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## Rail Freight Network in Europe: Opportunities Provided by Re-launching the Single Wagonload System

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### Abstract

The market share of Single Wagonload (SWL) transport in Europe is decreasing over time, dropping from 50% to 27% in the last decade, against a trend of total rail traffic which is almost stable. Such a figure, however, is not descriptive of the European context as a whole because in some countries SWL represents a key feeder of the rail freight industry while in other countries its continuation is at risk.

This paper investigates the importance of SWL by clarifying its role in the European freight transport sector and identifies a set of short and long-term measures aimed at re-launching such a service.

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### 1. Introduction

In the EU, more than 80% of freight transport flows is carried by road which is the dominant transport mode, mainly because road transport services for freight are considered as available, flexible, adaptable, reliable and affordable. Road transport, however, is responsible for the main negative externalities (Fig. 1) affecting the quality of the environment and livability, also contributing to increase road congestion and accident rates. In this context,

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the recent EU transport policy [1] states that a 30% of road freight over 300 km should shift to other modal solutions such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and “green” freight corridors.

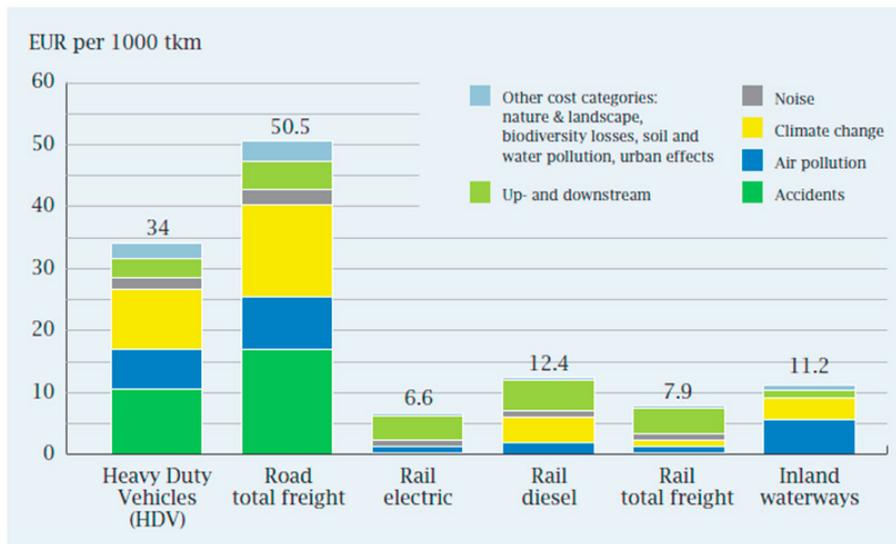


Figure 1- Average external costs for freight transport, EU-27, 2008 [2]

Within this scenario, Single Wagonload (SWL) should really become an alternative to road transport, by exploiting its higher flexibility in satisfying variable demand patterns than full train service, at least for smaller shipments which account for a significant share of the total rail traffic in Europe. With the SWL system, operators are capable of forwarding shipments that occupy only a few railway wagons, or even a single wagon. In the "first-mile" operations, the single wagon or small group of wagons is brought from the sidings where it is loaded to specific facilities (typically marshalling yards or shunting yards) where it is grouped together with others to form long trains. The trains then travel the bulk of the total journey distance, and are split up again at least once, as the shipments near their destination, for the "last-mile" operations.

Intermediate marshalling operations also typically occur, in which the single wagon or wagon-group is moved from one train to another. As opposed to combined transport, in which at least the “first” and “last mile” are performed by road, the shipment makes the entire journey by rail. Such a system was in widespread use a few decades ago, whereas nowadays SWL market share is decreasing over time, dropping from 50% to 27% in the last decade, against a trend of total rail traffic that is almost stable. Such a figure, however, cannot be assumed as descriptive of the European context as a whole and some differences at national level can be identified. Thus, in some countries SWL represents a key feeder of the rail freight industry while in other countries it is at risk of disappearing.

Within the context described above, this paper investigates the importance of SWL traffic also by clarifying its role in the European freight transport sector, through a focus on 11 European Key Countries (KCs): Austria, Belgium, Czech Republic, France, Germany, Italy, Poland, Romania, Sweden, Switzerland and the United Kingdom. The KCs were selected according to geographical location and market trends also taking into consideration the different SWL strategies implemented at national level. A large amount of information was collected by following different approaches; besides an extensive technical review of database and statistical information, direct interviews with different shippers and operators’ Associations as well as surveys addressing Railway Undertakings (RUs) and Infrastructure Managers (IMs) were carried out.

Such an investigation allowed a realistic picture of the current SWL system to be achieved, in terms of traffic trends, market segments, infrastructure endowment and business models, also by identifying weaknesses and gaps to be overcome as well as strengths and opportunities to support its re-launch.

For the first time in the last decade, such a study provides a quantitative view on the magnitude of SWL traffic in Europe as well as on the share of international flows, which represents almost 2/3 of the total SWL market.

## 2. Current situation of the rail freight transport market in Europe

The freight transport market in the EU, including sea transport, accounted for 3,824 billion tonne-km in 2011, therefore registering a 25,9% increase over the period 1995-2011 (i.e. +1,4% per year). On the contrary rail's market share was 11% and had been decreasing steadily since the year 2000. When considering only inland freight transport, recorded transported volumes were 2,414 billion tonne-km in 2011, thus increasing by 26,3% over the period 1995-2011 (i.e. +1,5% per year). In this case, rail's market share is of course higher (17,4% in 2011) but still registering a decrease from the value of 20,2% in 1995.

For the purposes of this paper, it is interesting to analyze rail's market share distinguishing between countries in which the SWL system is still largely supported, from the others in which it is not pursued extensively. Among the 11 KCs analyzed in this study, there are some in which the incumbent RUs belong to the "Xrail Alliance", a project started in 2007 aimed at supporting the development of the SWL sector by increasing quality of service (mainly in terms of reliability, punctuality and customers' orientation) and pursuing economies of scale [3]. The average share of rail freight transport is 28% in these countries, against 16% in the KCs not belonging to the Xrail network. In terms of tonne-km, the first group recorded a relative increase of about 21% between 2003 and 2012, the second group recorded a decrease of about 9% over the same period. In the single countries of the first group, trends were either stable or increasing, in the other group they were either stable or decreasing.

In the following sub-sections, the situation in the same period for SWL transport is described, in terms of traffic, market share and commodity types.

### 2.1 SWL rail market in the selected Key Countries

A few years ago the volume of SWL traffic in Europe was estimated to be about 100 billion tonnes-km [4]. However, such an order of magnitude likely needs to be slightly resized because, according to Eurostat figures [5] confirmed by the information gathered among the stakeholders, a general negative trend has taken place in the last decade, with the fraction of rail transport performed with SWL decreasing from 50% to 27%.

However, taking also into consideration the results of a previous analysis focussing on the SWL market throughout Europe [6], different national strategies can be recognized. Indeed, there are some countries where SWL still covers an important segment of rail freight transport (e.g. Austria, Germany, Czech Republic and Sweden) and other countries where such a service has been downsized (e.g. Slovakia, Poland and Italy) or, even, almost abandoned (e.g. UK).

Such segmentation is clearly presented in Table 1 showing the share of SWL traffic with respect to the total national rail traffic. To this end, it is worth noting that RUs active in the freight sector in the United Kingdom as well as the incumbent Italian RU, in recent years, have oriented their business model exclusively on increasing full trains and/or intermodal transport considered more sustainable than SWL transport under the local market and operating conditions. This has also induced a gradual closure of several marshalling yards and private sidings dedicated to SWL operation. Such downsizing strategies were often driven by the need to improve the financial situation of the RUs in a period of shrinking freight transport demand; SWL was assessed as the least profitable business, and therefore an obvious target for cost-reduction policies.

Table 1 - Share of SWL traffic with respect to total rail, 2012 (authors' elaboration based on Stakeholder consultation)

Country	A	B	B/A
	Total traffic [bn tkm]	SWL Traffic [bn tkm]	% of SWL traffic
Austria	15.70	6.32	40%
Belgium	5.13	1.46	28%
Switzerland	12.39	2.84	23%
Czech Republic	11.42	4.68	41%
Germany	87.91	34.15	39%
France	24.34	4.87	20%
Italy	17.02	2.08	14%
Poland	48.90	8.44	17%
Romania	8.19	1.64	20%
Sweden	21.24	5.43	26%
Slovakia*	7.59	1.66	22%
Slovenia*	3.23	1.16	36%
UK	18.58	0.28	2%
<b>Total</b>	<b>276.65</b>	<b>75.00</b>	<b>27%</b>

\*Source: Eurostat

Data collected through questionnaires also provide a picture of the SWL market in terms of territorial coverage (i.e. international and national traffic), by outlining that the KCs' international traffic is about 65% versus a 35% of national traffic. On the one hand (Fig. 2), more than 80% of Belgian and Swedish SWL traffic is international while in other five countries - respectively Germany, Poland, Czech Republic, Italy and Austria - the international portion of SWL traffic is between 61% and 80%. On the other hand, a prevalence of national traffic is observed in France and Switzerland, where SWL supply appears to play a more important role for the internal movement of goods than for the exchanges with other countries.

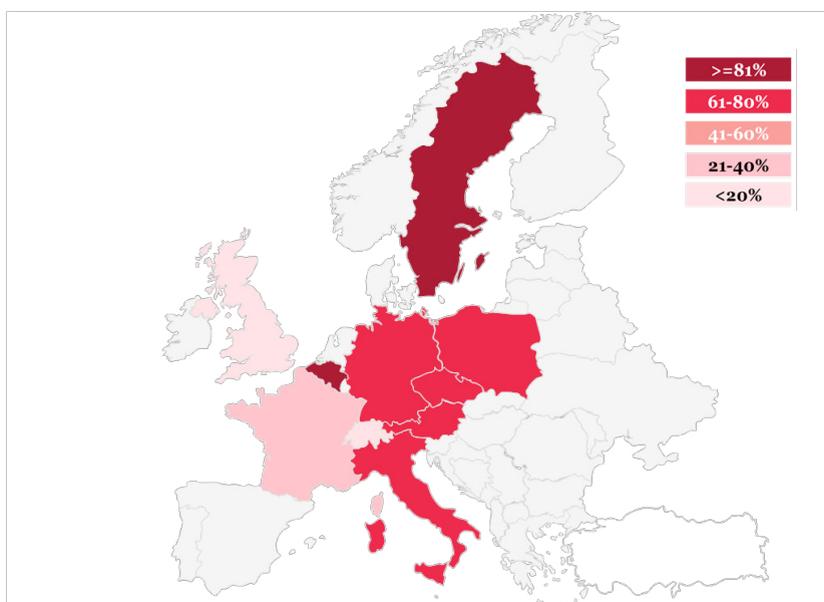


Fig. 2 - Key Countries: fraction of SWL international traffic (bn tkm)

## 2.2 Commodity types typically transported by SWL

According to the questionnaire and interview findings of this study, SWL services seem to be strictly related to transportation of specific commodity types. Thus, the main specific SWL traffic segments in the KCs (Table 2) were identified as follows:

1. basic metals, fabricated metal products;
2. chemical products;
3. coal and lignite, oil and LNG;
4. heavy industry products (incl. transport equipment);
5. products of agriculture.

Table 2 – Main traffic segments in the KCs, ranked according their relative importance from I, more important, to III, less important (authors' elaboration)

	Austria	Belgium	Czech Rep.	France	Germany	Italy	Sweden	Switzer-land	Poland	Romania	UK
Basic metals, fabricated metal products	I	I	III	I			I	I	I		III
Chemical products and Fertilizers		II		II	II		II		II	I	II
Coal and lignite; oil and LNG			I							III	I
Heavy Industry (incl. transport equipment)					I	I					
Secondary raw materials						II					
Products of agriculture	II									II	
Other*	III		II	III		III	III	II	III		

\*This category, depending on the country, refers to one of the following: metal ores and other mining and quarrying products/ mail, parcels/other non-metallic mineral products/wood and products of wood and cork.

Accordingly, SWL demand evolution is likely to be also related to the specific market dynamic affecting these categories. The relationship between SWL trend and overall land transport evolution of “captive” commodities appears to be true for basic metals, heavy industry (with particular reference to transport equipment) and agricultural products. To this end, Table 3, summarizing the percentage variation of goods<sup>1</sup> moved by rail and road, outlines the dramatic reduction of the flows of metals (-16% by rail) and transport equipment (-18% by rail) in the last 5 years.

Nevertheless, it is worth noting that different trends can be observed between the two five-year periods of Table 3, through which it is possible to perceive a kind of watershed<sup>2</sup> in terms of effects of pre-and post-economic crisis on freight traffic, also taking into consideration that a change in commodity classification occurred in the same period, changing from NST/R to NST 2007.

1 Traffic data were calculated leading back the commodity classes to a unique nomenclature.

2 Statistics on goods transported by rail, by group of goods and type of consignment (full wagon, full train) are not available. However the Eurostat database provides statistics on goods transported by mode (rail and road) and group of goods according to NST/R until 2007 and NST/2007 since 2008 (NST acronym stands for *Standard goods classification for transport statistics*).

Table 3 – Percentage variation in road and rail freight transport (EU 27)

Key Commodities for SWL	2003-2007		2008-2012	
	EU Countries*		EU Countries*	
	RAIL	ROAD	RAIL	ROAD
Basic Metals	12%	22%	-16%	-19%
Chemicals	9%	14%	9%	-22%
Coal and Lignite	8%	6%	1%	8%
Transport Equipment	5%	27%	-18%	-16%
Agricultural Products	-5%	3%	-5%	5%

*\*except Bulgaria; source: Eurostat*

Since they refer to both the road and rail segments, such trends can be also directly attributed to recession impacts on industrial production of raw and/or semi-finished materials. However, it is also evident that the rail sector has lost important units in a freight market clearly oriented to the road modality. Moreover, also agricultural products in each of the two 5-year periods lost a 5% of rail share versus a positive trend in road transport. In such a framework, chemicals represent an exception as rail transport recorded a constant growth (+9% in both 5-year periods) while road traffic volumes sharply declined.

In order to better clarify traffic trends related to modal shift, Table 4 provides total variations in terms of quantities (tonnage) lost or gained respectively by rail and road during the last decade.

Table 4 - Variation in road and rail freight transport (EU 27)

Key Commodities for SWL [1,000 tonnes]	2003-2007		2008-2012	
	EU Countries*		EU Countries*	
	RAIL	ROAD	RAIL	ROAD
Basic Metals	21,120	123,041	- 30,285	- 125,766
Chemicals	5,774	78,401	9,461	- 166,635
Coal and Lignite	25,960	9,109	1,582	11,968
Transport Equipment	2,034	122,631	- 6,857	- 41,713
Agricultural Products	- 1,459	20,056	- 4,077	60,323

*\*except BG; source: Eurostat*

By moving the focus only on the KCs, it is also interesting to consider the specific trends of the above key commodities. In particular, chemicals registered a quite constant increase over the 10-year span, it being also in countertendency if compared to trends of other commodities during the global economic crisis. This means that rail is consistently increasing its market positioning within the chemicals trade.

Also with reference to the coal and lignite market, rail transport covered a prevailing position and a recovery trend of such market has been confirmed, also after the past negative peaks recorded during the economic crisis. Regarding transport equipment, the rail market has preserved its traffic demand by limiting the negative impacts due to the economic recession (its percentage decrease was quite low if compared to road transport). This likely suggests that, besides a drop in overall orders for this kind of product, some important changes are taking place within the related logistics chain.

Finally, although agricultural products are widely moved by road, the overview over the last decade outlined how this seems not to be affected by the crisis (similarly to chemicals, the rail market registered a countertendency trend), so as to be characterized by a quite stable trend in the 2008-2012 period.

In Table 5 the relative figures for rail (see Table 3) are compared with those for total land transport over the period 2008-2012. It appears that the overall evolution of the exchange of some of these commodities has been one

driver also of the evolution of rail traffic, and therefore of SWL. In particular, the significant decline of rail in transport equipment and basic metals has been clearly driven by the overall decrease of such traffic in Europe. Such commodities have been mentioned among the “captive” ones for SWL, meaning that such general trend certainly also negatively affected SWL.

Table 5 – Summary of the analysis of main traffic segments evolution 2008-2012

Commodity	2008-2012 variation of total land transport	2008-2012 variation of rail transport
	[t-km]	[t-km]
Basic metals	-18%	-16%
Chemical products	-18%	+9%
Coal and lignite	+3%	+1%
Transport equipment	-16%	-18%
Agricultural products	+4.5%	-5%

For agricultural products, the reduction of rail freight tonnage does not appear instead related to a general tendency, since total land transport of such goods increased in the second 5 year period; modal competition seems in this case the element of such an evolution. Moreover, rail transport appears to have improved its competitiveness in the case of chemical products, for which the rail freight volumes increased in the context of a reduction in total land traffic.

### 3. Key issues and obstacles for the evolution of SWL

According to the direct surveys and interview outcomes, the crucial reasons responsible for the general decline affecting SWL transport demand are identified and critically discussed here, along with a set of key issues - referred to market demand and supply as well as to infrastructure - likely supporting SWL evolution.

On the one hand, a *general reduction occurred in demand flows for commodities defined as “captive”* for SWL services, such as those for metals and transport equipment. A reduction of the total land transport flows of 15-20% in 2008-2012 was observed together with an identical decrease of rail traffic. In particular, except for chemical products, where rail transport competitiveness seems to have counteracted a negative trend, for basic metals (the first segment in terms of volume for the RUs of Austria, Belgium, France, Sweden, Switzerland and Poland) and transport equipment (the most important segment in Italy) the overall evolution also penalised the rail sector.

On the other hand, the *scarce or completely lacking profitability of SWL* for the RUs operating such services, has addressed RUs towards the elimination or significant downsizing of services (as experienced in the UK, Italy, Spain, but to some extent also in France) because of the urgent need to improve their financial situation. Due to market competition, even in countries with RUs still supporting SWL such as Austria and Switzerland, 15-50% of the SWL services do not cover their production costs. This is also due to the complexity of the transport chain making it less easy to obtain economies of scale mainly for last mile and marshalling operations. Indeed, stakeholder consultation in the KCs shows that these represent a very important part of the costs: on average 22% for total marshalling activities to which a 25% is added for collection/distribution/shunting at node stations. In that respect, it should be also considered that the large proportion of international traffic in SWL means that the decision to eliminate such services by the dominant RU of a given country is very likely to affect SWL transport in all other countries exchanging goods with that country, since it will not be easy to find another RU interested and capable of replacing the incumbent.

In addition, there is an evident *difficulty in coping with market expectations in terms of service quality*, in particular for international transport that represents the core of SWL transport demand. Wagon tracking & tracing systems already available to shippers in most cases for domestic SWL movements are not implemented yet at large scale for international flows, while such information is available when using other transport modes. Hence, the reliability of such a system is perceived as not sufficient, even if at least 75% of SWL trains are reported to arrive within 1 hour of the scheduled arrival time, because the complexity of the production model amplifies the train delay (e.g. whether other groups of wagons have to await train arrival in order to reach an acceptable capacity utilization). However, this does not imply that 75% of the wagons, and even more 75% of deliveries, respect the scheduled time.

There is also a large part of the *SWL system that is still operated according to traditional production and business models* although several RUs are already operating or developing new production models aiming at optimizing use of available capacity and simplification of the transport chain (e.g. liner train supply). Enhanced models aiming at combining typical conventional SWL flows with regular flows of intermodal or conventional transport are promising in terms of efficiency and profitability, but are not yet planned and operated at large scale.

Besides, a number of *technological innovations* aiming at enhancing SWL productivity, flexibility and attractiveness for the shippers have been developed and, in most cases, they are fairly mature. Large scale implementations are, however, quite significant in terms of monetary resources required and, at least in some cases, the overall decline of the system does not encourage such investments.

Moreover, there has been a *limited effect on SWL of the liberalization process* which affected the European railway freight market in the last decade. Due to the complexity and lower profitability of SWL, new entrants focused on the intermodal and full train markets, so that the beneficial effects of market opening have not been observed for SWL (by the way, out a total of 6 RUs, only a couple of the new entrants contacted for the survey stated that they also supply SWL services). In this context, the peculiarity of the SWL market situation is evident when comparing the trend of SWL and full train services against that of total rail freight (Fig. 3). This clearly shows the SWL declining trend in spite of full train services remaining stable or increasing in the period 2004-2012.

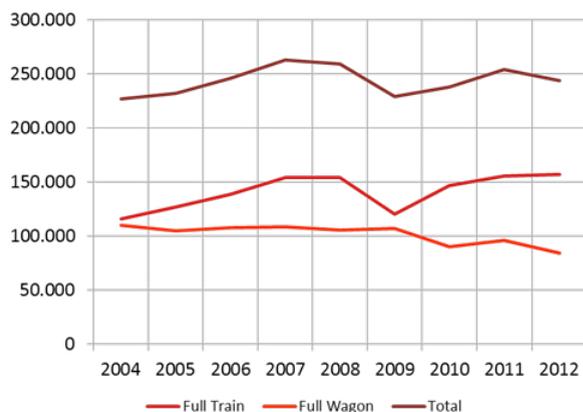


Fig. 3 - Freight volumes (Mtkm) moved by full train and SWL traffic over time (source: Eurostat)

Within this context, it also cannot be ignored that the majority of “new entrants” are, quite often, major foreign rail companies (i.e. ex-monopolistic operators) which have the technical and financial capability to drive the development of the SWL market even abroad, such as the German incumbent RU, now operating in many other markets outside Germany such as Poland and Italy.

It is also worth noting the *direct competition on small/medium shipments with the road sector*, the latter being able to improve its efficiency constantly. To this end, Fig. 4 shows how diesel fuel price variations did not generate a significant change in road transport prices; besides, road transport is highly rated by shippers in terms of flexibility, and its large capacity of door-to-door transport increases its competitiveness.

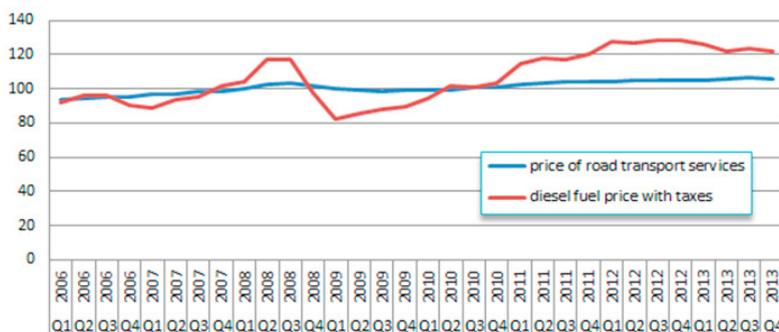


Fig. 4 - Evolution of road transport service prices and fuel prices in Europe, 2010 = 100 (source: Eurostat)

Some countries, such as Belgium, Italy and Romania, have a freight market still heavily oriented to all-road transport. So, in the absence of measures aimed at increasing the accessibility of the rail network together with proper policies also aimed at internalizing the negative externalities caused by transport activities, a better balance between rail-based and all-road transport is still far from being reached (and SWL, directly competing with road for small/medium size shipments, suffers more than the full train segment from this situation). Vice versa, the peculiar market conditions of Switzerland – based on heavy restrictions on trucks (such as the night ban and the truck tax proportional to the vehicle's maximum weight and the travelled distance) – allowed even domestic retail flows to be attracted by the SWL market.

Finally, particular attention is deserved by the issue of *availability of infrastructural facilities that are essential for SWL service operation*. This study provided evidence that the situation is rather heterogeneous across the KCs but, at the same time, recurrent characteristics exist. The numbers of marshalling yards in operation have been in several countries significantly reduced in the last 10 years (a 30-40% decrease on average), and/or plans for further downsizing exist. The tendency to reduce the available infrastructure for SWL appears, however, to be more an effect than a cause of the SWL traffic reduction. Indeed, IMs would like to avoid unexploited capacities because of the tight budget constraints they have, so they react by reducing the available train formation facilities and freight stations as soon as the relevant traffic streams are declining. Such decisions, although justified in the short term, might hinder any future re-launch of traffic, especially if the tracks in the yards or sidings or freight stations are removed, and the available land used for other purposes. In this context, countries pursuing SWL are the ones more oriented to the preservation of SWL-related infrastructure, while other countries are developing “marshalling-free” SWL services (requiring only limited shunting operations on flat yards) to combine wagons from different clients.

In any case, the reduction of private sidings still remains the most critical issue; rehabilitation or construction of sidings (and their certification, where needed) is a significant expenditure and administrative burden for the companies owning the plants connected by the siding, and only some countries support with specific actions their existence and development. On the other hand, road connections to industrial plants are built and maintained at no cost for the companies.

As a result of the survey and interview outcomes, the IM of the Czech Republic has no motivation to facilitate the SWL sector and, furthermore, the main national strategy announced by governmental authorities aims at closing up to 70% of private sidings. In Belgium, the stakeholders highlighted the lack of a clear willingness of the IM to invest in infrastructure and/or funding for operation and maintenance of private sidings. In Italy the closure of the main hump marshalling yards was decided, due to the strong reduction of demand for specific freight categories that were the most important ones for SWL (hump yards require high volumes to be economically sustainable). In the United Kingdom almost all infrastructures used for SWL traffic has been dismantled and there is also a limited availability of wagon fleet as well as of infrastructure to all operators.

In addition, even countries with dominant RUs still supporting SWL, such as Austria, Switzerland and Germany, do suffer for important infrastructural constraints derived from the choices of neighbouring countries, concerning not only the reduction of SWL-specific infrastructure but also the non-harmonised conditions imposed to rail freight trains, in terms of maximum train length, maximum axle load (influencing the wagon weight) and gabarit (loading gauge) [7]. Such conditions, by causing a lack of homogeneity in railway lines' performances, also produce negative impacts on total travel time and service quality. It is evident that such a constraint is not applicable to SWL only. However, the rail supply segment that has typically a lower profitability, such as SWL, is particularly affected by any further restriction potentially producing additional costs.

As far as above described, infrastructure downsizing is undoubtedly a key issue hampering SWL re-launch. There is very likely a risk of a “vicious circle” where rail traffic reduction is driving the closure of some key facilities, and the latter will generate further traffic drops. Due to the relevance of such a specific issue, how and to what extent the infrastructure can affect the re-launch of SWL services is investigated in the next section.

#### **4. Infrastructure for SWL: current situation and possible developments**

The SWL service requires the availability of specific infrastructure to be operated, as follows.

- shunting and marshalling yards allow to assemble/disassemble the long distance SWL trains. Indeed, SWL traffic generally passes through at least one train formation facility between origin and destination.
- freight stations are essential as points of start/end of the private sidings where trains feeding the SWL system may stop before starting the journey on the main network (or before being moved to private siding at the end of the trip). Freight stations are also needed to provide facilities to load/unload on SWL trains.
- private sidings connected to the main railway network are located in warehouses and plants and allow wagons to be loaded and unloaded on the customers' premises.

Freight stations and shunting/marshalling yards are usually owned by IMs whereas many of the smaller sidings are generally owned by private operators. Port areas often comprise private sidings, freight stations and intermodal terminals.

The current situation of facilities for SWL and their trends and developments in the upcoming years have been investigated through a desk analysis, which was essentially based on the KCs' Network Statements (NS) and the DIUM (*Uniform distance table for international freight traffic, list of railways stations, list of the railways places of acceptance/delivery*). The first document [8], according to Directive 2001/14/EC, identifies and describes the parts of the network dedicated to specified traffic types, also defining the access conditions to the infrastructure. The second one [9] contains relevant data both for RUs and customers, concerning rail freight transport into international traffic as well as a list of stations equipped with Intermodal Transport Unit (ITU) terminals. The findings of the desk analysis were, then, validated through direct interviews and a questionnaire submitted to IMs.

#### 4.1. Train formation facilities

In a shunting yard the trains are usually composed and split without sorting the wagons individually, by disassembling and shunting groups of trains using shunting locomotives.

On the contrary, a marshalling yard is a more complex facility because wagons are sorted in several tracks, typically each one corresponding to a given destination. Such a facility can be a flat yard, a hump yard or a gravity yard. The first type of marshalling yard is usually operated by shunting the wagon in the appropriate departure track with a locomotive, while the hump and gravity-based facility exploit, respectively, an artificial or natural difference in the ground level between arrival and departure tracks (single or group of wagons to be included in the same departing trains are cut from the arrival train, and then descend by gravity to the defined sorting or departure track). Rail brakes in some cases equip the hump yard tracks, so as to properly regulate the approach speed (in order to avoid wagon damage resulting from excessive impact from descending wagons approaching the standing ones); in other cases manual means (stop blocks) are used.

With regard to the function of the marshalling yards in the production system, they can be further classified into:

- marshalling yards serving inland traffic, which are mainly or exclusively dedicated to the SWL traffic between couples of inland origin-destination points;
- marshalling yards serving ports, which are usually dedicated to both conventional and combined rail traffic; they constitute a key node in the transport chain due the very close link between their functionality and the operational performance of berths and port terminals.

From a general point of view, it is important to underline how such structural elements are very relevant, due to their strong contribution to infrastructural, maintenance and operating costs.

With reference to the KCs, figures for the current density of marshalling yards with respect to the rail network extension are presented in Fig. 5. The geographical picture turned out to be extremely varied with a cluster of countries comprising Sweden, Belgium, Germany, Switzerland and Austria offering between 1 and 1.5 marshalling yards per 1000 km of network length, followed by the Czech Republic and Romania (between 0.5 and 1). A further cluster includes France, Poland Italy and the UK which register the lowest value of density (less than 0.5 yards per 100 km of network length).

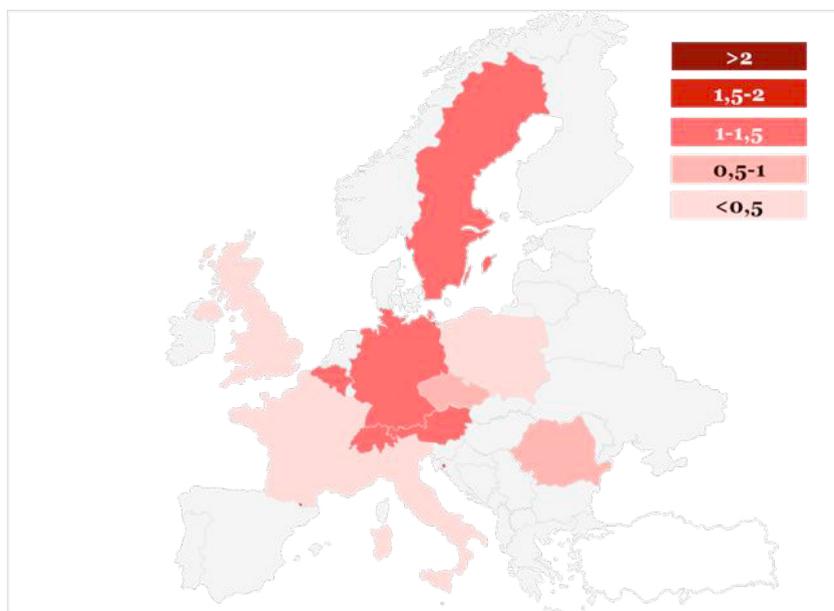


Fig. 5 - Operational marshalling yard density in the KCs (yards/100 km network length)

It is clear that a low density is indicative of a lack of connectivity of the freight transport system in comparison with the extension of the network. The development of “marshalling-free” SWL services (requiring only shunting operations on flat yards) to combine wagons from different clients is among the causes of the observed situation. However, this supply trend is also due to the reduction of total SWL traffic; indeed, only high volumes make the management of large hump yards sustainable.

#### 4.2. Freight stations for SWL

A freight station is a facility belonging to an IM including typically rail sidings where freight is loaded onto conventional wagons, and/or arrival/departure tracks from which private sidings are connected. Feeder trains from private sidings stop in the freight station before having an available path on the main line, and vice versa.

According to the results of freight station density with respect to rail network extension, the geographical picture (Fig. 6) seems to be more varied if compared with the previous one, also showing there is no territorial continuity among the Central European countries. The Czech Republic registers the highest value (more than 8 stations/100 km of network length) followed by Switzerland and Poland (between 6 and 8). Moreover, Sweden, Germany, Austria and Romania mark a station density between 4 and 6. Finally, for France and Italy such a value is between 2 and 4, and is lower than 2 for the United Kingdom.

On the one hand, a low number of stations clearly implies low capillarity of the conventional rail freight system. As it will be described later, the data presented in the map should be compared with the density of industrial sites generating the traffic in the different regions of the countries, in any case less than 2 stations for 100 km of network on average, as observed in some countries, is indicative of a low accessibility to the rail transport mode.

On the other hand, it should be highlighted that IMs need to operate efficiently (also considering the more and more stringent budget constraints), so that infrastructure “rightsizing” programs are unavoidable following the variation of freight traffic in terms of volume and spatial distribution. Thus, even if a reduction of capillarity is certainly a threat for the re-launch of the SWL system, it is clear that keeping a dense network of dedicated facilities in operation shall be carefully analyzed in economic terms. This means that where traffic volume does not allow appropriate cost coverage, other types of funding have to be considered.

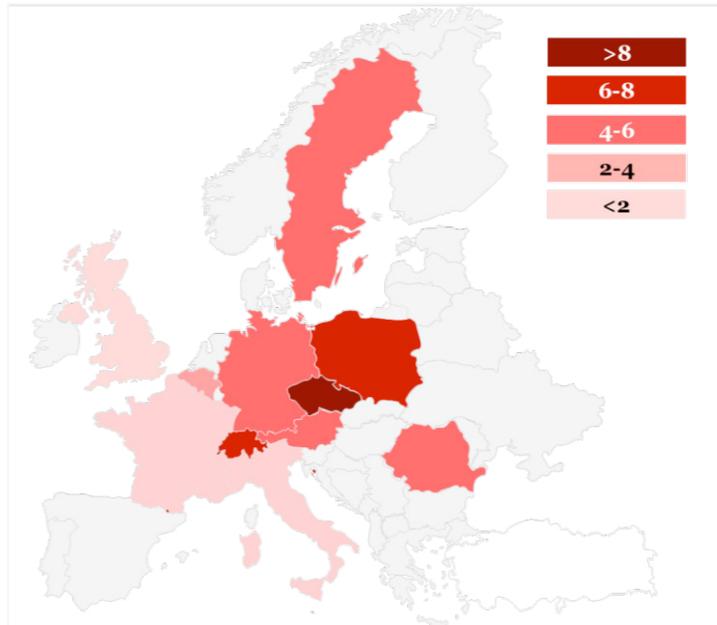


Fig. 6 - Freight station density in the KCs (stations/100 km network length)

#### 4.3. Private sidings

Private sidings establish a link between an industrial plant or warehouse, and a rail station or a railway line. So, they are an essential element of SWL system, by providing a direct access of SWL demand to the rail network. As far as density of the private sidings is concerned (Fig. 7), Switzerland registers the largest value (more than 20 private sidings per 100 km of rail network length) followed by Germany, Austria and Czech Republic which provide a value between 10 and 15.

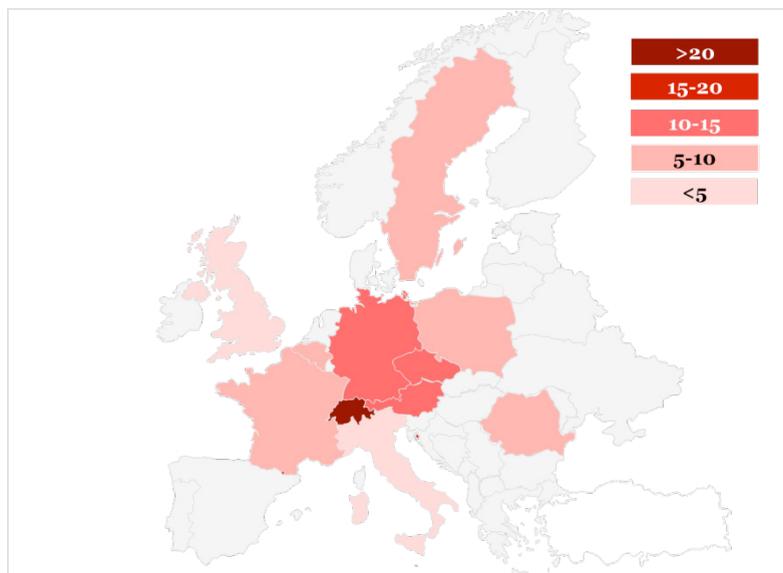


Fig. 7 - Private siding density in the KCs (sidings/100 km network length)

In addition, Sweden, Poland, France, Romania and Belgium mark a private siding density per 100 km of rail network between 5 and 10; for the United Kingdom and Italy the indicator drops to less than 5 private sidings per 100 km of network length.

Some countries support the use of private sidings and encourage their development, even with funding (Switzerland, Austria and Germany). In other contexts, Member States (MSs) and IMs (with budget constraints) in order to pursue financial stability tend to close freight stations, together with the last mile connection to sidings, reducing the appeal of SWL services. As an example, in Romania the price charged by the Railway Safety Authority for private siding certification is reported to be so high as to induce customers to forego this<sup>3</sup>. In Poland, on a total of 3,000 private sidings, only 1,500 are in operation; also in this case, requirements to obtain the safety certificate are reported to be strict and expensive.

#### 4.4. Evolution of the infrastructure facilities for SWL

As a result of the above analyses, some important concepts linked to infrastructure issues and directly affecting the SWL operation have been identified, as follows:

- most of the analysed countries experienced a significant reduction of the SWL infrastructures (e.g. private sidings, marshalling yards);
- due to the reduction of handled volumes, many hump yards have been closed and replaced in flat yards;
- such evolutions do not appear to be a "root cause" of SWL traffic reduction, but instead an effect; IMs needed to implement a "rightsizing" of the network to the actual level of SWL traffic, given also the lack of specific funding for maintenance and renewal of this kind of infrastructure in most Countries;
- the impact on international SWL traffic of the closure of such infrastructure is often not considered when decided at national level;
- a stability in the near future concerning the number of dedicated facilities is not expected.

The above underlines how the infrastructure issue strongly affects also production methods that, in case of strategies aimed at reducing fixed costs through the closure of specific rail facilities or development of few main hubs, have to be reconsidered with reduction in network connectivity and service capillarity. Moreover, local and regional rail lines (e.g. the adduction links used by SWL flows to reach the main national and/or EU freight corridors) are reported to suffer for a high rate of obsolescence, due to a lack of proper investments/maintenance in the rail sector, which hinder service performance.

A number of potential actions emerged from the analysis of the above mentioned trends, aiming at keeping the accessibility to essential infrastructure for SWL in a non-discriminatory way (i.e. avoiding an immediate closure once the incumbent RU decides not use a given facility any more). Description, consensus and expected effectiveness of such actions will be discussed in the next sections.

## 5. Rightsizing of essential infrastructure for SWL operations

### 5.1. Train formation facilities and rail freight network

As already outlined, the network density of infrastructural facilities within the selected KCs is quite heterogeneous. Besides, although it is difficult to gather "historic" data, the number of marshalling yards in operation has been in several countries significantly reduced in the last 10 years (mainly in France, Italy and Poland), and/or plans for further downsizing exist (such as in the Czech Republic).

Generally, it can be noted that countries pursuing SWL are the ones more oriented to the preservation of SWL related infrastructures. On the contrary countries like France, Italy and the UK developing "marshalling-free" SWL services to combine wagons from different clients show a tendency in downsizing SWL related infrastructures, due to the strong reduction or even elimination of the traffic using them. Indeed, large hump yards are sustainable only

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<sup>3</sup> There would be 800 particular rail branches owned by private enterprises.

in presence of high volumes of traffic. As already discussed, such a tendency to reduce the available infrastructure for SWL appears to be more an effect than a cause of the reduction of SWL traffic.

Most operators pointed out that, in order to be competitive with road transport, a strict cost management is needed in all parts of the transport chain, especially in the costly business of marshalling and/or shunting [10]. This requires above all avoiding unexploited capacities. To this aim a good coordination and efficient use of personnel in shunting areas would be beneficial as well as a continuous updating of the network structure aiming at achieving economies of scale by consolidating the operation in a relatively limited number of train formation facilities.

Moreover it cannot be ignored that SWL rail freight transport is highly dependent by the availability of infrastructure (i.e. arrival and departure tracks, freight stations etc.) used for “last mile” operations such as marshalling, shunting and wagon collection /distribution. In other words, competitive SWL services heavily depend on efficient “first” and “last” mile connections. Indeed, such services represent a relatively small share of the SWL production in terms of train·km, but do generate a significant part of the total SWL costs (more than 1/3 of the production costs), because of the need for specific equipment (e.g. shunting locomotives) and availability of staff that are not easy to be efficiently employed. Besides, last mile operations have a high impact in reliability and efficiency of the logistic and transport chain as a whole, so the lack of them or a reduction in their performance may result in further contraction of SWL market volume.

#### 5.1.1 Proposed actions to ensure the availability of “last mile” services for SWL operations

A number of issues emerged as deserving investigation to preserve or re-launch “last mile” services (also considering the potential lower interest of larger RUs to operate and expand them):

- enhancing the conditions for economic sustainability of last mile operations, such as through support to new “short-liner” operators (i.e. operators focusing on the last mile: shunting wagons to final destination or from the initial origin) or the public funding of last mile services defined as Public Service Obligations (PSOs);
- reducing the administrative burdens and setting specific safety requirements for RUs operating only on secondary lines (not opened to passenger traffic) and private sidings;
- ensuring availability of effective last mile operation in ports by involving the Port Authorities.

In case of development of short-liners, a more complex organizational and business model is likely to be implemented, where the large RUs are responsible for traction services on main lines, whereas the short-liners are in charge of activities within the last mile sections (collection/distribution of wagons from/to private sidings). Significant experience exists in France, where at least two short-liners are focusing on such last miles services (working in cooperation with RUs in service over the long distance) and two additional short liners expected to become active in the near future.

In this context, Fig. 8 summarizes the stakeholders’ views on the proposed measures to ensure the availability of last mile services.

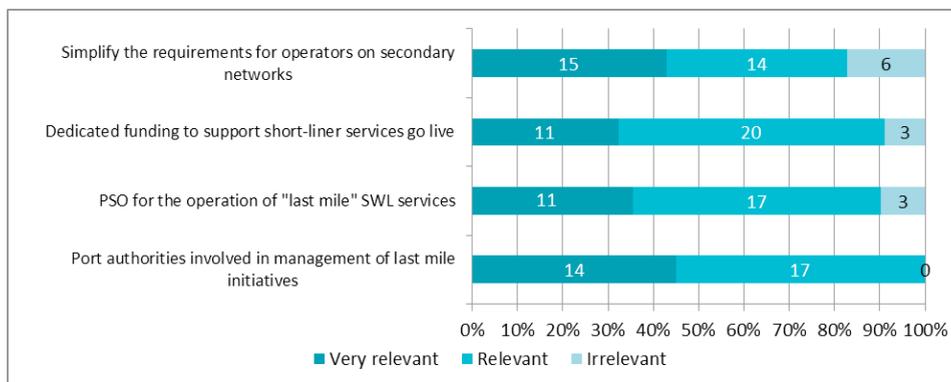


Fig. 8 - Stakeholders' position on the proposed actions to ensure the availability of last mile services for SWL operations (PSO: Public Service Obligation)

Most respondents claimed that *simplifying the requirements and obligations for operators which operate only on secondary freight-specialized networks* would help to reduce the production costs of SWL. Operations on secondary networks are often operating at lower speed and with trains running at much lower frequencies, so that the risk of accidents and their severity is inherently reduced. Simplification of requirements and obligations would help to reduce the production costs of SWL and make it more attractive without acting to the detriment of safety issues. To this end, Belgium adopted in 2013 a new legislation concerning rolling stock and personnel allowing non-railway operators to operate locally with their own equipment and their own staff. The aim is to create conditions to reduce the requirements in terms of personnel and rolling stock for enterprises having the status of transport auxiliaries, allowing them to perform "first/last mile" operations at a lower cost. However, a large amount of stakeholders pointed out that such measures on operational rules are very difficult to be implemented since pure freight-lines are very rare while most wagons often run on both secondary dedicated freight-lines and main lines with mixed services. Thus, the practical implementation of such provision is not easy, because of the necessity to provide a clear "boundary" between main line RUs and operators on secondary networks (now it is possible according to EU regulations only for isolated networks).

*Dedicated funding for the launch of short-liner services* is considered as relevant or very relevant by more than 90% of respondents. The financial help should allow the new operators to be economically sustainable in the first year of operation, similarly to the provisions of the Marco Polo program for intermodal services. Some stakeholders, however, believe that the program should focus on last mile infrastructure, essential for SWL, instead of supporting operations of new short-liner services. Other stakeholders believe that a temporary financial support to short-liners should be granted mainly to cover the costs for obtaining licenses and certification.

The *provision of Public Service Obligations (PSOs) for the operation of last mile SWL services* is also considered by stakeholders as a relevant option to take into account. Nevertheless, most respondents required that a framework and minimum rules establishing how such PSOs should be applied at a European level should be set, in order to avoid discrepancies among MSs.

Finally, several business models exist where port authorities are involved in the management of the last mile to connect ports to the rail network (e.g. port is only IM, port tenders last mile services, and/or port owns a RU). In any case, 100% of stakeholders agree on judging as important the *involvement of port authorities in the management of port-related last mile initiatives*. Shippers need to secure investments and, since many manufacturing companies and storage terminals are located in port areas, the ports' involvement in setting up last mile services is largely considered as advisable. This is already in place in the most significant French ports that are connected to the rail network, as well as in some German ports and in the Belgian port of Antwerp.

## 5.2. Private sidings

Private sidings represent a crucial element for the functioning of the SWL system, since they provide a direct access of SWL demand to the rail system. Thus, their availability and timely maintenance is essential. Many stakeholders, especially on the shippers side, expressed their concern on the progressive dismantle of the private sidings or on the difficulties to develop new ones.

Concerning the analysis of density of private sidings (cf. Fig. 7), that is the number of facilities per 100 km of network length, by comparing such a number to manufacturing industrial concentration<sup>4</sup> a new figure replace the previous one (Fig. 9).

Germany has by far the highest concentration of medium and big manufacturing companies, but relatively less private sidings, compared to other countries (apart from the UK, Italy and Poland) where the number of private sidings per manufacturing company is higher. On the contrary, Austria has one of the best private sidings/manufacturing companies' ratio in Europe, with over 40 facilities per 100 manufacturing companies. Sweden and France also present comparatively high density.

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4 For the purpose of this document, mining and quarrying, manufacturing and electricity, gas, etc. are considered.

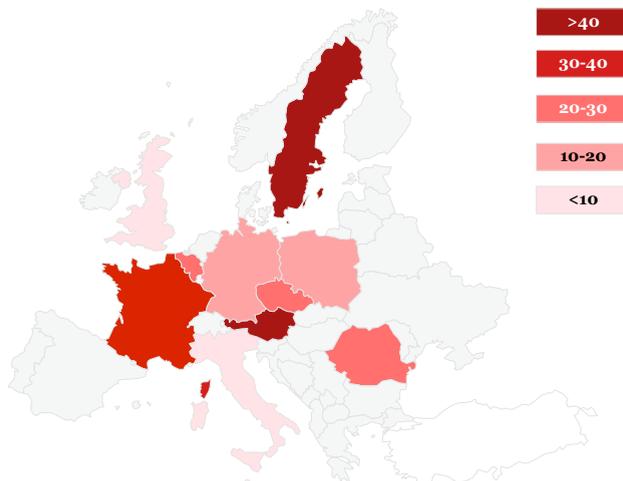


Fig. 9 - Private sidings/100 medium-large manufacturing companies

A lower density linked to the number of manufacturing companies may be interpreted in two ways: for countries with a relatively large SWL handled volume (i.e. Germany) it is likely to indicate that the traffic is more concentrated in terms of final origin/destination. For countries with low SWL volume (Italy, UK), it is more likely a sign of the decline of the SWL service both in terms of available supply and served demand.

As it can be noted, some countries support with specific actions the use of private sidings and encourage their survival and development (Table 6). To this end, Germany, Austria and Switzerland have established dedicated grant programs for supporting private sidings, which started in different years.

Table 6 - Example of funding schemes applied in Austria, Germany and Switzerland (Railway Gazette, 2007 and various sources)

		Austria (1986)	Germany (2004)	Switzerland (1995)
	% eligible costs	40% for new or reopened sidings; 30% for upgrading existing facility	50%	40% to 60%
Maximum subsidy	For new construction	€2.9m per project	€8 per ton per year; or €32 per 1000 ton-km/year	No limits, but grants are only available for sidings connected to stations or lines with at least 12,000 tons or 720 wagons per year
	For reactivation/extension	€2.2m per project	€4 per additional ton/year; or €16 per additional 1000 ton-km/year	
	For refurbishing	€1.45m per project		
Threshold		€15,500	€15,000	€30,000
Guaranteed volumes		Negotiated contract volumes for at least 5 years	Additional volumes reached within 5 years, measured in yearly average	n.a.

An interesting peculiarity of the Austrian scheme is that it funds sidings also in other countries, if the traffic originates or is destined to Austria. Moreover, all the three systems fund the construction, extension and reactivation

of private sidings, with the aim to transfer traffic from road to rail. Different subsidies are envisaged, with a minimum duration of 5 years in which specific volumes are required to be reached. The Swiss scheme appears less structured and requires a minimum investment threshold of €30,000 (twice that of Austria and Germany) but does not have limits for the maximum subsidy if not in terms of percentage of eligible costs (in line with the other two countries). In Germany the program for the funding of private sidings was developed in 2004 and revised twice to be into force until 2016. From 2005 to 2010 a total of 82 private sidings were funded - with €48.2 million, for a total investment of €129.4 million [11] – under the basis of the *Guidelines on Funding the Construction, Upgrading and Reactivation of Private Sidings*. Overall, as of December 2012, 120 projects have been funded. The respondents claimed that with more realistic economic appraisals and easier bureaucracy higher results could have been achieved. In any case, the above are the most important and general support programs for private sidings existing across Europe. In Sweden, there are no fixed criteria to support such kind of facilities, but the IM can use a certain percentage of its annual investment budget for private sidings.

Another issue emerged for some countries in Central and Eastern Europe is the excessively burdensome and costly certification process of private (industrial) sidings. In such countries in the past all industrial sidings were state owned and managed by the railway monopoly. Currently their status is still unclear and often this “grey area” implies that the same regulations in force for the main line tracks are applied, making difficult and costly to get the proper “certification”. Needless to say, for a private company this might appear as a non-priority investment that might even cause the decision to close down the siding in order to save on costs.

Besides, specific safety requirements (signalling equipment included) for lines that are used only by freight trains have been mentioned as to some extent not proportionate. The obligations to be fulfilled are often the same both for the national network where both freight and passenger trains run, and on secondary freight specialized lines (i.e. rules for operations, equipment needed to operate, etc.).

### 5.2.1 Proposed actions to support rightsizing of essential facilities for SWL operations

In a similar way to that proposed for supporting diffusion of last mile services, Fig. 10 summarizes the stakeholders’ viewpoint with regard to possible actions meant to rightsize the essential facilities for SWL service operations.

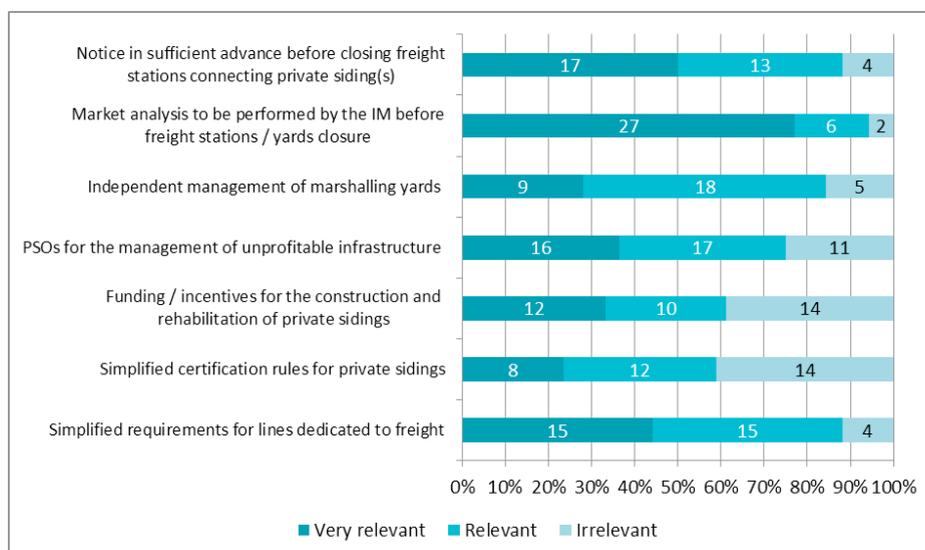


Fig. 10 - Stakeholders' position on the proposed actions towards rightsizing of available essential infrastructure

When the incumbent RUs decide to abandon a station or a train formation facility, the IM is likely to face operating and maintenance costs not justified by the existing traffic. This might urge them to close the facility with low or no traffic. As a consequence, the network is losing capillarity and this is likely to hamper the launch of new services from other RUs. In such cases, the *timing of the notice given for dismantling freight stations* is perceived as important by the industry. Article 13 of the Recast of the First Railway Package (Directive 2012/34/EU) imposes the IM to provide this mentioned notice. Nevertheless, it appears that the industry does not perceive this to be sufficient: a number of stakeholders stressed that 12 months are not appropriate and at least 24 months' notice should be provided in order to allow for proper investment planning.

Besides, a large majority of the respondents suggest that in case the IM intends to dismantle a station, a *market consultation should be performed before taking the final decision on the closure*, so that eventual future market needs as well as alternative solutions involving operators and shippers are taken into account in such a decision. Some respondents claimed that local authorities should also be included in the consultations as well, as these may be related to public interest. With respect to the market consultation, some good practices can be borrowed from the regulations on the airport sector, concerning the obligation to carry out consultation when making decisions on charges. This procedure has increased transparency: as recently reported by a Commission study<sup>5</sup> following the implementation of Directive 2009/12/EC<sup>6</sup> starting from 2011, consultations between airports and airlines are now being carried out and Member States' independent supervisory authorities have been set up.

Over 90% of respondents find it would be a relevant or even very relevant initiative to require *independent management of marshalling yards or terminals hubs* based on periodically renewed contracts. The renewals should be granted by transparent call-for-tenders procedures. However, a proper definition of rules will not be easy since in many cases the incumbent operators still hold the larger part of the traffic. Whatever rules are defined, these should not prevent the incumbent RUs from managing marshalling yards. They are the most competent and have a self-interest in effective management. Therefore, they should be allowed to bid for the management/operation of marshalling yards.

The *implementation of PSO for the management of unprofitable infrastructure* finds large consensus among survey respondents. According to this action MSs would be required to explicitly provide PSO for managing any unprofitable infrastructure that covers a key role for the functioning of SWL services. This solution is welcomed by some stakeholders because often the secondary network dedicated to rail freight needs important investments. The availability of PSO would put the RUs IMs in the condition of defining long term investments. It is also important to note that many stakeholders support this action, but many of them are sceptical that proper rules can be defined to implement it.

Many survey respondents claim that *private sidings are suffering from the lack of public funding/incentives*, which prevents their development as well as their upkeep. All stakeholders, whether short liners or bigger players, think that without proper public funding/incentives, private sidings hardly have a future, with all repercussions related to increased road transport (i.e. environmental issues, road traffic congestion, etc.). If responses are broken down per stakeholder category, all short-liner and terminal managers responding to the survey entirely support this action. A further important point raised during the consultation is that, when comparing rail and road, the latter appears to benefit from different investment and financing procedures, since the last mile connections between the industrial plants and the public road network are usually built by the public authorities with no cost for companies owning the plants. This is not the case for rail, except for few countries (Germany, Austria and Switzerland) that are recognized as best practices due to incentives granted for private sidings.

Some stakeholders suggested the *grouping of plants in industrial sites well connected to the rail network* should be encouraged and defined as a pre-condition of access to EU grants, if applicable. European spatial development policy and national planning should assure that new industrial areas are connected or are developed in areas which can be connected to the existing rail network. In line with such proposed action, areas where sidings do exist already

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<sup>5</sup> Report from the Commission to the European Parliament and the Council on the application of the Airport Charges Directive [com(2014)278].

<sup>6</sup> Directive 2009/12/EC of the European Parliament and of the Council of 11 March 2009 on airport charges.

because of the existence of (discontinued) industrial activities linked to the rail network should be selected in priority as the location of new industrial sites.

The application of *simplified certification rules for private sidings* is widely accepted by stakeholders. Indeed, private sidings or local tracks often present only one train in operation and rigorous safety systems and standards as for intensively used tracks would be somehow disproportionate. Moreover, the majority of stakeholders agree with initiatives aimed at simplifying requirements in terms of technical characteristics and signalling equipment for railway lines which are exclusively used by freight trains. Operations on secondary freight specialised networks are often at lower speed and with trains running at much lower frequencies, reducing the risk of accidents. Simplification of requirements and obligations would help to reduce the production costs of SWL and make it more attractive without reducing the safety standards. Specific experience of safety rules tailored to local networks when only freight trains operate do exist, for instance, in Germany, as developed by the association of operators VDV and accepted by relevant safety authorities.

## 6. Policies and recommendations

By combining the evidence provided by the data analyses carried out in this study with the opinions provided by the stakeholders, the following considerations can be drawn.

- The availability of last mile infrastructure is essential for the existence of the SWL system as well as for its re-launch. However, reductions of traffic volumes and stringent budget constraints have forced the downsizing of the available infrastructure, due also to the lack of specific funding policies in most KCs.
- The downsizing of the number of facilities used by SWL services was mainly driven by the traffic decline. It is widely recognised that the IM cannot keep open facilities where no traffic takes place or is likely to be developed in the near future. However, in line with the provisions of the Recast directive, the IM must inform the operators with sufficient advance about any decision of closure for train formation facilities and freight stations; this in order to allow operators to re-organise their logistic chain. Besides, the decision of closure must be supported by an adequate market analysis including the consultation of operators and local authorities aimed at verifying whether the traffic can be re-launched in the near future. In some specific and limited situations (such as peripheral areas, facilities serving market segments that may not be transferred to other modes, such as dangerous goods) specific funding policies can be foreseen to ensure the opening of the relevant facilities e.g. in the form of public service obligations.
- The conditions for the construction, rehabilitation and maintenance of last mile infrastructure are not harmonised between road and rail transport, as for the latter costs related to private sidings must be covered by the companies owning the connected plants. On the contrary, road links are developed at no cost for the industries. Specific funding and/or incentive actions for construction and rehabilitation of private sidings, such as the ones already existing in Austria, Germany and Switzerland, can reduce this gap and ensure fairer conditions of competition between modes.

In addition, other relevant actions to be implemented for the improvement of the capillarity of SWL supply should deal with:

- the simplification of complex certification procedures for private sidings in the countries where they exist;
- the development of land planning policies ensuring that any new industrial plant be developed in areas already connected to the rail network (such as discontinued industrial sites already equipped with their sidings) or that will be connected as part of the development project.

## 7. Conclusions

The study outcomes confirm the existence of three situations: countries with one or more RUs still pursuing SWL, countries where SWL faces constraints and countries where no major RU is still pursuing SWL. The main barriers hampering SWL development can be traced to a set of heterogeneous issues such as: demand decrease of “captive” commodities, price-competitive position of road transport, low service quality, rightsizing of infrastructure, outdated production or business models.

This study provides interesting implications for policy actions. SWL is a rail service suitable for small and medium-sized shipments. It can represent, along with intermodal transport, the direct competitor of the road sector, and its abandonment risks negative effects on specific market segments (e.g. chemicals, metal products). In extreme cases, dismantling SWL services could impact entire industries even generating the need of plant closure or relocation.

In this context, rail freight transport regulation requires a more effective implementation in order to create fair competition and guarantee access to relevant facilities. Capillarity of the rail network is also crucial for feeding freight to main routes whilst reducing wastes of time and additional costs. Accordingly, it is essential to implement policies and operating solutions to keep private sidings in operation as well as the marshalling/shunting yards still necessary for the SWL service. A proper management of last mile operations also represents a key factor to increase SWL sustainability, both in terms of quality and productivity. Moreover, operational integration with demand-oriented production methods, also by implementing an advanced real-time information system, is an essential issue. Finally, infrastructure accessibility, supported by economic sustainability as well as regulation of rail and other competing modes, can ensure long term viability of the SWL transport chain.

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