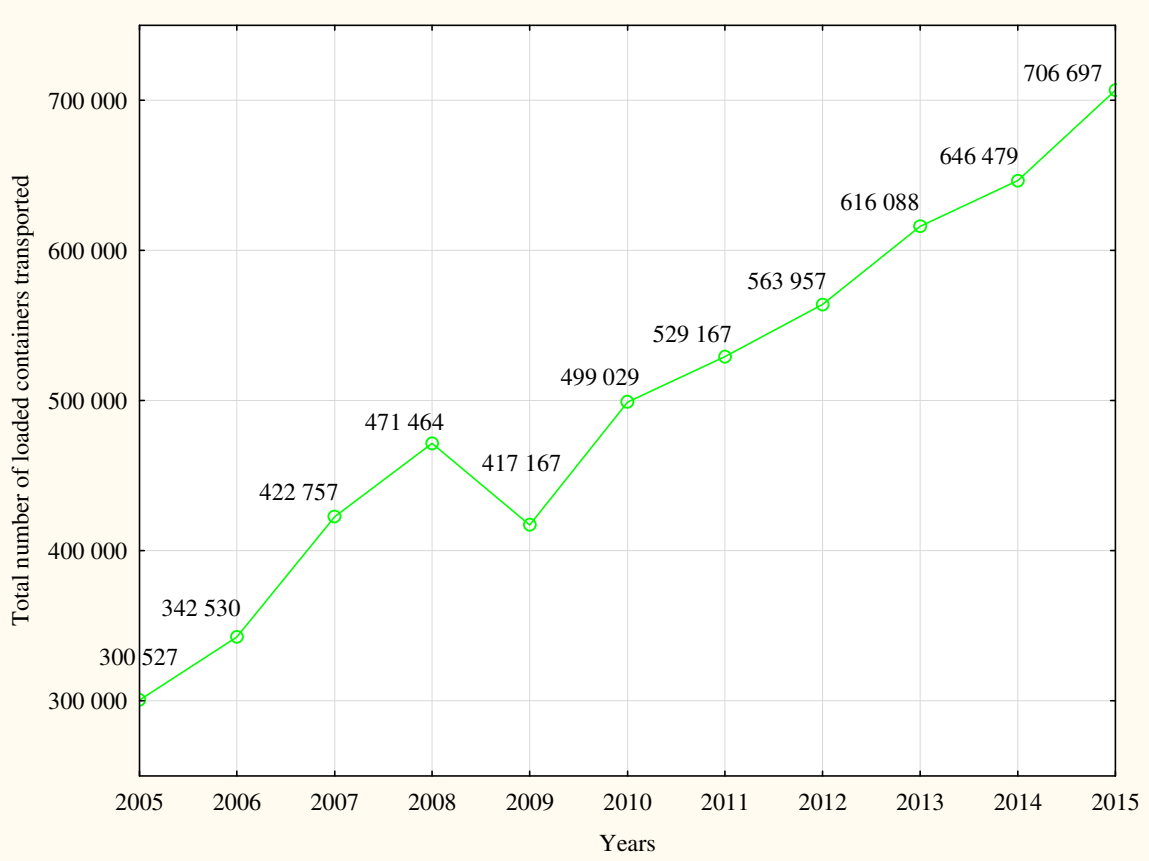


Fig. 1 Total number of loaded containers transported between 2005 and 2015 in the CR (authors based on [9])

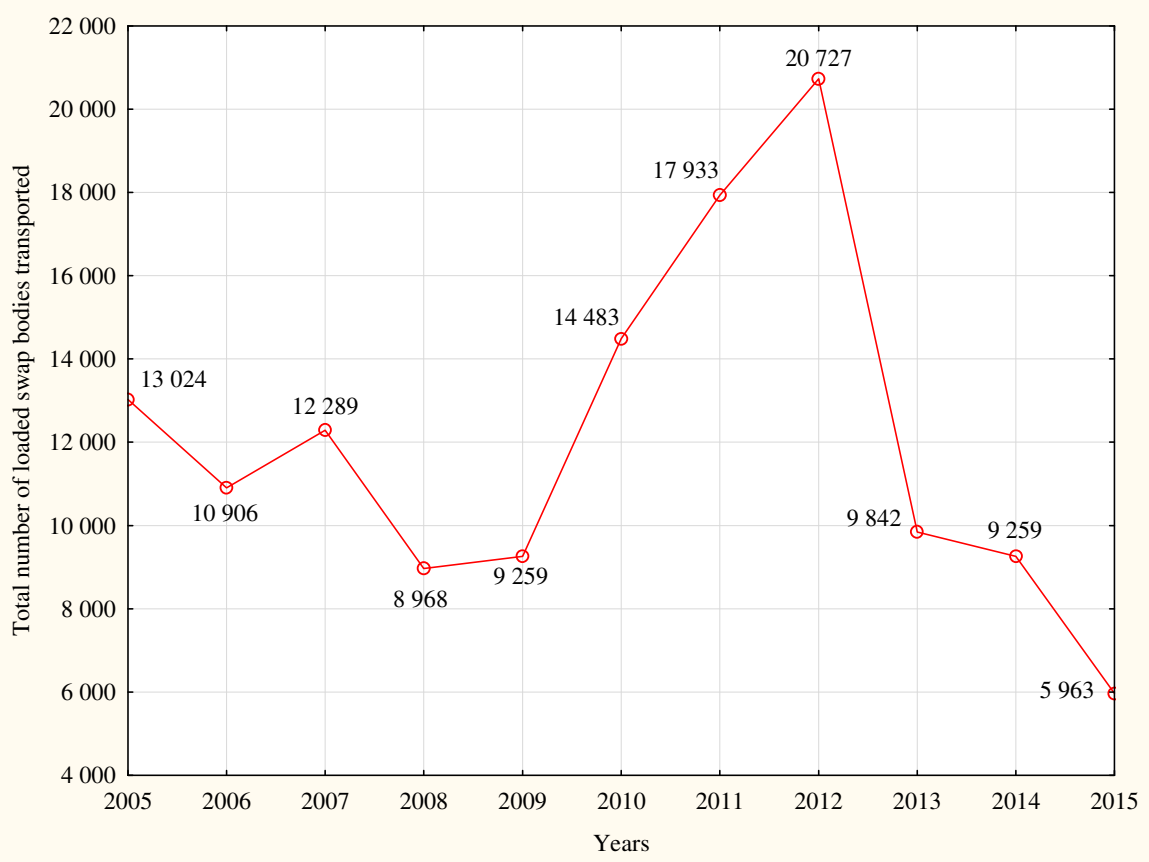


Fig. 2 Total number of loaded swap bodies transported between 2005 and 2015 in the CR (authors based on [9])

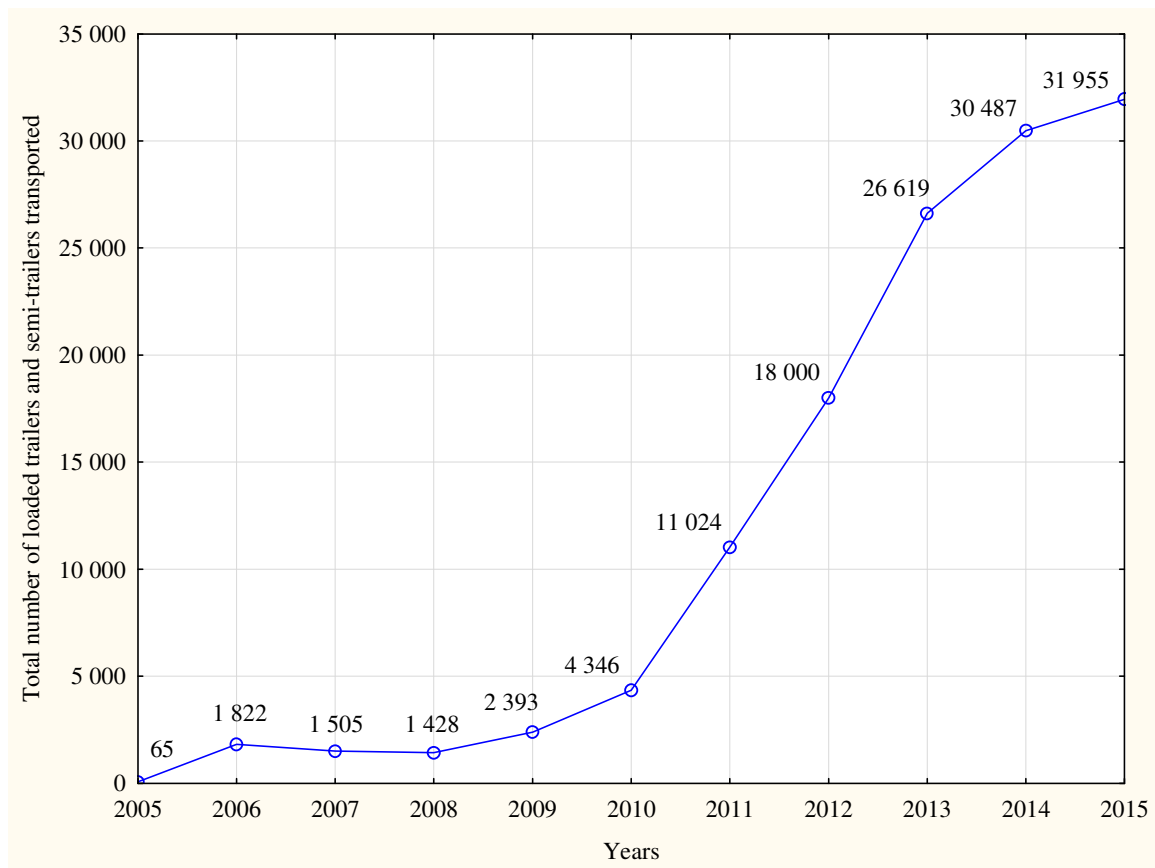


Fig. 3 Total number of loaded trailers and semi-trailers transported between 2005 and 2015 in the CR (authors based on [9])

We assume based on linear regression (relations 1-3) that the total number of loaded containers, trailers and semi-trailers transported in the Czech Republic will have increasing character, especially in years 2018-2022. We presume that the total number will oscillate in predicted period (2018-2022) in the Czech Republic between 801 342 and 951 292 for loaded containers and between 40 238 and 54 465 for loaded trailers and semi-trailers.

In the Czech Republic there are sixteen terminals for combined transport (Fig. 4), six of them are located in Ústí nad Labem region.

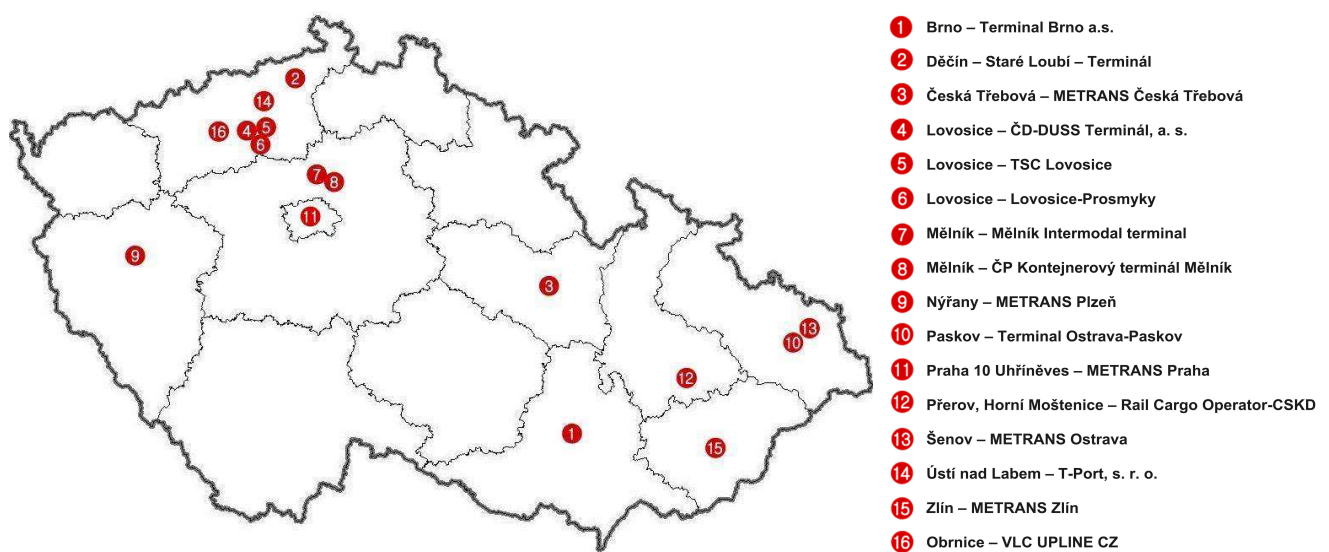


Fig. 4 Map of combined transport terminals in the Czech Republic (authors based on [9])

The overview of terminals in the Czech Republic with some parameters is presented in Tab. 1. Four terminals are trimodal terminals (no. 2 in Děčín, no. 6 in Lovosice, no. 8 in Mělník and no. 14 in Ústí n/L), which are operated by three transport modes (road, railway and inland waterway transport). Other terminals are bimodal, because these

terminals are operated only by two transport modes, which are in most cases road and rail transport. The largest inner area has terminal in Praha 10 (450 000 m<sup>2</sup>), which has fifteen railway tracks for transshipments of length between 309 – 695 meters. This terminal has the largest theoretical and actual volumes of transshipments, because standard volume of transshipments is 1 013 200 TEU per year (it is 84.43 % of maximum capacity of transshipments).

Table 1 Parameters of terminals in the Czech Republic (authors based on [14])

Parameters / Terminals	1	2	3	4	5	6	7	8
Location	Brno	Děčín	Česká Třebová	Lovosice no. 1	Lovosice no. 2	Lovosice no. 3	Mělník no. 1	Mělník no. 2
Transport modes	Ro/Ra	<b>Ro/Ra/In</b>	Ro/Ra	Ro/Ra	Ro/Ra	<b>Ro/Ra/In</b>	Ro/Ra	<b>Ro/Ra/In</b>
Inner area (m <sup>2</sup> )	40 000	15 000	130 000	15 000	24 000	2 000	49 000	19 000
Number of tracks	3	3	6	4	2	1	2	1
Length of tracks (m)	350	503 – 800	825 – 885	250 – 600	198	800	613	600
Theoretical / actual volume of transshipments (TEU or ITU)	30 000 / 15 000 TEU	7 200 / 10 TEU	850 000 TEU	53 000 / 22 000 ITU	60 000 / 45 000 ITU	2 000 / 6 TEU	150 000 / 80 000 ITU	30 000 / 20 000 ITU
Number of rail gantry cranes	0	1	3	0	0	2	0	0
Number of road gantry cranes	0	0	0	0	<b>3</b>	0	0	0
Number of container handlers	2	0	3	2	1	0	4	1
Operating days	Mo – Sa	Mo – Fr	<b>24/7</b>	Mo – Su	Mo – Su	Mo – Fr	<b>24/7</b>	Mo – Fr
Parameters / Terminals	9	10	11	12	13	14	15	16
Location	Nýřany	Paskov	Praha 10	Přerov	Šenov	Ústí n/L	Zlín	Obrnice
Transport modes	Ro/Ra	Ro/Ra	Ro/Ra	Ro/Ra	Ro/Ra	<b>Ro/Ra/In</b>	Ro/Ra	Ro/Ra
Inner area (m <sup>2</sup> )	35 000	32 000	<b>450 000</b>	12 000	40 000	18 000	6 000	120 000
Number of tracks	3	3	<b>15</b>	2	4	3	9	9
Length of tracks (m)	445 – 568	300 – 310	309 – 695	280 – 360	221 – 918	196 – 599	89 – 620	220 – 700
Theoretical / actual volume of transshipments (TEU or ITU)	200 000 / 130 000 TEU	80 000 / 54 000 TEU	<b>1 200 000 / 1 013 200 TEU</b>	30 000 / 18 000 TEU	180 000 / 90 000 TEU	11 000 / 60 ITU	290 000 / 250 000 TEU	30 000 TEU
Number of rail gantry cranes	2	0	<b>5</b>	0	0	1	0	0
Number of road gantry cranes	0	0	0	0	1	0	0	0
Number of container handlers	4	4	<b>10</b>	2	6	0	<b>10</b>	1
Operating days	Mo – Fr	Mo – Sa	<b>24/7</b>	Mo – Fr	Mo – Fr	Mo – Fr	Mo – Su	Mo – Fr
<i>Notes: Ro – road transport, Ra – rail transport, In – inland waterway transport; TEU – twenty-foot equivalent unit; ITU – intermodal transport unit; 24/7 – service is available any time and every day; Mo – Monday, Fr – Friday, Sa – Saturday, Su – Sunday.</i>								

Only three terminals (no. 3 – Česká Třebová, no. 7 – Mělník 1 and no. 11 – Praha 10) are operated in 24/7 mode. Terminals use most often container handlers. Road gantry cranes are not preferred, because these types of handling equipment use only two terminals: no. 5 – Lovosice and no. 13 – Šenov.

In the Czech Republic there are dense network of combined transport terminals, which are equipped with adequate technology, handling equipment, trained staff etc. Terminals currently have free capacity for transshipments.

#### 4. Conclusions

It is essential to utilize suitable transport units in order to increase continental combined transport. The condition for the shifting of further transport from the road to the railway transport is in particular that road transport companies

are equipped by needed technology. Road transport companies currently realize transports that could be potentially, based on mutually advantageous conditions and shifted to combined transport trains. Thus it is essential that such companies are equipped with suitable transport units.

For further development of combined transport it is essential to focus attention on projects related, in particular, to the support of the following areas:

1. Combined transport infrastructure area (terminals etc.), transportation means area respectively.
2. Acquisition of intermodal transport unit's area.
3. Transfer of road freight transport into railway transport area.
4. Technical and technological equipment of terminals area.

Combined transport disadvantage is, in majority of cases, higher price compared to direct road transport. Thus it is essential to introduce more advanced technologies that shall make these systems more effective (e.g. increase of cargo parameters of interchangeable additions, reducing transshipment costs). In this relation it is useful to mention, for instance, introduction of horizontal transshipment technologies. Under the Czech Republic conditions it cannot be expected that the first impulse for utilization in combined transport shall be born in the Czech Republic since these technologies are used in particular for transports with transport distance over 300 kilometers. The first impulse thus must be provided by a state that is a natural center and a crossroad of the European freight transport, such as is in particular Germany. Depending on the development of such a system abroad it is possible to develop such a system also in the Czech Republic and that in the form of developing relevant network of terminals.

Larger utilization of combined transport does not depend solely on the supporting measures (such as transport infrastructure, international interoperability, number of quality routes for freight railway trains, harmonization of fees), but also on the ability to react to the existing situation where the most important part of freight transport uses logistical and warehousing centers connected to road network. Combined transport will have to offer services to road transport companies for mid and longer distances. Freight transport logistics will continue to be operated, in particular, by means of the existing private logistic and warehousing spaces while at the same time it shall be essential to create links to combined transport terminals. These terminals must have both sufficient parameters and capacities. Thus the existing spaces will not have to be relocated or amended by building additional railway trailers to these spaces.

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