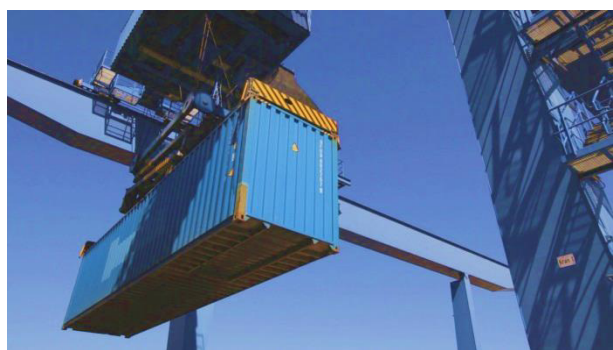


Synthesis document

Analysis of innovative logistics solutions such as rolling highways or solutions for other sustainable modes of long-distance Alpine crossing transport



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List of Abbreviations

ACP	Accompanied Combined Transport
AS	Alpine Space
ASP	Alpine Space Programme
BMVI	Bundesministerium für Verkehr und digitale Infrastruktur (engl. German Federal Ministry of Transport and Digital Infrastructure)
CT	Combined Transport
ERDF	European Regional Development Fund
etc.	et cetera
EU	European Union
GVZ	Güterverkehrszentrum (engl. freight transport centers)
ISO	International Organization for Standardization
ISU	Innovative Semitrailer Transfer
ITU	Intermodal Transport Unit
NiKRASA	Nicht-kranbare-Sattelaufleger (engl. Non-craneable Semitrailers)
p.	page
RCA	Rail Cargo Austria
RoLa	Rollende Landstraße (Rolling Road)
SB	swap body
SGKV	Studiengesellschaft für den Kombinierten Verkehr e.V. (engl. German Promotion Centre for Intermodal Transport)
SME	small and medium-sized enterprises
ST	semitrailer
UCT	Unaccompanied Transport

Preamble

The following report on innovative logistics is focused on Combined / multimodal transport in Alpine crossing freight transport and taking also into account the European Directive on the deployment of alternative fuels infrastructure.

In the framework of the Alpine Convention, the Transport Working Group contributes to the transnational cooperation in providing the delegations with analyses allowing committing actions. Moreover, it was the inspirator of several international cooperation projects such as "AlpInfoNet" or "Sustainable mobility solutions in remote Alpine territories" elaborated by the soft mobility subgroup.

Transport and mobility is one of the five areas of priority action of the Multiannual Work Program. The Group also works in connection with the Zürich Process on transport safety and mobility in the Alpine area.

At its XIIIth Alpine Conference 21st November 2014 in Torino, the responsible Ministers of 8 Alpine Countries decided about new mandates addressed to the respective working groups. Within the mandate 2015-2016 for the WGT figures the following purpose:

Analysis of innovative logistics solutions such as rolling highways or solutions for other sustainable long distance alpine crossing, also taking into account the directive on the deployment of alternative fuels infrastructure.

The following review presents the state of the art related to this mandate, whereas

- Part I is dealing with Combined / multimodal Transport and new innovative logistic solution in transalpine freight transport, and
- Part II is dealing with the European Directive on the deployment of alternative fuels infrastructure and its implementation (including situation in 3rd countries such as Switzerland).

The elaboration of Part I of the review is realized under Swiss Presidency, Part II is realized under Italian Presidency, in cooperation with all participating delegations.

The following experts participated in the preparation of the report:

Austria: Ernst Lung, Grubert Wolfgang – Federal Ministry for Transport, Innovation and Technology; Christian Rankl – Office of the Vorarlberg State Government;

France: Daniel Chemin (Coordinator) – Ministry of Ecology, Sustainable Development and Energy – France;

Germany: Jens-Uwe Staats – German Federal Ministry of Transport and Digital Infrastructure (BMVI); Harry Seybert – Bavarian Ministry of the Interior, for Building and Transport; Karl Fischer, Angelika Nürnberger, Nicola Neumeier, Marko Just, Waltraud Hartl – LKZ Prien GmbH (LKZ);

Italy: Paolo Angelini – Ministry for the Environment, Land and Sea; Massimo Santori – Transport Services Study Center; Raffaele Vergnani – European Academy of Bolzano;

Slovenia: Zlatko Podgorski – Ministry of Infrastructure and Spatial Planning;

Switzerland: Matthias Rinderknecht – Federal Office of Transport; Franziska Borer Blindenbacher – Federal Office for Spatial Development;

1 Introduction

During the last decades the most innovative and therefore strongly increasing segment of rail transport has been the so called Combined Transport (CT). This mode of transport unifies the respective advantages of road and rail transport, using the area-wide flexibility of the trucks, bundling the good flows at terminals and ship them by economically and environmentally favorable block trains over longer distances. High-quality rail transport undoubtedly offers advantages for freight transport in general across large distances and through mountainous territory. A basic distinction is made between Unaccompanied Combined Transports (UCT) and Accompanied Combined Transport (ACT), in which not only (semi)trailers but also the tractor unit are transported for a part of the trip by rail.

General information concerning innovative logistics through existing Combined / multimodal Transport in transalpine freight transport is available in the Review on Combined Transport in Alpine Countries, elaborated by the Zurich Group, May 2014:

http://www.zurich-process.org/fileadmin/data/webcontent/Webcontent/Sonstige_Dateien/compined_transport_review.pdf

A short summary related to this review is provided in this chapter (see 2.1.3).

Further additional information related to innovative logistics representing new developments since May 2014 is provided through the questionnaire on innovative logistics in Combined / multimodal Transport in Alpine countries (see Annex 1: Questionnaire (empty)) sent out in September 2015. These additional elements provided by the national delegations are summarized under the chapters 0, 3.1 and 3.2.

2 Combined Transport

Evolution of transalpine freight transport in general

“The share of rail in all transalpine freight transport volumes has changed only marginally: from 34.7% in 1999 to 33.9% in 2014. However, there are important differences between the countries”¹ (see Figure 1).

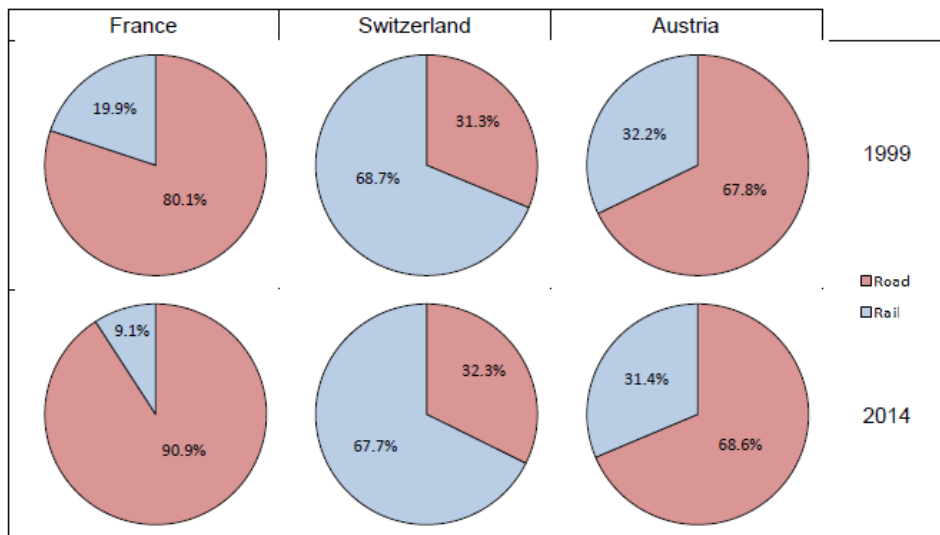


Figure 1: Development of modal split²

“The growth trends in the EU economy are reflected in the evolution of transalpine freight traffic volumes, however in a more pronounced way (except for the period 2011 to 2014):

+ 30% (+3.3% per year) from 1999 to 2007, - 16.2% between 2007 and 2009, + 12.5% from 2009 to 2011, - 0.4% from 2011 to 2014.”³

The following figure shows the development of rail freight transport by crossing between 1999 and 2014.

¹ EC, OFT (2016), p. xliii.

² EC, OFT (2016), p. xliii.

³ EC, OFT (2016), p. xxxvii.

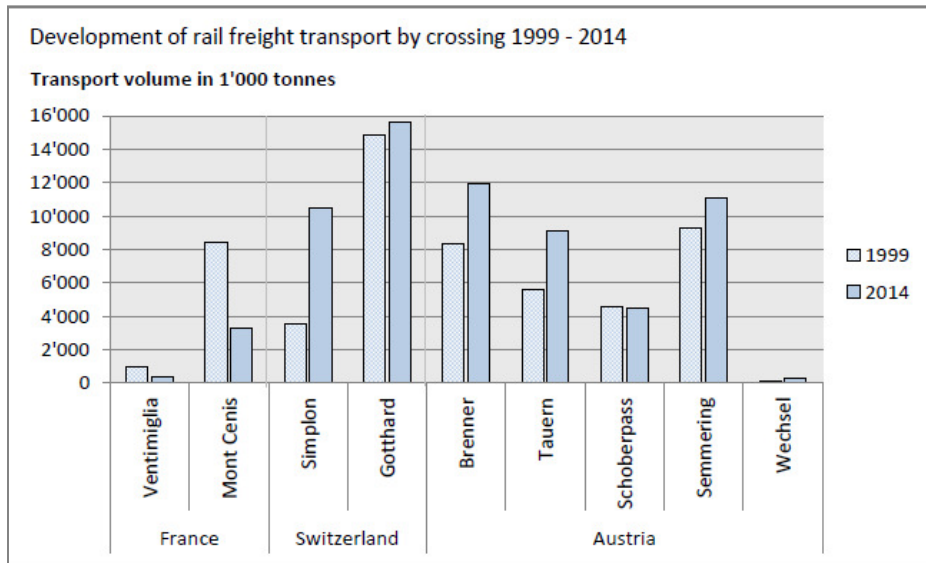


Figure 2: Development of rail freight transport by crossing 1999 - 2014⁴

Evolution of rail freight transport in CT:

The following figure illustrates the rail freight transport by crossing and production mode between 2013 and 2014.

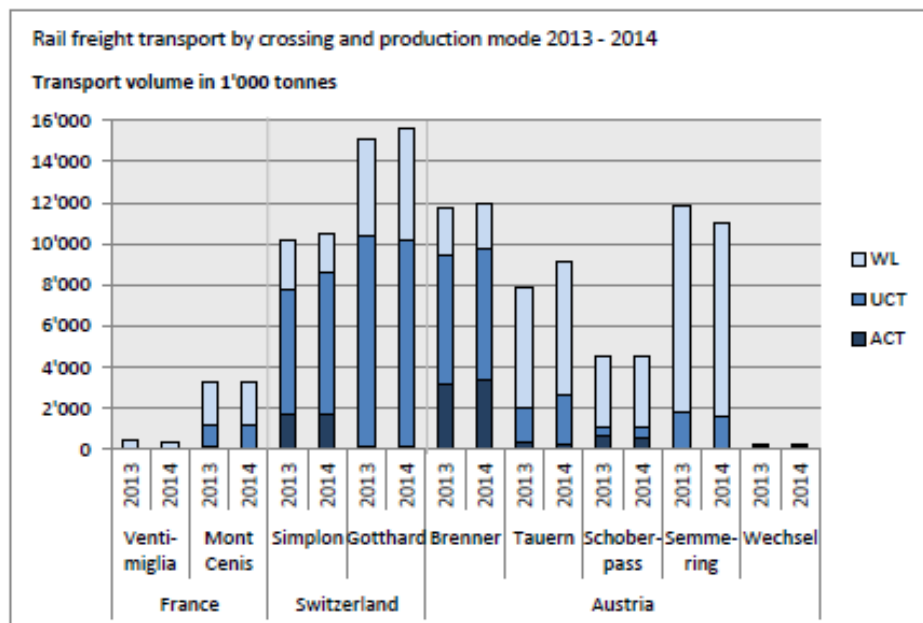


Figure 3: Transalpine rail freight volume, 2013-2014⁵

With exception of the year 2009, a continuous growth of Combined Transport (CT) can be observed for many years. Combined Transport is particularly important in addressing the volume of goods.⁶ Due to forecasted increase of freight transport the transport volume in CT will most probably also increase.

⁴ EC, OFT (2016), p. xlii.

⁵ EC, OFT (2016), p. xxxv.

⁶ Cf. Posset et al. (2014), p. 12.

2.1 Overview of CT

In rail transportation, a rolling motorway, or rolling road is a form of Combined Transport involving the conveying of road trucks by rail. This combination of track and road reduces road traffic and strain on the environment and is tied to many advantages for the customers.

Depending on the handling equipment specification it can differentiate between accompanied CT and unaccompanied CT.⁷ For further information please see Annex 2: Introductory explanations about CT.

2.1.1 Advantages of CT

Combined Transport as a sustainable way to shift traffic from road to rail, has a number of advantages:

Advantages	Short Description
44-ton-regulation	Vehicles that are used in the initial and/or final legs to the nearest CT terminal are allowed a maximum weight of 44 tons. This is 4 tons more than a truck used only on the road.
motor vehicle tax exemption (e.g. in Germany)	Motor vehicle tax does not apply to vehicles used in the initial and final leg.
toll savings	The toll only accrues at the initial and final legs; for CH reimbursement of performance-related heavy vehicle charges (LSVA) for initial or final leg.
exceptions for traffic bans	e.g. derogation from the existing driving ban on Sundays and public holiday if the initial and final legs is max. 200 km away. In CH no exemption from driving ban at night and on Sundays.
reduction of vehicle costs	Due to the low use of the vehicles the fixed and variable costs decrease (e.g. diesel, infrequent repairs, ...)

Table 1: Advantages of CT⁸

2.1.2 Alpine Crossing Relations

A selection of terminals in Germany, Italy and France with alpine wide connections via Switzerland and Austria is represented on the following maps and table.

⁷ Cf. Gronalt et al. (2011), p. 20.

⁸ LKZ Prien GmbH representation following Seidelmann (2010), S. 35 ff.; Koether (2010), S. 321.

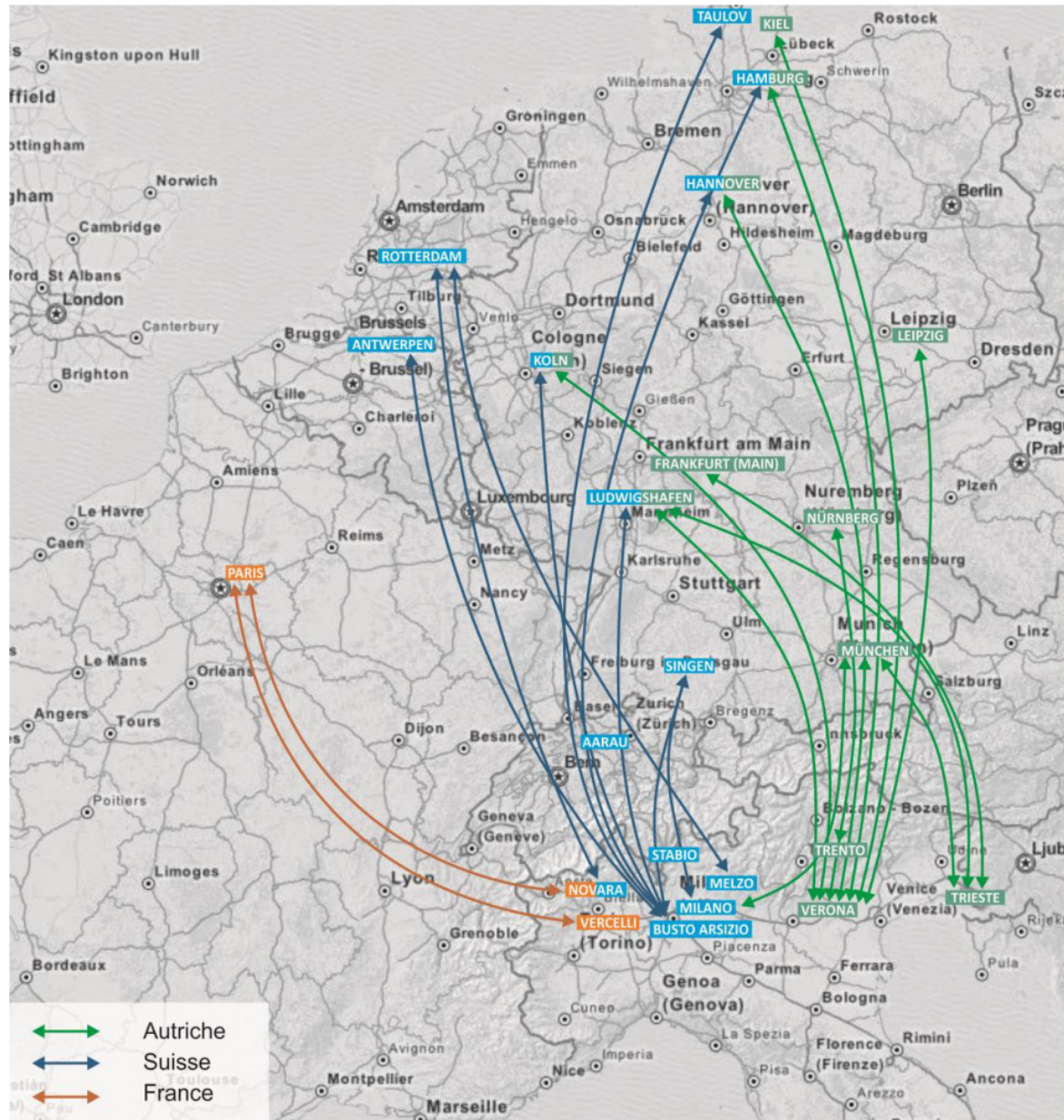


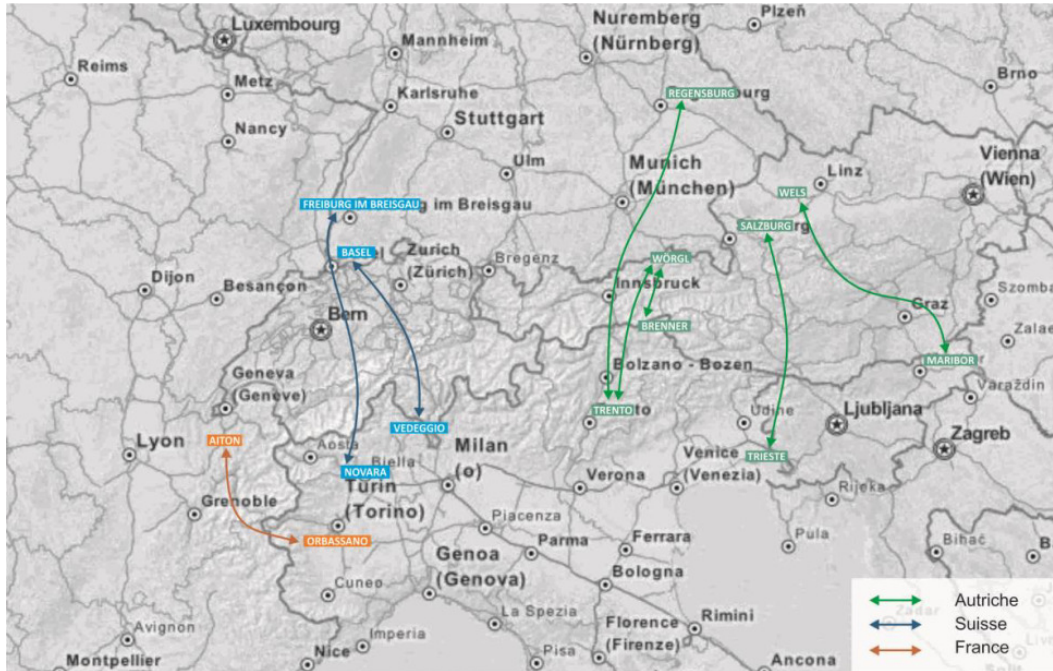
Figure 4: Transalpine relations UCT⁹

Following Alpine crossing relations exists in Slovenia via the Alps to Austria:

Koper - Ljubljana – Jesenice – state border with Austria – Salzburg

Koper - Ljubljana – Maribor – state border with Austria – Graz.

⁹ EC, OFT (2016), p. 40

Figure 5: Transalpine relations ACT¹⁰

The so called “RoLa” are operated in Austria by Rail Cargo Austria, in Italy by TRASPOSERVIZI S.r.l., in Switzerland by RAlpin AG and in France by AFA. The following table shows the relations of the operators.

RoLa operator	relations	
	from	to
Autostrada ferroviaria alpina (AFA) (France)	Aiton (FR)	Orbassano (IT)
	Orbassano (IT)	Aiton (FR)
Rail Cargo Austria (AT)	Brenner (AT)	Wörgl (AT)
	Wörgl (AT)	Brenner (AT)
	Trento (IT)	Wörgl (AT)
	Wörgl (AT)	Trento (IT)
	Wels (AT)	Maribor (SI)
	Salzburg (AT)	Fernetti/Trieste (IT)
RAlpin AG (CH)	Freiburg i. Br. (DE)	Novara (IT)
	Novara (IT)	Freiburg i. Br. (DE)
	Basel (CH)	Lugano (CH)
	Lugano (CH)	Basel (CH)
TRASPOSERVIZI S.r.l (ITA)	Trient (IT)	Regensburg (DE)
	Regensburg (DE)	Trient (ITA)

Table 2: Transalpine ACT relations

¹⁰ EC, OFT (2016), p. 42

2.1.3 Latest Figures for UCT and ACT

The review on Combined Transport in Alpine countries elaborated by the Working Group on Traffic Management Systems in the framework of the Zurich Process points out the significant increase of demand and market share of Combined Transport in general and in particular on transalpine routes.

The relevant terminology in CT issues relates to the jointly established document by UNECE, ECMT and EC: <http://www.uirr.com/en/road-rail-ct.html>

UIRR statistical figures published on their website run until 2013/14: <http://www.uirr.com/en/media-centre/annual-reports/annual-reports/mediacentre/651-annual-report-2013-2014.html>

former statistics: <http://www.uirr.com/en/our-association/statistics/transported-volume.html>

The Review is structured in chapters reporting about measures for the promotion of Combined Transport in general and Alpine crossing CT in particular, Infrastructure specificities, Offers for Alpine crossing CT services (Terminals, Connections, RU, Operators) and CT volumes.

In the annex, tables show the existing (year 2014) relations for

- Unaccompanied Combined Transport (UCT) and
- Accompanied Combined Transport (ACT).

Focusing on ACT relations which are in the spotlight of the mandate of the WGT, overall figures concerning Rolling motorway in Alpine Arch A, B and C, contracted in the alpinfo 2013 show the

Alpenquerender Güterverkehr insgesamt (Binnen-, Import-, Export- und Transitverkehr)																																															
Alpenquerender Güterverkehr Strasse und Schiene Ventimiglia bis Wien		2000										2006										2012										2013*															
		Strasse		Strasse+ Schiene		Total		Schiene		RA		Strasse		Strasse+ Schiene		Total		Schiene		RA		Strasse		Strasse+ Schiene		Total		Schiene		RA		Strasse		Strasse+ Schiene		Total		Schiene		RA							
		SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t	SGF 1000	Mio. t				
Frankreich	Ventimiglia	1061	13.7	14.5	0.8	0.8	0.0					1411	18.9	19.5	0.6	0.6	0.0					1282	17.1	17.4	0.4	0.4	0.0			1295	17.3	17.7	0.5	0.5	0.0												
	Montenapere	119	1.4	1.4								86	0.7	0.7									48	0.5	0.5					52	0.5	0.5															
	Mont-Cenis			8.6	8.6	5.0	3.6							5.2	3.0	1.8	0.4					3.4	3.4	2.2	0.7	0.5			3.2	3.2	2.0	0.6	0.6														
	Fréjus	1527	25.2	25.2							844	12.5	12.5									678	10.2	10.2					603	10.0	10.0																
	Mont-Blanc			0.0							606	9.0	9.0									581	8.8	8.8					549	8.3	8.3																
	Schweiz																																														
	Grand-St-Bernard	52	0.4	0.4							58	0.6	0.6									55	0.6	0.6					48	0.6	0.6																
	Simplon	27	0.1	3.8	3.7	3.6	0.1				82	0.9	9.9	9.0	3.3	4.2	1.5					85	1.0	10.8	9.8	2.5	5.8	1.4	78	1.0	11.1	10.1	2.3	6.1	1.7												
	Gothard	1187	7.6	24.4	16.8	6.9	8.9	1.0			856	9.3	25.5	16.2	5.2	10.6	0.4					886	10.0	23.9	13.9	4.3	9.4	0.2	766	9.3	24.4	15.0	4.6	10.2	0.2												
	San Bernardino	138	0.8	0.8							185	2.0	2.0									182	2.0	2.0					156	1.9	1.9																
Oesterreich	Oesterreich	93	1.2	1.2						125	1.8	1.8									92	1.0	1.0					90	1.0	1.0																	
	Reschen	1560	25.4	34.1	8.7	2.8	3.3	2.7		2086	33.3	45.0	11.6	3.5	5.5	2.3					1966	29.5	40.6	11.2	2.4	5.8	3.0	1936	29.0	40.7	11.7	2.2	6.4	3.1													
	Brenner	1270	18.2	23.0	4.8	4.4	0.4		1433	19.9	26.4	6.5	5.5	0.6	0.4					1433	19.9	26.4	6.5	5.5	0.6	0.4	1433	19.9	26.4	6.5	5.5	0.6	0.4														
	Tarvisio	65	0.5	0.5					102	1.1	1.1									68	0.8	0.8					32	0.4	0.4																		
	Felbertaum	940	11.6	19.3	7.7	5.7	0.5	1.5		852	11.1	19.1	8.0	6.8	0.8	0.5				907	13.3	21.6	8.4	5.8	2.2	0.4	865	13.5	21.4	7.9	5.9	1.7	0.3														
	Tauern	1030	9.9	15.2	5.3	5.0	0.4	0.0		1425	16.5	22.5	6.0	4.0	1.0	0.0				1341	15.8	20.4	4.6	3.5	0.8	0.0	1353	15.9	20.5	4.8	3.5	0.5	0.0														
	Schöberpass	430	3.9	13.8	9.9	9.5	0.4	566		6.6	15.2	8.5	8.0	0.6						426	4.8	15.8	11.0	9.2	1.5		438	5.0	16.9	11.9	10.1	1.5															
	Semmering	1100	8.6	8.7	0.1	0.1	0.0		1038	10.0	10.3	0.3	0.2	0.1						1068	11.8	12.1	0.3	0.1	0.1		1133	12.4	12.7	0.3	0.1	0.1															
	Alpenbogen C	Alpenbogen C	9379	110.3	171.9	61.6	38.3	17.1	5.2	10332	134.3	199.8	65.3	34.6	24.9	6.0	9756	127.2	190.1	62.8	30.3	26.4	6.1	9575	126.1	191.3	65.2	31.2	27.4	6.6																	
		Frankreich	2707	40.3	49.7	9.4	5.8	3.6		2927	41.1	46.9	5.8	3.6	1.8	0.4	2589	36.6	40.3	3.7	2.5	0.7	0.5	2559	36.1	39.8	3.7	2.5	0.6	0.6																	
Schweiz		1404	8.9	29.5	20.6	10.5	9.0	1.0	1180	12.8	38.0	25.2	8.5	14.8	1.9	1209	13.7	37.4	23.7	6.9	15.3	1.6	1049	12.8	38.0	25.2	7.0	16.3	1.9																		
Oesterreich		5268	61.1	92.8	31.7	23.0	4.5	4.2	8224	80.5	114.9	34.5	22.5	8.3	3.8	5958	76.9	112.3	35.4	21.0	10.5	4.0	5967	77.3	113.6	36.3	21.9	10.4	4.1																		
Alpenbogen B		7034	93.9	137.4	43.4	23.4	16.3	3.7	7751	108.9	158.1	49.2	21.2	22.9	5.0	6818	93.9	141.6	45.7	15.9	24.3	5.5	6603	94.2	141.8	47.5	16.0	25.6	6.0																		
Alpenbogen B	Alpenbogen B	2707	40.3	49.7	9.4	5.8	3.6		2927	41.1	46.9	5.8	3.6	1.8	0.4	2589	36.6	40.3	3.7	2.5	0.7	0.5	2559	36.1	39.8	3.7	2.5	0.6	0.6																		
	Frankreich	1404	8.9	29.5	20.6	10.5	9.0	1.0	1180	12.8	38.0	25.2	8.5	14.8	1.9	1209	13.7	37.4	23.7	6.9	15.3	1.6	1049	12.8	38.0	25.2	7.0	16.3	1.9																		
	Schweiz	2923	44.8	59.3	13.5	7.2	3.7	2.7	3944	55.1	73.2	18.1	9.1	8.3	2.7	3020	45.6	63.9	18.3	6.5	8.4	3.4	2925	45.3	64.0	18.7	6.6	8.7	3.5																		
	Oesterreich	4584	60.7	98.5	37.8	18.2	15.9	3.7	4841	69.4	111.4	42.1	15.1	22.4	4.8	4525	63.2	101.5	38.3	11.4	21.8	5.1	4287	61.2	101.3	40.1	11.2	23.3	5.6																		
	Alpenbogen A	1527	25.2	33.8	8.6	5.0	3.6		1450	21.5	26.7	5.2	3.0	1.8	0.4	1259	19.0	22.4	3.4	2.2	0.7	0.5	1212	18.3	21.6	3.2	2.0	0.6	0.6																		
Alpenbogen A	Alpenbogen A	1404	8.9	29.5	20.6	10.5	9.0	1.0	1180	12.8	38.0	25.2	8.5	14.8	1.9	1209	13.7	37.4	23.7	6.9	15.3	1.6	1049	12.8	38.0	25.2	7.0	16.3	1.9																		
	Schweiz	1653	26.6	35.3	8.7	2.8	3.3	2.7	2210	35.1	46.8	11.6	3.6	5.8	2.3	2058	30.5	41.7	11.2	2.4	5.8	3.0	2026	30.1	41.8	11.7	2.2	6.4	3.1																		
	Oesterreich																																														

following picture:

Table 3: Transalpine freight transport total

The evolution since 2000 shows a constant slight increase of ACT / RA (rolling motorway) in terms of net tons, with one exception at Tauern and Schober (Alpine Arc C). The state of play of ACT relations in the Alpine area is tabled in chapter 2.1.2.

Alpenquerender Güterverkehr Strasse und Schiene Ventimiglia bis Wien		2012				2013*			
		Strasse		Strasse+	Schiene	Strasse		Strasse+	Schiene
		SGF 1000	Mio. t	Schiene Mio. t	Mio. t	SGF 1000	Mio. t	Schiene Mio. t	Mio. t
	Frankreich								
	Ventimiglia	672	10.2	10.2	0.0	679	10.3	10.3	0.0
	Montgenèvre	7	0.1	0.1		8	0.1	0.1	
	Mont-Cenis			0.0	0.0			0.0	0.0
	Fréjus	69	1.0	1.0		67	1.0	1.0	
	Mont-Blanc	121	1.7	1.7		114	1.6	1.6	
	Schweiz								
	Grand-St-Bernard	28	0.3	0.3		26	0.3	0.3	
	Simplon	28	0.3	9.6	9.3	25	0.3	10.0	9.7
	Gothard	477	6.2	17.3	11.2	444	6.2	18.3	12.2
	San Bernardino	73	1.0	1.0		68	1.0	1.0	
	Oesterreich								
	Reschen	42	0.6	0.6		42	0.6	0.6	
	Brenner	1658	26.1	36.8	10.7	1639	25.9	37.6	11.7
	Tarvisio	533	8.4	12.9	4.5	553	8.7	12.9	4.2
Alpenbogen C	Felbertauern	4	0.1	0.1		2	0.0	0.0	
	Tauern	576	8.3	12.0	3.7	586	8.4	11.4	3.0
	Schoberpass	314	4.3	4.9	0.7	331	4.5	5.3	0.8
	Semmering	5	0.1	2.8	2.7	5	0.1	3.1	3.0
	Wechsel	249	3.5	3.5	0.0	278	4.0	4.0	0.0
	Alpenbogen C	4324	63.7	102.0	38.2	4314	64.2	104.5	40.3
	Frankreich	869	13.0	13.0	0.0	868	13.0	13.0	0.0
	Schweiz	607	7.8	28.3	20.4	563	7.8	29.7	21.9
	Oesterreich	2848	42.9	60.7	17.8	2883	43.4	61.8	18.5
	Alpenbogen B	3709	55.9	91.6	35.7	3665	55.9	93.7	37.8
	Frankreich	869	13.0	13.0	0.0	868	13.0	13.0	0.0
	Schweiz	607	7.8	28.3	20.4	563	7.8	29.7	21.9
	Oesterreich	2233	35.1	50.3	15.2	2234	35.2	51.1	15.9
	Alpenbogen A	2497	37.2	68.4	31.1	2426	36.8	70.4	33.6
	Frankreich	190	2.7	2.7	0.0	182	2.6	2.6	0.0
	Schweiz	607	7.8	28.3	20.4	563	7.8	29.7	21.9
	Oesterreich	1700	26.7	37.4	10.7	1681	26.4	38.1	11.7

In the inner Alpine Arc A the main transalpine routes show a constant increase up to 5,6 mio t compared to 5,1 mio t in 2012.

“The chart below shows the evolution of transalpine rail freight transport between 2013 and 2014 by Alpine crossing” in France, Switzerland and Austria¹¹.

Concerning the different production modes, volumes in ACT show a slight decrease (- 0.7%).¹²

¹¹ EC, OFT (2016), p. xxxv.

¹² EC, OFT (2016), p. xxxvi.

Country	Crossing	WL			UCT			ACT			Total		
		2013	2014	2013/14	2013	2014	2013/14	2013	2014	2013/14	2013	2014	2013/14
France	Ventimiglia	457	299	-34.6%	6	77	---	---	---	---	463	376	-18.7%
	Mont Cenis	2'012	2'115	5.1%	1'097	1'093	-0.4%	136	91	-33.3%	3'245	3'299	1.7%
	Total	2'468	2'414	-2.2%	1'103	1'170	6.1%	136	91	-33.3%	3'707	3'675	-0.9%
Switzerland	Simplon	2'308	1'830	-20.7%	6'096	6'921	13.5%	1'726	1'712	-0.8%	10'130	10'462	3.3%
	Gothard	4'643	5'451	17.4%	10'237	9'956	-2.7%	165	179	9.0%	15'045	15'586	3.6%
	Total	6'952	7'280	4.7%	16'333	16'877	3.3%	1'890	1'891	0.0%	25'175	26'049	3.5%
Austria	Brenner	2'201	2'108	-4.2%	6'360	6'452	1.4%	3'141	3'366	7.2%	11'702	11'926	1.9%
	Tauern	5'900	6'485	9.9%	1'666	2'416	45.0%	340	205	-39.6%	7'906	9'107	15.2%
	Schoberpass	3'461	3'441	-0.6%	451	493	9.2%	643	552	-14.1%	4'555	4'485	-1.5%
	Semmering	10'084	9'391	-6.9%	1'786	1'660	-7.1%	---	---	---	11'871	11'050	-6.9%
	Wechsel	145	131	-9.5%	131	118	-9.7%	---	---	---	276	249	-9.6%
	Total	21'791	21'555	-1.1%	10'394	11'139	7.2%	4'123	4'123	0.0%	36'309	36'817	1.4%
Total		31'211	31'250	0.1%	27'830	29'186	4.9%	6'149	6'105	-0.7%	65'191	66'541	2.1%

Table 4: "Evolution of transalpine freight transport, 2013-2014 (in 1'000 tonnes)"¹³

2.2 Infrastructure of CT

Requirements for the free flow of goods are functioning infrastructures and equipment.

Therefore in this section there will be explained the facilities of the main traffic routes. Air transport is not included because of the low importance for (Alpine) CT.

Essential for the use of CT are well-connected, networked and sufficient existing multimodal freight centers (GVZ) and terminals. In macro-economic consideration the GVZ and transshipment facilities can make a significant contribution to the transshipment of freight traffic from road to rail and waterway. Based on the efficient networking of different modes of transport, free transport infrastructure capacity is created, bottlenecks are minimized as well as greater transport safety and reliability is realized.

To expand and support the existing infrastructure and transshipment facilities, which have partially already reached the capacity limit, transshipment facilities are under construction or in planning. These new Freight Transport Centre and transshipment facilities should contribute to handle the expected future growth in the volume of goods. However, the possibilities for capacity expansion and optimization of the processes have to be used in existing terminals.¹⁴

Traffic facilities are used for the transshipment of goods. These terminals, freight centers and dry ports are presented in the following.

2.2.1 Terminals

For Combined Transport a node is needed as infrastructure next to the road, rail and waterway network, on which the necessary techniques and equipment for the handling of the loading units are available.¹⁵ These transshipment points are called terminals.

¹³ EC, OFT (2016), p.xxxv.

¹⁴ Cf. BIHK (2012), p. 30/31

¹⁵ Cf. <http://kombinierter-verkehr.com/terminals-und-umschlagsgerate/> (12.11.2015).

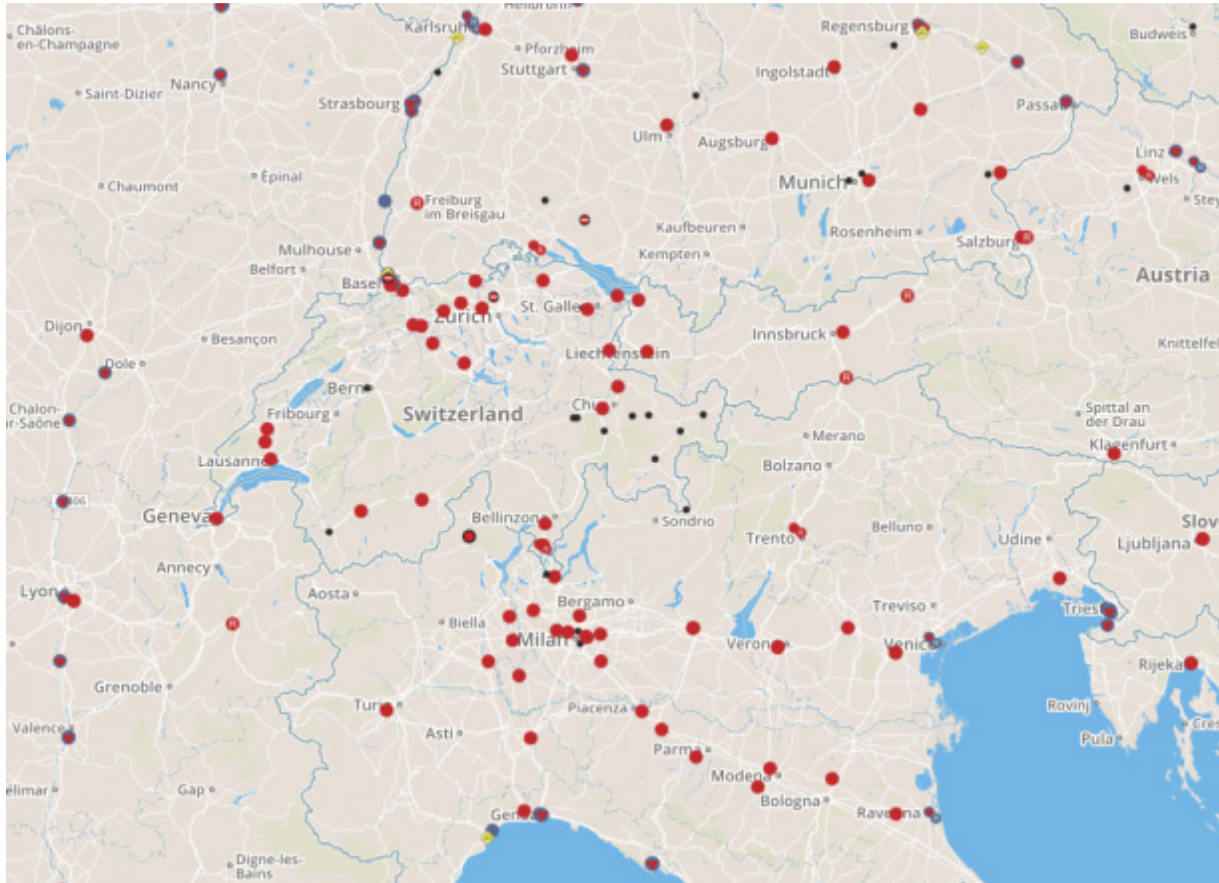


Figure 6: Terminals in Alpine regions¹⁶

The transshipment can take place with or without intermediate storage. Primarily, the loading units are transshipping vertically, by using handling equipment (for example cranes or reach stackers). Terminals can be distinguished to the infrastructural arrangement. More details to terminals can be founded in Annex 3: Introductory explanations about terminal

Choosing the right location and the respective assembly of systems is based on the connectivity of road, rail and water. Of great importance are the sufficient space requirements like geographic proximity to customers and logistics companies. The range of additional services (e.g. repair and maintenance of loading units) situated adjacent to the transshipment process is high added value for the customers and helps to make CT more attractive.¹⁷

The German government sees terminals as an important link in the CT. A funding regulation support the construction, areal expansion and the expansion of private terminals with a government grant of 80% since January 2012. Therefore it should be developed additional quantities of goods for CT in the

¹⁶ Cf. SGK (2016), <http://www.intermodal-map.com/de/freie-karte>

¹⁷ Cf. overall Posset et al. (2014), p. 193 ff.

future.¹⁸ A new regulation will be compiled until 2017. Till then the existing funding regulation should be extended until end of 2016.¹⁹

On the basis of the revised legal act of freight transport (Gütertransportgesetz)²⁰ the Swiss Confederation can grant on request an investment aid (credits and dues) for a terminal project. For the period 2016-2019 the funding available for terminals and sidings amounts to 250 Millions Swiss francs. Private investors, terminal operator or terminal owner can submit a request to the Swiss Federation for an investment aid on transshipment facilities for CT. In any case min. 20% of the own funds is provided by the applicants.

2.2.2 Dry Ports

In connection with terminals or transshipment centers, the Dry Ports are mentioned. Dry ports can be described as intermodal terminals, which are located in the hinterland of a seaport and interconnected by a rail connection. Customers can collect their goods or containers in the same way and can be processed as if they had been delivered the goods in the port.²¹ A Dry Port can offer more services in comparison to a seaport because of capacity reasons. These are non-added value services such as picking-services or maintenance work on containers and transport modes.²² Nevertheless the Dry Port is no direct competition to the seaport. He only offers a capacity expansion.²³ To ensure a smooth process, also in cooperation with the ports, it is necessary to integrate the Dry Ports in the logistics processes and chains of the seaports.²⁴

2.2.3 Freight Centres

Additional options for terminal locations are Freight Centres.²⁵ It is a “spatial summary of independent companies in freight transport (e.g. freight forwarders, shippers, carriers, customs) and in additional services (e.g. storage, maintenance and repair) and they are active in an area which at least one terminal is located”.²⁶ Freight Centres are mostly located on strategic traffic axes or conurbations that are easily accessible by rail, road and inland waterways.²⁷ Also possible are connections to the hinterland (Dry Ports), domestic and offshore terminals.²⁸

¹⁸ Cf. overall http://www.bmvi.de/DE/VerkehrUndMobilitaet/Verkehrspolitik/GueterverkehrUndLogistik/KombinierterVerkehr/kombinierter-verkehr_node.html, (12.11.2015).

¹⁹ Cf. BMVI (2015), p. 33

²⁰ Cf. <https://www.admin.ch/opc/de/classified-compilation/20140476/index.html>

²¹ Cf. overall Eiband/Behmer/Fischer/Hagn (2011), p. 19.

²² Cf. overall Roso (2006), p. 4.

²³ Cf. overall Eiband/Behmer/Fischer/Hagn (2011), p. 24.

²⁴ Cf. Eiband/Kochsiek (2012), p. 18.

²⁵ Cf. Posset et al. (2014), p. 184.

²⁶ UN,ECE/ECMT/EC (2001), p. 57.

²⁷ Cf. Brandenburg/Oelfke/Oelfke/Waschkau (2012), p. 183.

²⁸ Cf. Posset et al. (2014), p. 184.

2.2.4 The innovative approach: Process optimization in handling terminals of Combined Transport by the transfer of production principles

Due to its interface function between the different transport modes intermodal terminals play a crucial role in the Combined Transport. Against the background of a predicted increase of the transport volume in CT, handling terminals will transship even more quantities of goods in the future. To adjust the processes in transshipment terminals to the predicted amount, solutions to streamline the processes are necessary.

Due to decades of experience and knowhow in the fields of optimization and the efficient design of processes, the industrial production can serve as a benchmark for the CT. From these efforts, inter alia, the so-called “lean production” originated.

The main goal of this production system is the increased efficiency of the company by eliminating any waste (= non valuable activities) systematically and thoroughly.²⁹ In the lean production the design guidelines of the flow and the pull principle are of central importance.

Continuously flowing processes (flow principle)

Continuous flow production means, ideally, that parts are produced and transferred directly to the next process step without stopping between the steps.³⁰ This ideal is distinguished by the fact that no buffer stocks of unfinished parts incurred between the individual working steps.³¹

Pull systems (pull principle)

In designing the process sequence, it may happen that there are parts where the introduction of a continuous flow production is not possible or does not make sense. These process steps are therefore linked to the downstream customers through a pull system.³²

In contrast to the push system, in which the production of goods is based on a pre-established plan with projected customer demand, the downstream process calls the necessary parts in the necessary quantity at the appropriate time from the upstream process.³³

The common goal of the flow and the pull principle is the leveled production. With the help of leveling the customer demand for a specific period it is possible to decouple the fluctuating customer needs both from the production processes as well as from the logistics processes. The result is a more than everyday consistent utilization of capacities.³⁴

Example: terminal layout taking into account production principles

In Figure 7 a terminal is shown that takes into account the design principles of the lean production described above. New to this terminal layout is a separate area of the terminal for the loading and unloading of loading units. The area is adjacent to the lane and is used for the loading and unloading by the customer himself. The load depots and empty depots as well as the transshipment tracks are

²⁹ Cf. Ohno (2009), p. 26.

³⁰ Cf. Rother and Shook (2000), p. 45.

³¹ Cf. Liker (2007), p. 76

³² Cf. overall Rother and Shook (2000), p. 46; Liker (2007), p. 163

³³ Cf. Liker (2007), p. 160.; Takeda (2012), p. 178

³⁴ Cf. overall Gorecki and Pautsch (2013), p. 224f

located below the crane, traffic and parking areas can be served by the overhang of the gantry crane. Thus, the loading unit can be handled, but no additional handling equipment must be purchased, a range extension of the gantry cranes is necessary. The presorting of the container is conceivable using already-provided chassis.

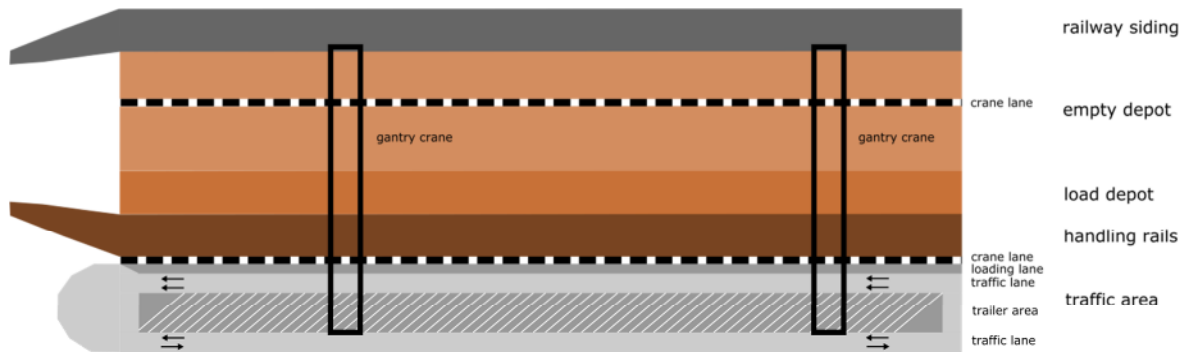


Figure 7: Integration of a premium parking space³⁵

The main advantage of this approach is the time saving potential for the customer due to the independent loading and unloading of the loading units. The terminal, however, can achieve a steady utilization of the cranes if in times of low utilization rates loading units are presorted and parked in the extra space already. Moreover the transshipment terminal has improved control possibility of the terminal utilization by the "Drag" (pull) of the loading units during periods of lower terminal utilization. Furthermore, depending on the construction of transshipment terminals, no more terminal tractor to drive the semitrailer in the crane runway is required.

³⁵ LKZ Prien GmbH

2.3 Question of Costs

As cost factors are strong drivers influencing the share between road and rail transport, this chapter is presenting some evidences related to important cost elements in freight transportation.

“In 2014, as already in 2013, diesel has become cheaper in Europe compared to the previous year. [...] But the transport costs between 2013 and 2014 only changed slightly (see Table 5).³⁶


















Country		Road	ACT	UCT	change rates
France	long distances				-0,8% à +1,3%
	short distances				-0,4% à +3,0%
Switzerland	long distances				-1,4% à +0.1%
	short distances		-		-0,8% à +0,6%
Austria	long distances				-1,0% à +4,9%
	short distances				+0,1% à +10,3%

Table 5: Transport costs 2014 compared with 2013³⁷

“The relations of transport costs between the different modes did not change significantly” (except for long and short distances on ACT in Austria).³⁸

- **“Costs of exclusively road transport: 1.67 €/ITU*km (ITU= Intermodal Transport Unit)**
- **Costs of transport operations comprising ACT services: 1.50 €/ITU*km**
- **Costs of transport operations comprising UCT services: 0.97 €/ITU*km”³⁹**

As this chapter and table are from the summary of the Traffic Observatory 2014.

For more explaining to meanings and examples short/long distances etc. see <http://ec.europa.eu/transport/modes/road/doc/2015-annual-report-covering-the-year-2014.pdf>.

For a better understanding of the development of transport cost, the following subchapters show the cost structures of rail and road freight transport. It should help to understand the state-induced increases of costs. It is needed to identify the effects of these cost increases on rail freight transport.

³⁶ Cf. EC, OFT (2016), p. xlv.

³⁷ EC, OFT (2016), p. xlv.

³⁸ Cf. EC, OFT (2016), p. xlv ff.

³⁹ Cf. EC, OFT (2016), p. xlv ff.

2.3.1 Cost Structure of Rail Freight Transport

As a rule, the costs of rail freight transport are composed of following components⁴⁰:

- Costs for infrastructure use
 - fees for route use of infrastructure operator
 - investment costs for use of railway track
- Energy costs for
 - diesel
 - traction current
 - pull weight
 - route profile
 - time of day (by electric energy)
 - rejection of electric energy
- Costs for traction unit
 - E-locomotive
 - Diesel locomotive)
 - shunting locomotive
 - costs for financing (own locomotive)
 - amortization costs (own locomotive)
 - rent costs (rented locomotive)
 - maintenance costs (planned and unscheduled)
 - cost for main inspection
- Cost for freight wagon
- Costs for operating staff
 - train driver
 - shunter
 - wagon technician
- Overhead costs
 - production control
 - distribution
 - administration (e.g. disposition, book keeping)

⁴⁰ Cf. Hwh (2015), p.17 ff.

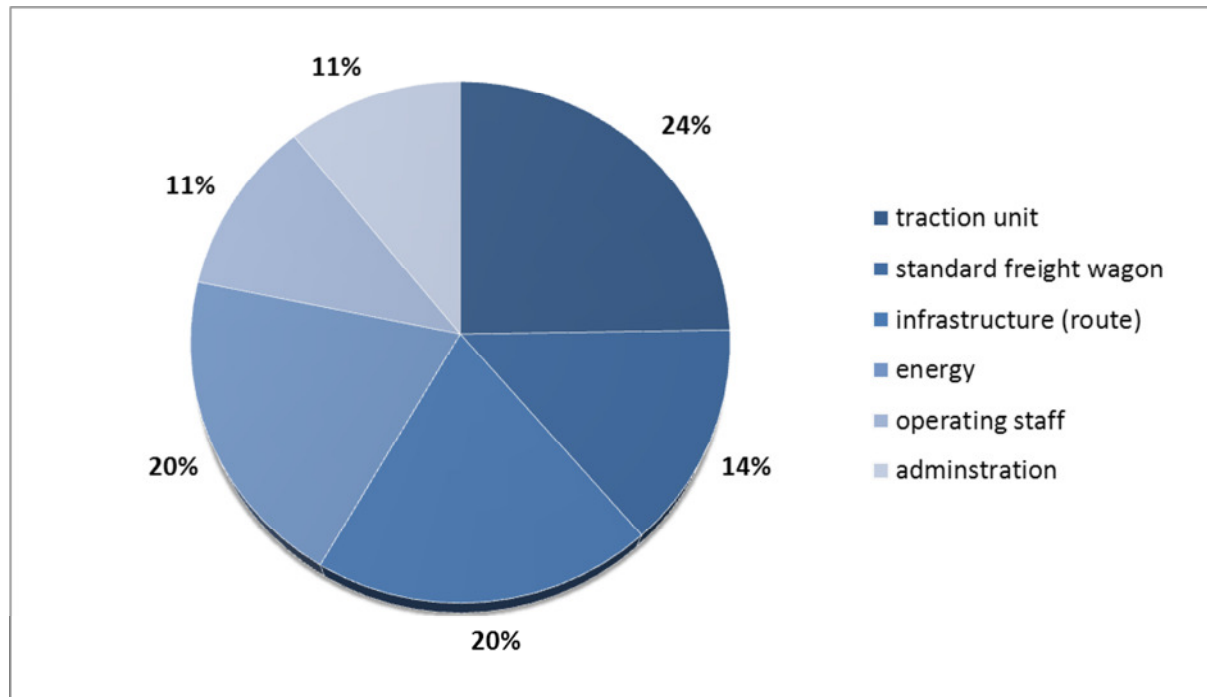


Figure 8: Cost structure rail freight transport (example in Germany with standard freight wagon⁴¹)

2.3.2 Cost Structure of Road Freight Transport

The costs in road freight transport can consist of following parts⁴²:

- Procurement costs
- Imputed interest
- Imputed amortization
- Fuel and lubricant costs
 - o diesel consumption per 100 kilometers
 - o annual mileage of trucks
 - o diesel price for internal and external refueling
 - o share of equity and debt refueling
 - o lubricant consumption in percent of fuel consumption
- Tire costs
- Maintenance and repair costs
- Staff costs
- Taxes and Insurance
- Tolls and road tolls
- General and administrative expenses / entrepreneur reward / risk and profit

For an exemplary truck road transport with a EURO V - articulated train can be based on the following cost allocation:

⁴¹ Hwh (2015), p. 18

⁴² Hwh (2015), p. 20 ff.

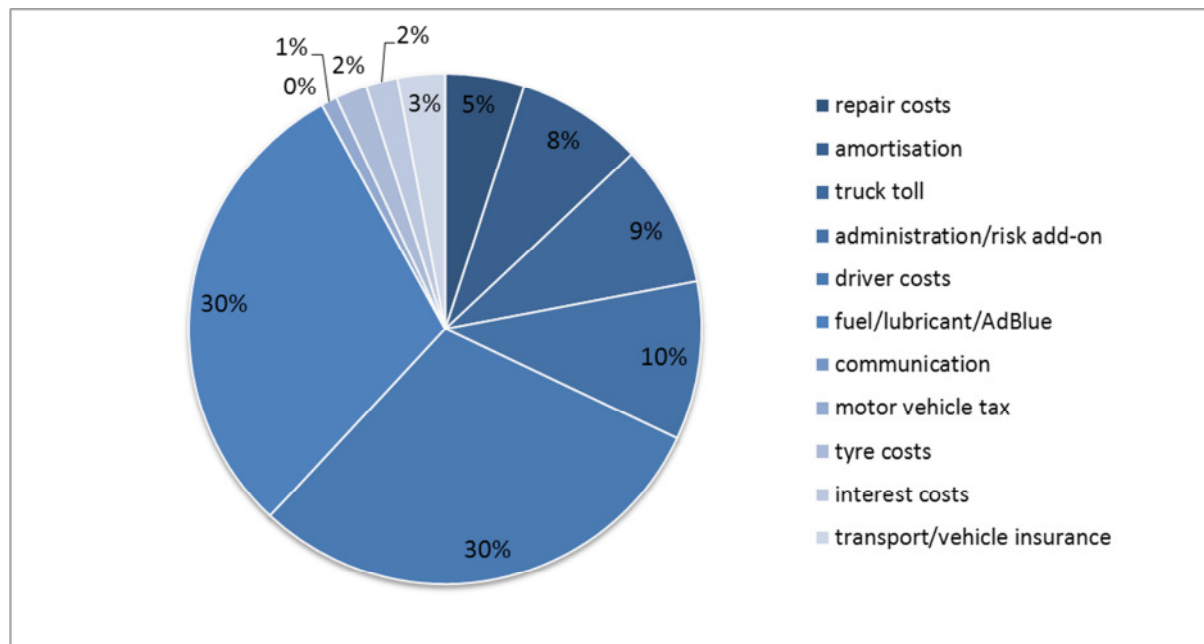


Figure 9: Cost structure truck transport drawbar-trailer EURO V - example Germany⁴³

Outcome of the comparison of cost for freight transport on road and rail:

In order to perform a comparison of the cost structures of rail freight transport and road freight transport, it is first of all necessary to unify the considered cost pools. Therefore the following superior cost structures are viewed:

- Vehicle costs
- Energy costs
- Infrastructure costs
- Operating staff costs
- Administrative costs

The biggest cost components are energy and driver costs of road freight transport (both 30% of total costs). Almost two thirds are mainly determined by these costs. At the rail freight transport the biggest cost components are usually the traction unit (it depends on the used vehicle) followed by energy costs and costs of infrastructure use.⁴⁴

⁴³ Hwh (2015), p. 25

⁴⁴ Hwh (2015), p. 17/25

2.4 EU, national Projects and Studies related to CT

In this chapter EU projects (e.g. AlpFrail, Transitects, SusFreight) and studies related to transalpine CT in Alpine States are described.

2.4.1 AlpFrail – Alpine Space Project

Initial situation:

During the last 20 years the transalpine traffic has reduplicated. In 2003 104 million tons of goods were transported on road and on rail over the inner alpine bow. Currently the quantity of goods is increasing disproportionally. The increased domestic market arisen from the EU enlargement has an essential impact on it. The LKZ Prien GmbH as Lead partner has analyzed the freight traffic and elaborated suggestions for the cross national overall concept by the application of new technologies. Utmost emphasis is thereby put on harmonization of economic efficiency and sustainable ecology. The lapse of the previous eco points arrangements in Austria as well as the quotas for the new EU member states have changed the general conditions for the displacement of the freight traffic to the rail in the alpine space in the year 2004. This is also documented by the shipment decline of the Rolling Road on the Brenner. It seems important therefore, besides present very effective and national furtherance instruments for Combined Transport, to observe also new rudiments for traffic displacement, like the project "AlpFRail" (Alpine Freight Railway).

Objectives of the project:

The target of this project is a consequent displacement of freight flows to rail in the whole Alpine Space by innovative concepts. A rail network, which enables connections in all directions, should be generated. At first, in the project AlpFRail all existing freight flows were analyzed and evaluated in simulation processes. On this basis the traffic flows were optimized and integrated in a network. In order to provide the customers with all available offers within the rail network and to enable a traffic controlling in cases of bottlenecks, a standard information and quality management system is under development.

Project partners:

The LKZ Prien GmbH (LKZ) headed the project technically and 16 partners of the alpine countries collaborated. The project was unique within the EU transport politics. For the first time state ministries, regional governments, provinces, regions, chambers of commerce and associations from Germany, Austria, Italy, France and Switzerland co-operated in order to reorganize the freight traffic on rail. Furthermore the German Railways, the port of Venice and the association of the medium-sized transport companies in Italy took part in the project.

Project duration:

2003 to 2007

2.4.2 Actionplan Tauernbahn – German and Austrian Study

Initial situation:

The crossing of the Alps on the Tauern axis is one of the most important transport axes of the European Union. Simultaneously, the Alps are considered as ecologically particularly sensitive region. A further increase of the through road freight traffic and the massive expansion, within the meaning of the Alpine Convention, of road infrastructure should be rejected for ecological and economic viewpoints. Instead of just neglected on this relation Combined Transport should be further promoted with the objective of performance and quality and the provision of additional transport capacity taking into account infrastructural measures.

In this report there were worked out new concepts of operation for rail links through the Tauern. For this purpose, the Tauern axis was examined (in the strict sense between Schwarzach - St. Veit and Spittal) between Salzburg and Villach (in the broader sense; investigation horizon) for their efficiency and operation. A further investigation in relation to flows of goods and rail products included also the Bavarian, Italian and Slovenian area.

Objectives of the project:

There were identified shortcomings of the investigation of the current state and deduced measures to improve the quality of performance and market acceptance. In addition, the results were used for developing market-driven rail freight rates (Combined Transport, conventional wagonload services) that can be implemented on the market in the short term.

Project partners:

Austrian Department of Transportation, State Salzburg, State Carinthia

Project duration:

2003 to 2004

2.4.3 TRANSITECTS – Alpine Space Project

Initial situation:

Since earlier times transport crossing the Alps has changed tremendously. The exchange of goods, persons and services was concentrated more and more to the main transport transit axes. The Alpine Space is reacting very sensitive to the influences of raising transport volumes crossing the Alps. The specific topographical and climatic situations in the narrow alpine valleys sharpen negative effects of traffic. The quality of life for people living along these corridors is suffering more and more from congestions, land consumption as well as air and noise pollution. Based on different former projects raised under the framework of the Alpine Space Programme we know very well about the situations and conditions of alpine crossing transport. In whole Europe traffic is rising; especially growth in freight transport reached an enormous level. Although the global economic crisis caused a decrease of transport flows, the negative effects of freight traffic remain present.

Objectives of the project:

TRANSITECTS (Transalpine Transport Architects) was a European project aimed at developing and implementing attractive rail products and systems to disburden traffic bottlenecks in the Alps and to mitigate related negative effects of traffic. To implement the shift from road to rail related traffic TRANSITECTS created sustainable intermodal solutions to fit changing markets - especially Combined Transport products for transalpine freight traffic. Furthermore, the project supported the development of intermodal nodes and proactively fostered the railway system.

Project partners:

16 partners from four countries (Austria, Germany, Italy, and Slovenia) collaborated in a transnational network. Cooperating national Ministries were the Italian Ministry of Environment, Sea and Land Protection as well as the Austrian and Slovenian Ministries for Transport.

Regional partners were the regions Carinthia, Salzburg, Tyrol, Berlin Brandenburg, Donau-Iller, Stuttgart, Friuli Venezia Giulia, Lombardy and Veneto, further partners represented research institutions, agencies, chambers of commerce or associations are the European Academy of Bolzano, the Agency of East Lombardy for Transports and Logistics (A.L.O.T.), Veneto Chambers of Commerce and the German Association for Housing, Urban and Spatial Development. The LKZ has been involved as project- and financial manager.

Project duration:

July 2009 to June 2012

2.4.4 SusFreight – Alpine Space Project

Type:

The project “SusFreight, Sustainable Freight Transport – now and tomorrow” is co-financed by the Alpine Space Programme (INTERREG Project) and funded by the European Regional Development Fund (ERDF).

Scope:

The project aims at addressing the most critical issues related to transport through the Alpine Region. The project mapped the relevant stakeholders as well as projects and initiatives in the Alpine Space and beyond. The aim was to valorise and capitalise the experiences of previous projects. The project synthesises former results and provides for the first time an overall summary of the conducted activities in the past years. As a result of this analysis, a number of thematic fields has been identified where future action is required, with the aim of increasing sustainability of freight transport. With its results produced, the SusFreight project gives recommendations to the public sector. Recommendations address and fill relevant gaps, thus suggesting a more consistent and effective framework to support future policies and projects and reshape EU Programmes – Alpine Space 2014+ in particular - in the field of sustainable transport and mobility.

It addresses general policies with a stronger focus on incentives for political, public and economic actors and an advisory, rather than restrictive attitude. a major capitalisation result, the report lists 18 recommendations that can help improving future projects and recommending to develop a more effective way of implementing European policies.

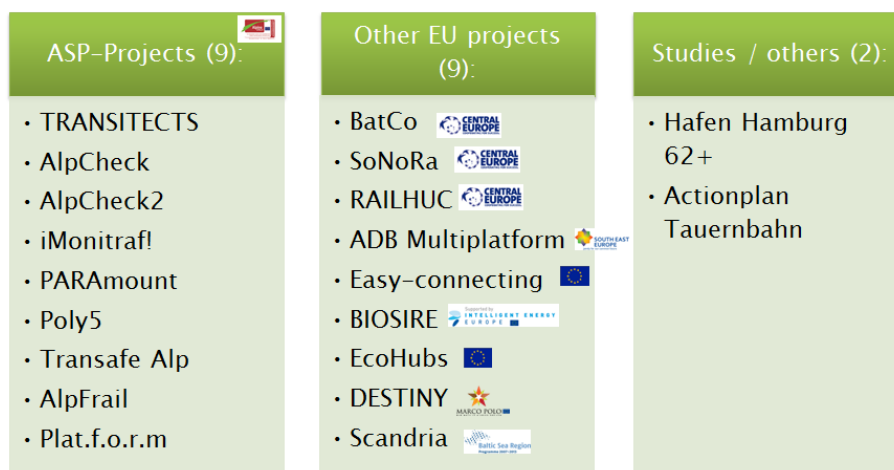


Figure 10: Analyzed projects and studies in freight transport by the project SusFreight⁴⁵

⁴⁵ SusFreight Project Partners (2015), p. 5

Stakeholder/Partners

Project Partners:

- German Association for Housing, Urban and Spatial Development – Lead Partner
- Stuttgart Region Economic Development Corporation
- Association of Chambers of Commerce of Veneto Region
- Venice International
- Development Agency of Carinthia
- Ministry of Infrastructure and Spatial Planning, Slovenia
- LKZ Prien GmbH – Project Management

Project stakeholders:

As (sustainable) goods transport consists of complex processes, there is a huge number of stakeholders which had to be addressed by the project's results. Thus, following stakeholders were taken into consideration:

- Science
- Politics (executive and legislative authorities)
- Alpine Convention / Alpine Dialogue
- Zurich Process
- Chambers of Commerce
- Associations / non-governmental originations
- Infrastructure providers and operators
- Transport companies (esp. road and rail)
- Forwarders
- Logistics service providers

Objectives and Targets:

The objective of the project was to generate recommendations for future policy development, for strategies (e.g. Macro-regional strategy) and programmes (e.g. ASP 2014+) in the thematic field sustainable transport and mobility by exploiting the accomplishments of ASP in regards to sustainable freight transport. Therefore the project identified the framework and challenges of sustainable freight transport in the AS. In a second step it valorized and capitalized the experiences of previous projects tackling sustainable freight transport. The main focus lied on the ASP-projects AlpCheck2, iMonitrafl, PARAMount, POLY5, TranSAFE-Alp and TRANSITECTS. Moreover, in TRANSITECTS a cross-fertilization process with other programme areas had started, and thus relevant results of BaTCo, Scandria and SoNorA etc. were included. Besides achievements, limits encountered by the projects and future challenges will be specifically highlighted and integrated in the recommendations.

SusFreight has taken into account different fields of sustainable goods transport:

- Supply chain improvement and targeted investment
- New technologies
- Governmental spatial planning – regulations and incentives
- Private companies involvement
- Information and education policies
- New measurements standards / collection methods

The recommendations developed for each field address relevant (political) decision makers and programme managers. It will help them to evaluate project applications regarding their impact and relevance, especially in the frame of programmes like Alpine Space.

Financing Mechanism

Total budget: 518.000,00€

ERDF Contribution: 393.640,00€

Timeframe/work plan

September 2013 to December 2014

Reporting and Dissemination

As SusFreight was an AlpineSpace project, the monitoring and reporting was mandatory (to the Programme Authority). The main reporting and dissemination of results was at the Final Conference in Brussel with high political participation.

Expected Impacts/Follow up

A further Alpine Space programme (or similar EU programme) can follow on the SusFreight project and work with the outcomes and results. Additionally, the booklet with the outcomes is a high-valuable source and basis for political decision makers.

Problems and Challenges

As sustainable goods traffic is a complex chain of actors involved it was very important to take every target group's requirements into consideration. Therefore, a lot of practice feedback was collected – sometimes the requirements were contrary. Then, it was SusFreight's task to look at the details and the reasons for each requirement so that all requirements harmonize could be harmonized in order to have logical recommendations.

Specific outputs:

As described before, stakeholders from practice (e.g. forwarders, Combined Transport terminal operators) were invited to give feedback to interim working results. Here, there was the challenge of bringing the requirements of daily business together with the interim results (i.e. recommendations). It became clear that an implementation of the recommendations can only be achieved if there is a common understanding of each other requirement and if there is a better cooperation and communication between the stakeholders of policy and economy.

Documentation:

SusFreight Final Booklet, Website: www.susfreight.eu

2.4.5 ASB-CombiHub – Austrian project

(Full title in German: ASB-CombiHub– die hybride Nutzung bestehender Anschlussbahnen als intermodale Umschlagsknoten für Kombinierte Verkehre)

Current situation & objectives of the project:

The Project ASB- CombiHub dealt with the topic of the suitability and utilisation of feeder lines for cargo handling in intermodal transport. The focus was on the handling of cargo involving swap containers and containers in general.

The supply of urban agglomerations with goods of all kinds and the economical configuration of intermodal transport require an appropriate choice of location for suitable transition points and terminals respectively - in order to ensure that compromises in spatial planning between housing and industrial areas have to be made quite often.

Transition points in the form of terminals frequently cause an increased volume of traffic, which can have a negative effect on the quality of life in the adjoining housing areas. Transition points do, however, lead to a better quality of life in urban agglomerations on the whole as they ensure the availability of a diverse array of goods and offer the population an added source of employment. The project's goal is the identification of feeder lines in the vicinity of urban agglomerations and the evaluation of their usability regarding the cargo handling in intermodal transport. The most important aspect is the feeder lines' capability concerning the implementation of innovative technologies in the sector of cargo handling (e.g. SWABPort-, Mobiler-Technology ...). The problems caused by the market entrance of a plethora of such technologies over the past years are meant to be dealt with in this way. In addition to the geographical suitability of feeder lines the technical as well as the commercial suitability and the legal framework necessary to the implementation of a container- cargo handling on feeder lines were analysed in terms of the project. Additionally different modes of operation are supposed to show, which kinds of synergistic effects can be realized by using feeder lines for cargo handling such as this. Furthermore the modes of operation that are necessary to the theoretical implementation of such an enterprise were demonstrated.

The project's goal was the identification of feeder lines in the vicinity of urban agglomerations that are suitable for cargo handling in relation to intermodal transport, but have not yet been used in this capacity. All of this was to be done in terms of a pre-assessment.

Based on this project the implementation of such a scheme employing innovative technologies in the sector of cargo handling is planned for a subsequent project that shall combine the application of innovative technology in the sector of cargo handling and an equally innovative organizational implementation as well as the optimizations connected to it (e.g. the hybrid use of feeder lines).

Project partners:

TECHNOMA Technology Consulting&Marketing GmbH (project coordination), TRAFFIX Verkehrsplanung GmbH

Project duration:

08/2013 – 07/2014

Accompanying documents:

<http://www2.ffg.at/verkehr/projekte.php?id=1140&lang=en&browse=programm>

2.4.6 ILKÖ – Austrian project

(Full title in German: ILKÖ- Integriertes Logistiknetzwerk KV in Österreich)

Current situation & objectives of the project:

Within the ILKÖ-Project an integrated end-to-end logistics network for rail freight transport focusing on Combined Transport in Austria was developed. Existing barriers between the different players shall be dismantled and an innovative, neutral logistics-network in the approach of a one-stop-shop was designed.

The end-to-end logistics network will contribute to a more energy and resource efficient rail freight transport system and will be able to boost the competitiveness of Combined Transport. The essential output of the project consists of an innovative software-architecture and an implementable organizational and business model.

As a follow up, it is planned to test this new developed logistics-network with existing logistics services.

Project partners:

c.c.com Andersen&Moser GmbH,
LTE Logistik- und transport-GmbH,
Montan Speditionsgesellschaft m.b.H.,
Salzburg AG für Energie, Verkehr und Telekommunikation,
Traffix Verkehrsplanung GmbH,
Wiener Lokalbahnen Cargo GmbH

Project duration:

07/2014 – 06/2016

Accompanying documents:

<https://www2.ffg.at/verkehr/projektpdf.php?id=1182&lang=en>

2.4.7 Support Scheme for regular Intermodal Transport Services – French Study

Type:

This project is an Aid scheme (subsidies) aiming at supporting the operation of regular intermodal transport services for national and international services to/from France.

Scope:

The project is designed to support regular combined transport services that are alternatives to significant road transport on the French territory and that involve handling of intermodal transport units in a terminal located in continental France.

Stakeholders, partners:

It is mostly a central government project, but local and port authorities can also contribute to it and bring additional funding, within the limits of the State Aid decision covering it.

Targets, target-groups:

Objectives of the project are:

- to encourage modal shift from road to more sustainable transport alternatives for freight transport (maritime (short sea shipping), waterways, railways)
- to mitigate the cost of terminal handling by providing some subsidies in order to support real alternatives to road-only freight transport. Subsidies are allocated on the basis of the data of actual traffics handled.

It targets combined transport operators or forwarding agents that provide freight transport services representing alternatives to road transport.

The distance between terminals must be more than 80km, except for waste transport services and urban distribution.

Transit services are not eligible to the scheme.

International transport services to/from terminals very close to the north-east border with Belgium, Luxembourg, Germany or Switzerland are excluded. Some other exclusion apply, in particular for feedering services.

Financing mechanisms:

The project is financed through central government budget.

Local authorities can also decide to contribute to it.

Timeframe, workplan:

The current Aid scheme is designed to cover the traffics operated during the 2013-2017 period. Related budget years are 2014-2018, given that subsidies are allocated on the basis of data of actual traffics handled. The current Aid scheme has been notified to the European Commission.

It is run annually via a call for expression of interest published at European level.

Reporting, monitoring, dissemination:

Information about the scheme is made available on the Transport ministry's website, where all information relating to the annual calls for expression of interest is published.

Furthermore, sectoral national conferences are being organised by the Ministry (on rail, waterways, road freight or logistics transport) during which information about the scheme is also made available to potential participating beneficiaries. These national conferences aim at improving each transport mode for freight transport hence aiming at improving the effectiveness of combined transport.

Data provided by all beneficiaries on actual traffics are also used for the monitoring of the scheme.

Expected impacts, follow up:

The scheme's expected impacts are a better efficiency of freight transport.

Depending on evolutions within each transport sector and therefore depending on the conditions of competition between transport modes, measures for re-balancing transport modes might be needed.

Therefore, a decision on the follow-up of the current scheme will only be made once an assessment of the evolutions of each transport sector is made, after the current scheme period.

Problems, challenges:

The challenges faced are mainly linked to the setting of the right level of public subsidies and to the evolution of the performances of each transport mode. The level of subsidies mainly depends on budget resources and the number of eligible units actually handled, as recorded within the process of the annual calls.

No indications about specific outputs, documents

2.4.8 Kombiterminal Burghausen – German Study

The following tasks and objectives have been edited in the project:

- Creation of bases modal shift from road to rail
- Determination and allocation of relocation quantities eligible and future relations
- Analysis of intermodal environment Burghausen and recommendation of new transport routes to and from Burghausen (inter alia Alpine crossing routes via Austria to the Southern ports – see Figure 11)



Figure 11: East corridor⁴⁶

The project has contributed to the Alpine crossing rail freight transport relation from Burghausen (Germany) via Salzburg (Austria) to Trieste (Italy). The train runs once a week.

Project partners:

The LKZ Prien GmbH took over the project management and accompanied the identification of potential future amounts for the Kombiterminal Burghausen.

Project duration:

2014 to 2015

⁴⁶ LKZ Prien GmbH following map basis of BBIV

2.4.9 Future Trailer – German project

Current situation & objectives of the project:

The (non-craneable) semi-trailer is the standard transport unit in the European (road) goods transport today. However, the conditions of the regulatory, legal and economic framework for road transport (e.g. lack of truck drivers) lead to the situation that transport companies and forwarding agencies look for alternative transport methods. One alternative is the use of the railway. Since only a few years, it is now possible to give access for the above mentioned non-craneable semi-trailers to the combined traffic. This kind of trailers have the major market share. Only 5 to 10 % of all trailers in Europe are craneable ones. So, the new possibility for shifting non-craneable semi-trailers from road to rail due to innovative transshipment technologies addresses a complete new market segment for combined traffic and offers a huge potential for raising the share of railway goods transport (about 800.000 to 1 Mio. non-craneable semi-trailers in the EU). Although these new technologies (e.g. NiKRASA) work quite well, there are some aspects which can be improved in order to have a more efficient (and thus cost-efficient) intermodal transport process.

Therefore, the target of this project is the design of the semi-trailer of the future who can be used equally on road and rail. This trailer – which is basically designed for the road transport and standardized regarding the current regulations – is the central transport unit which goes through the whole transport process. However, improvements are also to be developed in other fields of the Combined Transport, e.g. wagons.

Therefore, the approach of the project is the development of results by having expert discussions and analyses in close cooperation with all relevant CT participants.

Project partners:

The core team of the project is the LKZ Prien GmbH and Spedition Eberl.

Target groups of the project results:

Railway companies, terminals, transport companies and forwarding agencies, wagon manufactures, infrastructure operators, semi-trailer manufactures, policy, science, associations

Project duration:

April 2016 to December 2017

2.4.10 Innovation in transalpine Freight Transport – Swiss Study

Current situation & objectives of the project:

What are the potentials of innovative measures in the freight transport sector (rail, intermodal)? - the study gives answers for the following measures:

1. innovations of the transport system which present completely new systemic solutions for the transport chain and covering several sectors such as rolling stock, infrastructure and operational services offered;
2. innovations related to the rolling stock which include improvements of the rolling stock and its components;
3. innovations related to the infrastructure leading to improvements of the fix infrastructure or its components,
4. innovations related to processes which optimise the proceedings at the existing railway system at existing technology

For each category, examples of detailed measures with a high degree of market- and industry readiness are defined:

for instance in category 1:

- radio based multiple unit control for double traction in shuttle services;
- optimization of freight rail traction in a highly occupied rail network of mixed traffics;
- automatic braking test for entire trains requesting intra train communication and energy supply on every waggon;
- Hybrid or bi-system traction locomotives;
- Modalohr rolling stock, Cargobeamer for non cranable units;

in category 2:

- telematics of rail waggons for tracking and tracing;
- automatic center buffer couplers for rail waggons;
- retrofitting with low noise composite breaks (K-Sohle, LL-Sohle)

in category 3:

- optimization of tunnel gaudge, rolling stock and loading units;
- increase of axle weight according to TSI on certain categories of TEN routes;

in category 4:

- harmonization of operating rules and regulations in international and multisystem rail transport (including operation language, signalling systems);
- train coupling and sharing (to and from blocktrains) for increased network capacity.

Project partners:

ETH Zürich, Institut für Verkehrsplanung und Transportsysteme

Project duration:

2013/2014

2.4.11 Trends and Innovations at UCT in and through Switzerland – Swiss Study

Initial situation:

The Swiss Federation pursues a stringent and continuous policy to shift road freight traffic in and through Switzerland to rail, especially to unaccompanied freight transport. The Federal Office for Transport commissioned a study to enhance the framework conditions of the corresponding support program and - more important - create the necessary organisational conditions.

Objectives of the project:

With regard to foreseeable developments and trends in the logistics market and technological innovations, the study aims at assessing their relevance for the technical requirements on rail and terminal infrastructure both qualitatively and quantitatively. It considers the following developments:

- Dimensions and weights in road freight transport,
- Dimensions and weight of ISO-containers,
- Adaption of intermodal equipment for the transport of temperature-controlled goods,
- Production parameters for rail (axle loads, train length and weight, speed),
- Market opportunities for horizontal transshipment techniques and possibilities for (semi-) automation of transshipment within inland terminals
- Innovative traction technologies to connect peripheral regions as well as the possibility for diesel traction or hybrid locomotives on long distance freight transport.

Project partners:

KombiConsult und K+P Transport Consultants

Project duration:

2008-2010

3 Innovative Logistics Solutions for transalpine Freight Transport

3.1 Innovations of CT

In this section the three major innovations – the standard container, the swap body and semitrailer which have been developed in the last 50 years and today are no longer indispensable as well as the latest innovative handling systems – CargoBeamer, ISU-System, Modalohr and NiKRASA - are presented.

3.1.1 Standard Container

The American forwarder Malcolm McLean transported the first steel boxes already in 1956 to Texas. At this time so-called "Shiver Men" dragged bales, sacks and wooden boxes in the hold of ships. For a 5,000 ton ship 60 people often needed one week to unload the cargo. Today, the giant container ships are often only a few hours in the port.⁴⁷ Through negotiations with the Americans and Europeans an agreement was finally reached, and so the present ISO standards emerged.⁴⁸ From the worldwide more than 20 million containers⁴⁹ the majority corresponds with the standard.⁵⁰

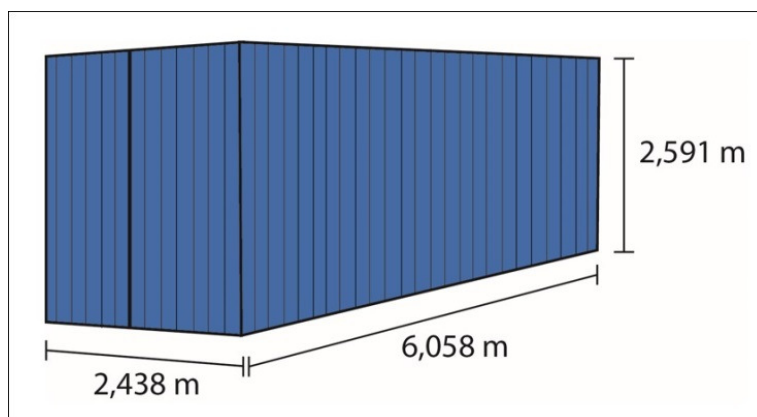


Figure 12: 1 TEU (20-foot ISO-standard container)⁵¹

Based on the uniform dimensions are especially well suited for the CT because they can be transferred fast from one mode of transport to another.⁵² Next to the standardization and robustness container are characterized by the stackability and the space-saving storage in particular. Furthermore it has to be mentioned that there are restrictions like the lack of compatibility with the euro pallet and the difficult loading and unloading because it usually only can be parked on the ground.⁵³ It was necessary to compensate these disadvantages at the developing of the swap bodies.

⁴⁷ Cf. overall <http://www.welt.de/print-welt/article212832/Die-Erfindung-des-Containers.html>, (19.11.2015).

⁴⁸ Cf. GDV (2005), p. 17.

⁴⁹ Cf. Seidelmann (2010), p. 16

⁵⁰ Cf. GDV (2005), p. 17; Posset et al. (2014), p. 80.

⁵¹ LKZ Prien GmbH based on Posset et al. (2014), p. 81

⁵² Cf. Beckmann (2010), p. 267.

⁵³ Cf. overall Gronalt et al. (2011), p. 51.

3.1.2 Swap Bodies

At the same time when the container developed to the transport mode number 1 in the global trade further technologies in Europe with similar principles were tested as well.⁵⁴ The result was among other things the swap body, also known as interchangeable container.⁵⁵ The idea of the swap bodies came from the company Dachser which developed a European swap body system to reach an efficiency increase.⁵⁶ Due to the fact that the development is oriented on the sea container, a transport mode was created which is interchangeable and can be separated from the carrier vehicle (truck) like the ISO container.⁵⁷ In contrast to containers, swap bodies does not need to be stored on the ground because they can be placed with own pillars (see Figure 13).

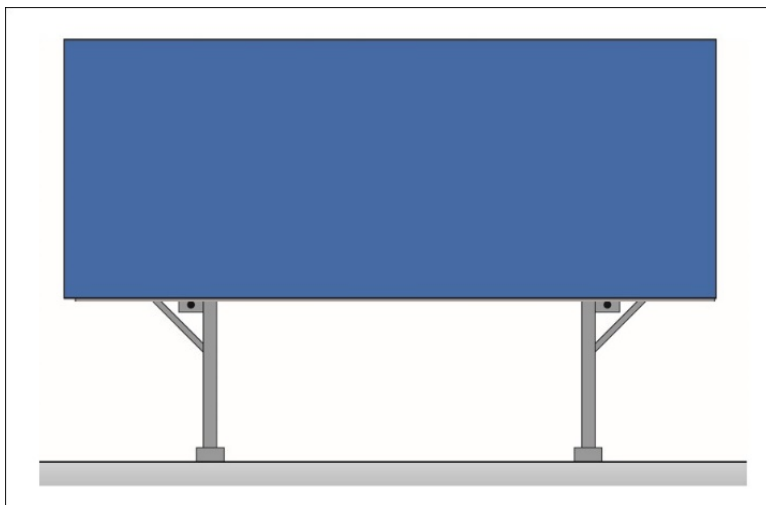


Figure 13: Placed swap body⁵⁸

Swap bodies are especially suitable for the use in the CT road/rail and have longitudinal recesses for transshipment by gantry cranes. For the first time railways in freight traffic could reach customers which do not have their own rail connection. Nowadays swap bodies belong to the most important loading units in the intra-European traffic. About two thirds of the intermodal, European traffic volume is transported this way. This is mainly based on the standardized norm and the high fleet utilization which guarantees a full operating capability for the loading of the euro pallet.⁵⁹

⁵⁴ Cf. Seidelmann (2010), p. 20.

⁵⁵ Cf. Gronalt et al. (2011), p. 56.

⁵⁶ Cf. <http://www.handelszeitung.ch/unternehmen/dachser-setzt-einen-meilenstein-der-logistikgeschichte>, (19.11.2015).

⁵⁷ Cf. GDV (2005), p. 607.

⁵⁸ LKZ Prien GmbH depiction based on Arndt/Büscher/Gohlke (2013), p. 51

⁵⁹ Cf. overall Seidelmann (2010), p. 20 ff.

3.1.3 Semitrailers

Simultaneously to swap bodies in Europe, also transport offers for semitrailers were developed.⁶⁰ Since 1936 special truck semitrailers were transported on flat wagons in France. However, since the charge capacity of the semitrailer was increasingly inadequate, the "kangaroo" system, co-developed by the French state railway, was introduced at the beginning of the 1960s in order to load bigger semitrailers. With this system it was possible for the first time to perform even cross-border Combined Transport in the Benelux countries and Italy.⁶¹ On the road, there are combinations of a particular tractor, the tractor unit (tractor) and the trailer, which represent at the present time about 60% of trans-Alpine journeys in freight transport. These together form the tractor. They are connected by the kingpin, wherein a portion of the weight of the trailer shifted to the axles of the tractor (see Figure 134)⁶². There are two types of semitrailers the craneable and non-craneable one (see Annex 4: Information to craneable and non-craneable Semitrailers).

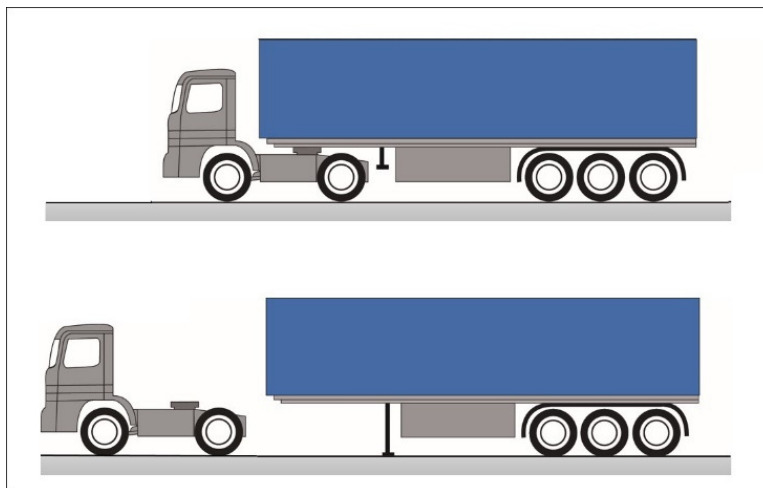


Figure 14: Depiction of a semitrailer⁶³

⁶⁰ Cf. Seidelmann (2010), p. 24.

⁶¹ Cf. overall Wenger (2001), p. 38 ff.

⁶² Cf. overall SBB CFF FFS (2014), p. 4.

⁶³ LKZ Prien GmbH depiction based on SBB CFF FFS (2014), p. 4

3.1.4 CargoBeamer

The system was invented by the logistical rail service company CargoBeamer AG. It is a self-designed pocket wagons. The side walls can be folded down so that the pallet can be moved onto the wagon laterally. Once folded back up, they secure the whole pallet including the trailer. For using the system high infrastructure costs and high space requirements are necessary.⁶⁴



Figure 15: CargoBeamer⁶⁵

Type:

“CargoBeamer uses a universal loading palette – which is part of the wagon. All semi-trailers fit onto these palettes – at once, without any modification. In addition to automated CargoBeamer terminals, operation in all existing conventional rail/road terminals is possible, too.”⁶⁶

Stakeholders/partners:

The CargoBeamer AG company have found the cargo handler and terminal operator Achema Group in Lithuania and Deutsche Bahn Schenker Rail as train operating company for the “Efficient Semi-Trailer Transport on Rail Baltica” (ESTRaB) project. The German political alliance for the promotion of rail transport (Allianz pro Schiene) supported the project.⁶⁷

Targets

“Environmental protection, relieving the pressure on Europe’s roads and supporting transport companies in reducing their CO2 emissions are just some of the leitmotivs of CargoBeamer AG.”⁶⁸

Financing mechanisms:

The European Commission’s Programme Marco Polo II supported the testing and market introduction of the CargoBeamer system on the route between the Netherlands and Lithuania within the EU project ESTRaB.⁶⁹

⁶⁴ Cf. overall Nallinger (2014), p. 12.

⁶⁵ CargoBeamer AG

⁶⁶ <http://www.cargobeamer.eu/>

⁶⁷ Cf. <https://www.allianz-pro-schiene.de/wp-content/uploads/sites/2/2015/10/flyer-estrab-cargobeamer-englisch.pdf>

⁶⁸ <http://www.cargobeamer.eu/>

⁶⁹ Cf. <https://www.allianz-pro-schiene.de/wp-content/uploads/sites/2/2015/10/flyer-estrab-cargobeamer-englisch.pdf>

Timeframe / workplan:

In 1998 the CargoBeamer concept were developed and in 2013 the CargoBeamer AG in Bautzen were founded. In 2013 the first CargoBeamer wagon had been rolled out.⁷⁰

Accompanying documents:

www.cargobeamer.com

<https://www.allianz-pro-schiene.de/wp-content/uploads/sites/2/2015/10/flyer-estrab-cargobeamer-englisch.pdf>

3.1.5 ISU system – Innovativer Sattelaufleger Umschlag (Innovative Semitrailer Transfer)

ISU is a rope technique developed by the Rail Cargo Austria (RCA) to transship a standard trailer with a crane. In this solution, a carrying harness is placed around the tire and the king-pin picked up by the crane. A standard pocket wagon serves as wagon.⁷¹ Despite standard equipment, however, the transshipment process takes a relatively long time and brings a high amount of personnel with them.⁷²



Figure 16: ISU⁷³

Type:

Based on the findings of the research project CREAM (Customer-driven Rail-freight services on a European mega-corridor based on advanced business and operating models, see www.cream-project.eu) the ISU technology is now used for combined connection provided by ÖBB Rail Cargo and partners.

Scope:

The project is focussed on the classic middle and long distance combined transport, so a service between Wels and Trieste is provided as part of a transport chain between Middle Europe and Turkey.

Stakeholders/partners:

The main stakeholder in Austria is ÖBB Rail Cargo Group, the freight unit of the national state owned railway company. In the CREAM project many European railway companies were represented together

⁷⁰ <http://www.cargobeamer.eu/>

⁷¹ Cf. overall http://www.railcargo.com/de/Produkte_und_Innovationen/ISU/index.jsp, (25.11.2015).

⁷² Cf. Nallinger (2014), p. 12.

⁷³ Rail Cargo Austria AG

with science and consultants. The main target group of the ISU-services are freight forwarders, actually with a focus to the transport logistic chain from Middle Europe to Turkey.

Targets / target groups:

Up to 85% of the trailers on roads are not suitable for transshipment by cranes. The innovation of the ISU technology is that it makes these trailers craneable. Using this technology contributes to shift cargo from road to rail and to reduce exhaust fumes and greenhousegas-emissions.

Financing mechanisms:

The CREAM project was funded by the European Union in the 6th framework program with 12 Mio. Euro. (RailwayPro, 29 September 2010).

Timeframe / workplan:

The CREAM project started in the year 2007 and ended in 2011. The ISU-services of ÖBB Rail Cargo are actually circulating. The start of the implemented services (Wels – Trieste) was in November 2013.

Reporting, monitoring, dissemination:

The CREAM research project in the 6th framework program is well documented at: www.cream-project.eu

Information to the implemented ISU services are provided at

http://www.railcargo.com/de/Produkte_und_Innovationen/ISU/index.jsp.

A detailed technical description is available at

http://www.railcargo.com/de/Produkte_und_Innovationen/ISU/ISU_ppt.pdf.

Expected impacts / problems, challenges:

no indications

Specific outputs:

see link to presentation in accompanying documents

Accompanying documents:

http://www.railcargo.com/de/Produkte_und_Innovationen/ISU/ISU_ppt.pdf. This presentation is attached to the questionnaire. A brief information to the ISU services is available at: http://www.railcargo.com/de/Produkte_und_Innovationen/ISU/index.jsp

3.1.6 Modalohr

Modalohr is a system developed by Lohr Industrie SA, a French manufacturer of transport technology. It allows a horizontal handling using low-floor double carriage with revolving structure. By folding out the construction in specially equipped terminals, the truck units can be driven onto the wagon. After loading, the constructions are mechanically folded back on the wagons.⁷⁴ This requires a high space in the terminals.



Figure 17: Modalohr⁷⁵

3.1.7 NiKRASA – Non-craneable semitrailers become craneable

The system NiKRASA is developed by the market for the market, consisting of a terminal platform and transport platform. With NiKRASA all standards remain the same and does not require any changes of the trailer, wagons, terminals or processes.⁷⁶

Type

NiKRASA is a system which enables non-craneable semitrailers to be loaded onto standard pocket wagons. It was officially launched in 2014. The NiKRASA system consists of two components: a terminal platform onto which trucks can drive and the transport platform. The transport platform is used as a tool to shift a non-craneable semitrailer from road to rail.

Scope

The development has been carried out with the aim of having a system which can be used in daily transport and working processes. NiKRASA makes the transfer of non-craneable semitrailers from road to rail possible.

Stakeholder/Partners

Customers: Customers of NiKRASA are transport companies which want to take part in Combined Transport with non-craneable semitrailers.

Terminals: The terminal is responsible for handling the NiKRASA system (i.e. driving the trailer onto the platform and loading it into the wagon). The loading and unloading processes are similar to the process

⁷⁴ Cf. overall <http://lohrprod.benjix.sdv.fr/lohr-railway-system-en/>, (26.11.2015).

⁷⁵ Lohr Industrie S.A.

⁷⁶ Cf. <http://www.nikrasa.eu/de/startseite.html>, (26.11.2015).

with craneable semitrailers- so there is no change in the existing processes which has been a development criterion.

Trailer manufacturers: It is a trailer which is shifted from road to rail. Thus, also the trailer industry has been integrated in the development of NiKRASA.

Railway companies: TX has been development partner in NiKRASA. This innovative railway company integrated the know-how of running trains, transporting semitrailers and how to handle and check semitrailers in loading and unloading processes.

Objectives and Targets

The system offers freight forwarders and terminals complete flexibility because no modifications need to be made to their equipment. In this way, NiKRASA addresses a complete new market of trailers which had yet no chance to be transported by railway. NiKRASA does not take away transport amounts from existing Combined Transport routes. Instead of this, NiKRASA brings new amounts to Combined Transport and contributes to a higher share of environmentally friendly transport.

Financing Mechanism

The NiKRASA development was financed by public companies. Following companies made financial contributions / investments: TX Logistik AG, bayernhafen Gruppe and LKZ Prien GmbH. NiKRASA also received financial contributions by the Bavarian Ministry of Economic Affairs and Media, Energy and Technology, the Bavarian Ministry of the Interior, for Building and Transport and the Austrian Federal Ministry for Transport, Innovation and Technology as part of the Innovation Programme for Combined Transport.

Timeframe/work plan

The time from the initial idea until the official market launch was four years (2010 – 2014).

Reporting and Dissemination

Already during the development NiKRASA was presented to the major stakeholders, especially to customers. It is their needs the system should be tailored to. But also semitrailer producers and railway (security) experts were involved in the development process. At the time of the market presentation (end of September 2014), NiKRASA was officially presented to journalists from logistics magazines, Combined Transport experts, representatives from politics and especially to customers.

Expected Impacts/Follow up

The introduction of NiKRASA is the only real innovation after the standard container (TEU) which is used in worldwide chains.

In the future, it is possible to do further development activities to improve the system even more (e.g. adapt the design in order to transport further types of trailers).

Problems and Challenges

NiKRASA has been developed with following requirements: the system must shift non-craneable standard semitrailers from road to rail into standard pocket wagons without any change at the trailer, the wagon, terminal processes and handling technologies (e.g. cranes). During the development it was often difficult to fulfill these requirements. As the NiKRASA system affects a broad variety of stakeholders (e.g. terminal operator, railway companies, trailer technology and after all the customers)

a lot of know-how from completely different fields had to be collected and brought together. Despite these difficulties, all requirements could be fulfilled.

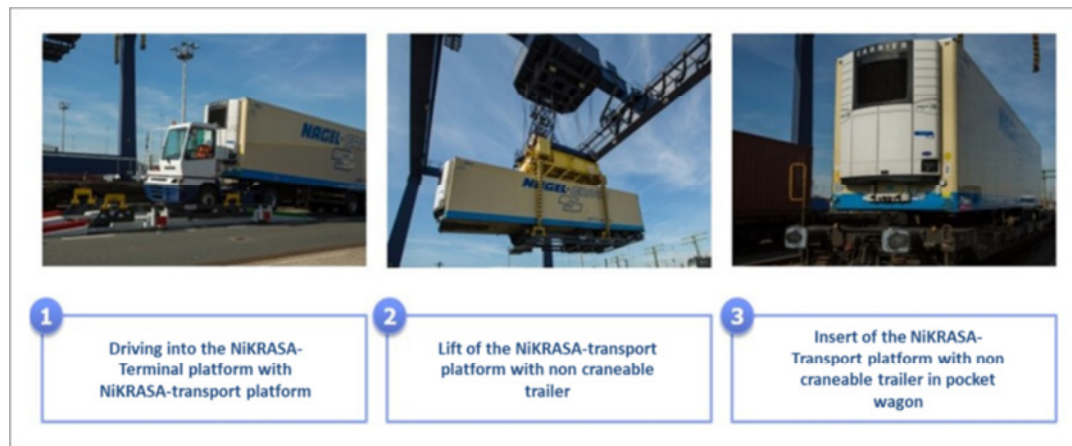


Figure 18: Transshipment with the NiKRASA system⁷⁷

Accompanying documents:

<http://www.nikrasa.eu/en/home.html>

3.1.8 ContainerMover 3000 truck-mounted rail-road transshipment technology for ISO-containers and swap-bodies

The system ContainerMover 3000 is developed by the market for the market. It is a device mounted onto a truck enabling independent road-rail transshipment at every freight station with load transfer point or at private sidings. The system can be used for the direct transshipment between road and rail vehicles of standard class C745 and C782 swap bodies or 20' and 40' containers. Thanks to the ContainerMover 3000 system, no dedicated fixed infrastructure is necessary for intermodal load transfer, nor is there a need for extra personnel since the truck driver can handle the transshipment completely himself. Removable adapter frames on the rail vehicle ensures that the ContainerMover 3000 can be operated with any intermodal flat wagon.

Type

The ContainerMover 3000 can handle standard containers and is therefore a significant improvement in comparison to existing horizontal transshipment techniques. The ContainerMover can transfer weights up to 22 tons. The system is operated remote-controlled, and a video camera and two distance lasers support the truck driver in positioning the road vehicle alongside the wagon. The ContainerMover-3000 can lift swap bodies and containers by up to 40 cm. The Mover truck is therefore also an efficient means of delivering swap bodies to their standing area with their retractable legs extended.

Stakeholders/partners:

InnovaTrain Ltd developed the system ContainerMover 3000. The company was founded in 2010 as a private competence-centre for intermodal liner trains and transshipment concepts. The Idea of the ContainerMover was inspired by the good rolling mechanism of a drawer. Testing began in June 2011.

⁷⁷ LKZ Prien GmbH

Reporting, monitoring, dissemination:

More and more customers are opting for InnovaTrain's turnkey technical solutions and building them into their logistics processes. One of Switzerland's biggest retail chains has gone back to using the rail mode for its supply chain logistics after adopting InnovaTrain's solutions. Other firms are improving their logistics systems by adopting the ContainerStation system for their loading bay or intermediate storage purposes.

The systems marketed by InnovaTrain are suitable for all standard ISO containers and swap bodies and have proved their worth in practice.

Accompanying documents:

<http://www.innovatrain.ch/en/containermover/>







Category	ISU www.isu-system.de 	NiKRASA www.nikrasa.eu 	CargoBeamer www.cargobeamer.com 	Modalohr www.lohr.fr/en 
Required material and infrastructure	<ul style="list-style-type: none"> ISU-traverse ISU-spreader ISU-ramp ISU-wheel gripper² 	<ul style="list-style-type: none"> terminal-platform transport-platform 	<ul style="list-style-type: none"> Cargogate with transshipment module or: Wagon composition with crane biting edges 	<ul style="list-style-type: none"> Modalohr-terminal with transshipment modules
Costs transshipment infrastructure & equipment	<p><u>Investment:</u></p> <ul style="list-style-type: none"> 60.000€ for the intermediate frame with lifting straps and two loading ramps³ <p><u>Ongoing:</u></p> <ul style="list-style-type: none"> Maintenance of ISU-components 	<p><u>Investment:</u></p> <ul style="list-style-type: none"> terminal-platform: modest 5-digit amount transport-platform: modest 5-digit amount <p><u>Ongoing:</u></p> <ul style="list-style-type: none"> Maintenance of transport platform & terminal platform 	<p><u>Investment:</u></p> <ul style="list-style-type: none"> Cargogate: 10-20 Mio.€ per site¹ <p><u>Ongoing:</u></p> <ul style="list-style-type: none"> Maintenance of facility 	<p><u>Investment:</u></p> <ul style="list-style-type: none"> Modalohr-terminal: ca. 6,7 millions € per site¹ <p><u>Ongoing:</u></p> <ul style="list-style-type: none"> Maintenance of facility
Costs wagon & additional equipment	<ul style="list-style-type: none"> Double pocket wagon: 180.000€¹ for 2 parking spaces 	<ul style="list-style-type: none"> Double pocket wagon: 180.000€¹ for 2 parking spaces 	<ul style="list-style-type: none"> Cargo Beamer wagon: 360.000€¹ for 2 parking spaces Wagon base: 20.000€ x 2 pallets per wagon = 40.000€ 	<ul style="list-style-type: none"> Modalohr wagon: 385.000€⁵ for 2 parking spaces
Know-How & processes	<ul style="list-style-type: none"> no special know-how necessary transshipment with special handling equipment (chains) movement and swinging of trailer (e.g. with wind) standard processes in transshipment facility staff training by system implementation 	<ul style="list-style-type: none"> no special know-how necessary stable transshipment because of semitrailer "lies" in transport-platform standard grippers standard process in transshipment facility staff training by system implementation 	<ul style="list-style-type: none"> transshipment at Cargogate: know-how necessary by technical handling because of (new) system not comply with the standard transshipment crane transshipment: standard-processes taking of the pallet (vertical handling) with standard gripper 	<ul style="list-style-type: none"> transshipment at Modalohr-terminal: know-how necessary by technical handling because of (new) system not comply with the standard transshipment
Capacity train length	<p>40 semitrailer</p> <p>Calculation: 700m/34,03m = 20,57 wagons → at 20 TWIN-double pocket wagon, each with 2 parking spaces complied a capacity of 40 semitrailers</p>	<p>40 semitrailer</p> <p>Calculation: 700m/34,03m = 20,57 wagons → at 20 TWIN-double pocket wagon, each with 2 parking spaces complied a capacity of 40 semitrailers</p>	<p>36 semitrailer⁴</p> <p>Calculation: 700m/39,00m = 17,95 wagons → at around 18 wagons, each with 2 parking spaces complied a capacity of 36 semitrailers</p>	<p>42 semitrailer</p> <p>Calculation: (700m – 2x 33,87m) / 32,94m = 19 intermediate wagons → at 19 intermediate wagons plus 2 end wagons, each with 2 parking spaces complied a capacity of 42 semitrailers</p>

Table 6: Detailed comparison of selected systems for Combined Transport⁷⁸

⁷⁸ LKZ Prien GmbH representation following others (Cf. ¹www.zukunft-mobilitaet.net; ²ISU Systemübersicht DI Erich Possegger; ³Tandetzki: Machbarkeitsstudie ISU-System⁴CargoBeamer)

3.1.9 Alpine crossing Connections of selected CT Systems

In the following table and map the Alpine crossing relations from the analyzed CT systems CargoBeamer, ISU, Modalohr, NiKRASA and ContainerMover 3000 are shown.

CT system	relations	
	from	to
CargoBeamer ⁷⁹	Domodossola (ITA)	Köln (DEU)
ISU ⁸⁰	Wels (AUT)	Curtici (ROU)
⁸¹	Wels (AUT)	Triest (ITA)
⁸²	Wels (AUT)	Stara Zagora (BGR)
Modalohr ⁸³	Aiton (FR)	Orbassano (ITA)
	Bettembourg (LUX)	Perpignan (FRA)
	Calais (FRA)	Le Boulou (FRA)
⁸⁴	Le Boulou (FRA)	Bettembourg (LUX)
NiKRASA ⁸⁵	Bettembourg (LUX)	Triest (ITA)
	Padborg (DNK)	Verona (ITA)
	Herne (DEU)	Verona (ITA)
ContainerMover 3000	Oensingen (CH)	Tessin (CH)

Table 7: Alpine crossing connections of selected CT systems

⁷⁹ Cf. <http://www.cargobeamer.com/Buchen-758630.html> (16.12.2015)

⁸⁰ Cf. <http://www.tradetrans.com/de/content/der-erste-zug-der-relation-wels-curtici> (16.12.2015)

⁸¹ Cf. http://www.railcargo.com/de/E-Services/Infothek/Publikationen/factsheets_operator.pdf (16.12.2015)

⁸² Cf. <http://www.eurotransport.de/news/kombinierter-verkehr-kranbare-loesungen-sind-gefragt-6575013.html> (16.12.2015)

⁸³ Cf. <http://lohr.fr/lohr-railway-system-de/referenzen/> (16.12.2015)

⁸⁴ Cf. <http://www.lorry-rail.com/services/?lng=de> (16.12.2015)

⁸⁵ Cf. <http://www.txlogistik-nikrasa.eu/> (16.12.2015)



Figure 19: Map of connections of CT systems⁸⁶

⁸⁶ LKZ Prien GmbH representation on map basis of BBIV

3.2 Further Innovations Rail and Road Transport

3.2.1 Austria

New Concept for delivery light duty e-vehicles:

3.2.1.1 *E-Log Klagenfurt*

Type:

E-Log is an implementation project for urban freight logistic, based on electric powered vehicles and electricity supply based on photovoltaik.

Scope:

The scope of the project is city logistics in Klagenfurt (Carinthia) ,including neighbour communities. In the frame of the project 200 electric powered road vehicles should replace conventional light duty vehicles and cars. It was planned that 3 innovative electric vehicles called city logs -powered by fuel cells – provide a freight shuttle between the logistic center and the city center. Although prototypes were produced, the producer could not deliver the vehicles für Klagenfurt. In September 2016 a service with electric powered trucks will start to provide this shuttle service.

The introduction of other electric vehicle is successful, in July 2016 already 120 vehicles are circulating in the frame of e-log project in the Klagenfurt region.

Stakeholders/partners:

The project is supported by the Austrian Climate and Energy Funds with 1,57 Mio.Euro. This fund is financed by the Austrian ministries for transport and for environment. A coordinating role has the city administration of Klagenfurt and the daughter society of it IPAK . The project is based on the participation of many private companies, they are listed in the attached fact sheet.

Targets / target groups:

The main target group are delivery services, services of craftsmen and social services. In the region Klagenfurt approx. 3.200 light duty vehicles are in use. At least 200 of them should be replaced by electric powered vehicles. Moreover, 300 loading stations should be implemented in the region Klagenfurt.

Financial mechanisms:

Total budget : As mentioned e-log Klagenfurt is supported by the Climate and Energy Funds with 1,57 Mio €, the total budget is 7,65 Mio.€ , see <https://www.klimafonds.gv.at/foerderungen/gefoerderte-projekte/detail/?plistcall=1&pid=46049>

Timeframe / workplan:

E-Log Klagenfurt started in 2011, the project is still under way.

Reporting / monitoring:

The Climate and Energy Funds requires status reports like the attached report for 2014. In addition to the information at the website <https://www.klimafonds.gv.at/unsere-themen/e->

mobilitaet/modellregionen/e-log-klagenfurt/ an own website is available <http://elog-klagenfurt.at/>: Moreover, the e-Log project is presented on events for the target groups and a phone information campaign for potential users of electric powered vehicles is under way.

Expected impacts:

A reduction of 85 % of CO₂ emissions is possible due to the substitution of 200 light duty vehicles by electric powered vehicles. This means more than 230 tons CO₂ reduction yearly.

Problems / challenges:

Elections of the local government and changes on the political level caused some delays. Moreover, the fuel-cell driven City Logs are available later as planned. Moreover, the fuel-cell driven City Logs cannot be delivered, because the producer is bankrupt. As substitute for the city-logs electric powered trucks will distribute and collect the freight and circulate between the logistic center and the city of Klagenfurt, starting in September 2016.

Specific outputs:

see above, no other information.

Accompanying documents:

In addition to the links

<https://www.klimafonds.gv.at/unsere-themen/e-mobilitaet/modellregionen/e-log-klagenfurt/>

a website is available

<http://elog-klagenfurt.at/>.

3.2.2 France

3.2.2.1 *Autoroute Ferroviaire Alpine (AFA) – [Alpine Rail Motorway] – experimental rail freight service*

Type:

The AFA experimental project originated in the aftermath of the 14 March 1999 fire in the Mont-Blanc tunnel, which highlighted the dangers of mixed traffics (goods&passengers) in road tunnels (nearly 40 people trapped in the tunnel died, the fire lasted for 2 days).

In order to offer an alternative to road freight transport across the Alps between France and Italy, the 2 countries jointly decided to launch the AFA project which initially aimed at testing a new approach to modal shift. This project gave the opportunity to test a new technology for transferring standard trucks directly onto trains (i.e. without any need for trucks' modifications) via the existing historical rail infrastructure (Frejus line). It enabled accompanied freight transport (full trucks) as well as non-accompanied freight transport (trailers only, without their tractors).

This project, which offered an innovative rail freight service, could be described as an operational pilot project.

It included infrastructure works. Two specific terminals were built, one in Aiton near Chambéry (France) and the other one in Orbassano near Turin (Italy). More recently (2012) works for increasing the gauge of the Mont-Cenis historical tunnel were completed in order to increase the capacity for rail freight transport between France and Italy via the Frejus line. The AFA experimental project eventually benefitted from these works.

Scope:

The AFA project is a cross border one, linking two regions : Rhône-Alpes in France and Piémont in Italy.

The AFA service is 175 km long and it uses the historic railway line (Frejus line).

It aims at offering an environmentally friendly short-distance transport solution for freight movement through the Alps between France and Italy.

Stakeholders, partners:

Stakeholders who either directly took part to the project or were involved in its definition were: the two States, the European Commission, the two incumbent railway undertakings, the Regions and local authorities, and representatives of French and Italian road hauliers.

Targets, target-groups:

Objectives of the project were:

- to demonstrate the feasibility of a direct transfer of road freight traffic onto rail, for non-cranable loading units ("standard" trucks)
- to test a new train technology enabling to speed up train loading and unloading operations
- to provide an immediate sustainable alternative to road freight transport through the Alps and facilitate a rapid modal shift from road to rail
- to provide a rail alternative for accompanied and non-accompanied freight transport

As non-cranable loading units represent most of the road freight traffic, market targets were road hauliers using standard trailers, semi-trailers, tank trucks, as opposed to containers, swap bodies or cranable trailers. During most of the experimentation though, only tank trucks could be transported by the service given rail infrastructure constraints (tunnel gauge of the Frejus historic line) that were only lifted in 2012.

Financing mechanisms:

The service operations were subsidised by the two States which contributed equally.

Furthermore, France provided some funding for the construction of the French terminal.

The European Commission's approved the scheme and authorised State Aids.

Timeframe, workplan:

The experimentation was initially planned to last for 3 years (2003-2006), period during which the works on the Mont-Cenis tunnel gauge were initially due to be completed.

In 2006, an assessment of the initial period of experimentation lead to the conclusion that the experimentation was worth pursuing until the infrastructure upgrades were finalised.

In 2009, given the results of the experimentation, the States signed an formal Agreement and decided to launch a call for tender for the opening of a commercial service on the line at the end of the experimentation, with a potential extension to the Rhone-Alpes region.

The new commercial service was due to start straight after the end of the infrastructure works, which were necessary to accomodate for the "standard" trucks (4 metres in height). For numerous reasons, these works could only be completed in 2012.

In the end, the experimentation covered the period 2003 to mid-2013, for which State Aids were approved by the European Commission and granted to the operator.

Reporting, monitoring, dissemination:

The operator provides to the States monthly and yearly reports covering both technical and financial aspects of the scheme.

On top of that, a review report for the whole experimental period was provided by the States to the European Commission as requested by State Aid decision.

An evaluation of the project was also undertaken in France (by the '*Cour des comptes*').

Expected impacts, follow up:

The expected follow-up of the experimental project is the implementation of a full commercial service on the line, after completion of an international competition process.

This aims at providing an improved (increased frequencies, longer distance) and permanent solution for road hauliers.

Actually the States launched a call for tender in 2009 and received offers in 2010. The analysis was completed in 2011, but due to several negative circumstances, some of them linked to the economical crisis in Italy, the procedure was finally abandoned.

The States now aim at relaunching a consultation to implement the new commercial service.

Problems, challenges:

The projects faced several challenges :

- technical challenges had to be overcome : infrastructure characteristics (notably a 33‰ gradient) or severe harsh winter conditions linked to a very specific and sensitive environment (Alps). These technical challenges had an impact on the cost of the service, which was also a challenge, that had to be taken up given the benefits of the scheme in terms of externalities' cost savings
- project management : being a cross-border scheme implied increased difficulties in the project management compared to a national one. The scheme notably faced funding issues, even more so after the economic and financial crisis that made public resources scarcer, particularly in Italy.
- competition with road traffic : to become a credible alternative to road transport, the service had to be both affordable and reliable; Availability of the infrastructure was therefore key on a cross-border itinerary which is part of an EU rail freight corridor (RFC). Efficiency of RFC management is then also a challenge.

Specific outputs:

European Commission decisions : NN155/2003 (FR) & N810/2002 (IT), NN34/2008 (FR) & N11/2008 (IT), N540/2009 (FR) & N586/2009 (IT), SA.33845(2011-N) (FR) & SA.34146(2011/N) (IT)

3.2.3 Germany

3.2.3.1 *Longer freight trains*

In frame of the revised Action plan freight transport of the German Federal Ministry of Transport and Digital Infrastructure the allowance of longer freight trains are planned measurements.⁸⁷

Initial situation:

Currently, freight trains in Germany are largely limited to a train length of 740 m due to a widespread presence of effective length of passing tracks of up to 750 m. Should the demand for long trains increase in the future significantly, the infrastructural requirements for 740 m trains on major highways are not consistently available. In order to increase the efficiency of rail freight transport 835 m long freight trains are operated in commercial operation on the relation Padborg (DK) - Maschen near Hamburg.

Objective of the measure:

Due to the enablement of longer freight trains on important relations it should reached in medium and long-term strong efficiency increase at the rail freight transport. So that the expected increase of value for the rail could be handled.

Time schedule:

The BMVI will investigate a prolongation of about 100 local named passing loops to a useful length of 750 m at the German rail network.

The result of investigation of further suitable routes for 835 m trains should be available until end of the legislature period.

3.2.4 Lichtenstein

No new measures in operation or planned

⁸⁷ Cf. BMVI (2015), p. 17/18

3.2.5 Switzerland

In Switzerland, an innovative logistic concept including freight infrastructure and service operation concept is under discussion, but due to outstanding political decisions, it is for the time being without any formal framework definitions, stakeholder composition or financial mechanisms.

3.2.5.1 *Cargo Sous Terrain (CST)*

Link: <http://www.cargosousterrain.ch/de/>

The project is based on a underground tube system between cities for automated freight transport units, linked by hubs to distribution operation centers.

There is no alpine specific element, it is more focused on transport logistics and bottleneck solution in the Swiss midlands (plateau central/ Mittelland), where congestion on existing road infrastructure is already problematic and increased fine distribution by rail would be disproportionately expensive.

The project is oriented in the long term perspective due to heavy infrastructure investments which would be necessary for implementation.

3.2.5.2 *Promotion of innovative measures for freight transport in the framework of the revised legal Act on freight transport (Gütertransportgesetz):*

The Swiss Parliament voted on 25th September 2015 the revised federal law on freight transport. It is valid since 1st July 2016. In article 10 of this act, financial subsidies for technical innovation in rail freight transport with a view to increase the efficiency and sustainability, specifically related to lower impacts on natural resources, are foreseen.

Also measures leading to new common standards to be applied in a consolidated way among relevant stakeholders and pursuing the same objectives (efficiency, sustainability) could be subsidised. Possible projects are mentioned in the study described in chap. 2.4.10.

3.2.5.3 *Modal shift report 2015*

Every two years the Swiss Federal Council submits a report to the Parliament in which he provides an overview on the state of play concerning modal shift policy in. It depicts the recent developments in trans-alpine freight transport and its environmental effects, evaluates the modal shift instruments and accompanying measures and proposes possible additional measures. The report 2015, approved on the 04.12.2015, contains a special package for the opening of the Gotthard base tunnel, consisting in an adjustment of the Swiss vehicle fee as well as temporary discounts on the fees for freight train paths along the new Gotthard line.

The Modal shift report 2015 has been approved by the Federal Council on December 4th 2015 and is available for download on the webpage of the Swiss Federal Office for Transport dedicated to the modal shift policy: <http://www.bav.admin.ch/verlagerung/index.html?lang=de>⁸⁸

⁸⁸ see also UVEK (2015), "Verlagerungsbericht 2015", Report in German/French/Italian

3.3 Outlook – Digitalisation

One way to link the different modes of transport “rail”, “road”, “air” and “waterway” in a better way, to optimize them and make them more efficient is the digitalization. Therefore the following measures are useful to achieve a better connection of all modes of transport.

- “Ensure powerful digital infrastructure for freight transport and logistics
- Create a concept for better linking and relating of transport modes
- Optimize structure of information in road freight transport
- Ensure a sufficiently level of funding for facilities of non-federally owned CT-companies
- Improve interoperability on the rail”⁸⁹
- Exact position of wagons through GPS: tracking & tracing of loading units.

Additionally, the implementation of telematics in rail freight transport allows improving maintenance, services and security for wagon keepers, shippers and clients, e.g. through⁹⁰:

- Surveillance of mechanical, security and environmental state of containers and swap bodies (temperature of refrigerator swap bodies, control of open or closed doors) out of immediate control)
- Specific information on the performance of the wagon (distance covered, insufficient performance, long idle times) allow scheduled revision of axles, reducing overall number of interventions and raising availability of the wagon
- Reduced inventory level though continuous information on location of wagons
- Improved customer service through traceable shipments
- Automatic alert with deviations from normal conditions (e.g. breach of rules) or special events (delays, arrival, deviations) for swap bodies.
- Constant transparency for shippers and customers through surveillance and data transfer
- Improved security through remote supervision of swap bodies through warnings with hazardous goods shipments (e.g. unexpected opening of doors, leakages)
- Unique selling proposition for shippers
- Improved cash-flow through automated invoicing and automated processing of transactions and ERP-solutions (e.g. SAP)

Introduction of a new focus on logistic and technological innovations in the rail system to make it more competitive, e.g. automatic shunting and coupling of wagons, automatically driven freight trains and long Alpine tunnels as well as soft policies to make rail more attractive. e.g. “one-stop-shops” for passenger tickets, transfers and facultative also accommodation in the Alps and beyond, easy access to combined transport also for small and medium enterprises based on service centres: Based on good practice analysis recommendations should be elaborated.

⁸⁹ Cf. BMVI (2015), p. 29 ff.

⁹⁰ Cf. <http://www.wascosa.ch/data/uploads/infoletter/wascosa-infoletter-25-de.pdf>

3.4 Recommendations

- Openness for technologies for Combined Transport – new technologies for CT should be fostered and supported, so that economic growth can be harmonised with the protection of the environment.*
- Development of new business models tailored to the need of SMEs for the participation in CT*
- Optimize empty container management*
- Development of best practice concepts for an optimal freight village and terminal design and layout*
- Collection of all existing standards in European rail transport in a knowledge pool as basis for harmonizing standards* and in order to improve the whole combined transport process
- Analysis of latest traffic forecasts and data on the flow of traffic in Combined Transport (lines crossing the Alps and on their accesses)
- Optimization of IT flows along the supply chains by electronic and standardized data exchange among terminals*
- Support approaches to corridor planning and coordination (in the frame of the new TEN-T) and thus increase potential for Combined Transport (Corridor Platforms)*
- Improvement of interfaces between national networks and transnational corridors*
- Provide non-discriminating access to intermodal terminals
- Accelerate processes of technical migration
- Support pilots of innovative products.

* Source: “SusFreight” Recommendations, EU-Project Alpine Space Programme (2012-2014)

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http://www.bav.admin.ch/verlagerung/index.html?lang=fr&download=NHZLpZeg7t,Inp6I0NTU042I2Z6In1ae2IZn4Z2qZpnO2Yuq2Z6gpJCDfIB,fmym162epYbg2c_JjKbNoKSn6A-- (France)

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5 Annex

Annex 1: Questionnaire (empty)



Questionnaire related to innovative Logistics in the field of Combined / multimodal Transport in the Alpine Region, addressed to Member States of the Alpine Convention

Version 0.2 (02 September 2015)

Issued by Federal Office of Transport / Switzerland as lead partner for innovative logistics related to the mandate 2015-2016 of the WGT Alpine Convention, upon request of the WGT meeting held on 10 July 2015.

Name(s) and contact details of originator(s)

Name / Institution:
e-mail:
Phone:
Specific observations:

Date of submission:

Questionnaire on innovative logistics in combined / multimodal Transport in Alpine countries

As a basis the following Report dated from May 2014 elaborated in the framework of the Zurich Process among Alpine Countries has to be taken into account: only projects going beyond this report need to be taken up in this questionnaire.

http://www.zurich-process.org/fileadmin/data/webcontent/Webcontent/Sonstige_Dateien/compined_transport_revieu.pdf

**For each measure/project, please fill in the entire questionnaire
(copy / paste of question 1 – 12)**

1. Innovative Logistics in Combined / multimodal Transport: Name of the project

Please specify the name of the project.

2. Innovative Logistics in Combined / multimodal Transport: Type of the project

Please specify the type of the project: implementation / research project, landtransport(rail,road)/inlandnavigation, regulation, operation / handling, rolling stock, technological development, specific infrastructure in CT, financing or fiscal mechanisms / subsidies, research, pilot project with external funding etc.

3. Innovative Logistics in Combined / multimodal Transport: Scope of the project

Please specify the scope of the project (geographic, longdistance, urban logistics etc., operators, application field, technological development, research area, etc.) .

4. Innovative Logistics in Combined / multimodal Transport: Stakeholders / partners

Please specify the involved stakeholders, (initial) partners, target groups (public, private, parapublic).

5. Innovative Logistics in Combined / multimodal Transport: Objectives, targets, target groups

Please specify the objectives, targets, target groups and potential impacts of the project (policy, modal shift, management regulation of the logistics/transport undertaking etc.).

6. Innovative Logistics in Combined / multimodal Transport: Financing mechanisms

Please specify the financial mechanisms for setting up and operating the project (public, private, piloted project with external funding / programs (like Alpine Space), (fiscal)incentives, tax refunding etc.). Total budget

7. Innovative Logistics in Combined / multimodal Transport: Timeframe / workplan

Please describe the timeframe concerning development, implementation, duration of pilot action / duration of incentives etc. of the project , total duration

8. Innovative Logistics in Combined / multimodal Transport: Reporting, monitoring and dissemination

Please describe the reporting, monitoring or evaluation measures related to the project (all dimensions) and how the project outputs were disseminated to the target groups.

9. Innovative Logistics in Combined / multimodal Transport: expected impacts, follow up

Please describe the expected impacts and the potential follow up of the project (options for negative and positive results, policy, financially, etc.).

10. Innovative Logistics in Combined / multimodal Transport: Problems and challenges in the project

Please describe problems and challenges during the project phase.

11. Innovative Logistics in Combined / multimodal Transport: Specific Outputs that were produced

Please describe problems and challenges during the project phase.

Documentation

12. Relevant accompanying document

Please list here all the accompanying documents referred to in this form that are submitted together with this form.

Annex 2: Introductory explanations about CT

(1) Process Chain of CT

The transport operations in Combined Transport consist of a multi-link transport chain. According to DIN 30781 a transport chain is a "series of technical and organizational interconnected processes, where persons or goods are moved from a source to a destination." The consigner is the source and the recipient is the destination.

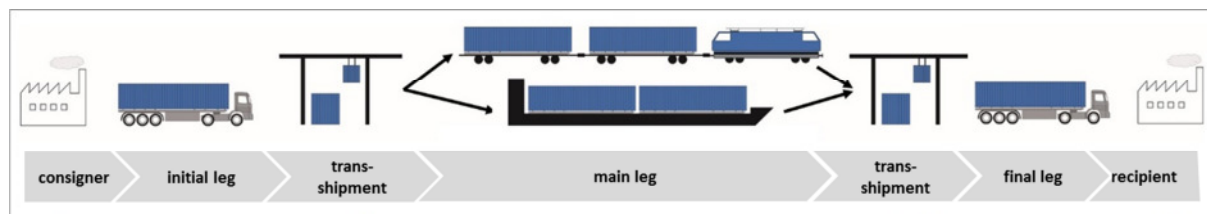


Figure 20: Transport chain Combined Transport⁹¹

Combined Transport is the transport of goods in loading units by at least two modes of transport in a transport chain without changing the loading unit. A loading unit is the physical transport unit, which is composed of the product itself, the loading aids (pallets, box pallets, etc.) and the load securing equipment (e.g. lashings). Unit swap bodies, containers and semitrailers are used to transport the loading goods. These details will be presented under point 3.1. The main distance covered track (main run) is carried out by rail or waterway, with the aim, to keep the trailing on the road as short as possible.

This combination allows the use of the system benefits from at least two different modes of transport. Of crucial importance in general in Europe is the CT road/rail, with the two transport modes "road" and "railway".

(2) Unaccompanied CT (UCT)

In the UCT only the loading unit is transshipped from one transport mode to the other – towing vehicle and driver do not accompany the transport (load). Therefore trucks are needed at the destination terminal in order to bring the load/loading unit to their final destination. This final leg by truck is made by a subsidiary of the transport company or one of his partner networks. The loading units must be standardized for the transshipment process and in most of the cases craneable.⁹² The most important transport units in the UCT are containers, swap bodies and semitrailers.

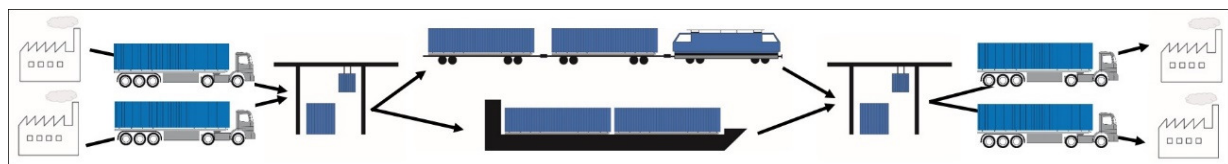


Figure 21: Unaccompanied CT⁹³

⁹¹ LKZ Prien GmbH following Posset et al. (2014), p. 37.

⁹² Cf. Gronalt et al. (2011), p. 20.

⁹³ LKZ Prien GmbH following Posset et al. (2014), p. 38

(3) Accompanied CT

In accompanied Combined Transport the truck or lorry and the semitrailer are transshipped mainly on a low loading wagon with continuous loading platform/area.⁹⁴ This happens with a “Roll-on-Roll-off-technique” over a ramp in terminals for that purpose. During the journey the driver is accommodated for safety reasons in a couchette. At the destination the driver can continue his journey to the recipient directly.⁹⁵ This type of Combined Transport is well-known under the name "Rolling Road" (short: RoLa). The carriage on Rolling Roads has been declining for years.⁹⁶

In general more units are transported by unaccompanied CT as by accompanied CT.⁹⁷

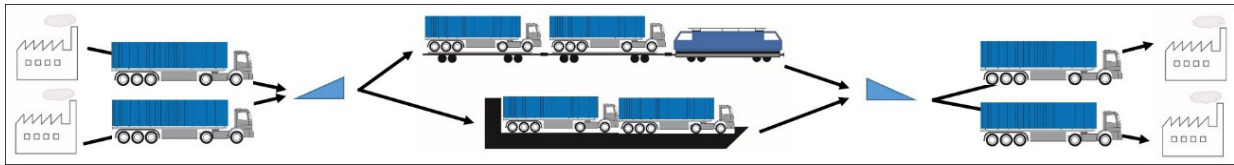


Figure 22: Accompanied CT⁹⁸

⁹⁴ Cf. Berndt (2001), p. 32.

⁹⁵ Cf. Lampe (2006), p. 10.

⁹⁶ Cf. overall Arndt/Büscher/Gohlke (2013), p. 196.

⁹⁷ Cf. Arndt/Büscher/Gohlke (2013), p. 195.

⁹⁸ LKZ Prien GmbH following Gronalt et al. (2011), p.22

Annex 3: Introductory explanations about terminal

(1) Structure of a Terminal

Onshore connection

Under the onshore connection is summarized both the access to the terminal by road and rail. On the street side the truck passage occurs by gates with counters. For loading and unloading as well as for entry and exit of trucks marked areas are available. To perform the cargo-handling operation to and from the truck, the trucks park in loading lanes or in other transfer positions.

Storage areas

As already stated, areas (sidings) are necessary for indirect transshipment operations for the interim storage of load units. This bridges the time gap that arises due to asynchronous deliveries and pick-ups of loading units.⁹⁹ Storage areas are therefore seen as buffer areas, which provide a balancing distribution of loading units over time.¹⁰⁰

Water-side connection

Transshipment terminals need a quay or a quay wall with berths for the loading and unloading of ships. The transshipment operations are carried out with the help of jib cranes, which are arranged at the quay wall. The transport of loading units to the quay cranes can be carried out indirectly with the help of reach stackers, forklifts or directly with trucks and trains.¹⁰¹

(2) Terminal Process

With the help of transshipment terminals, load units can be handled between mode of land transport (trucks and freight train) and mode of water transport or only between land transports.¹⁰² If a terminal serves all three modes of transport (rail, road, ship) it is a trimodal terminal. Are merely transshipped in a terminal loading units between two modes of transport, it is called a bimodal terminal.

For the transshipment of the load unit there are mostly used gantry cranes or mobile handling equipment like reach stackers. Under a gantry crane is a mobile rail bridge, which spans due to the size several tracks, truck lanes and parking lanes. The spreader who is mounted on the gantry crane can be adjusted to the respective turn-up end load units and engages the container into the top corner fittings. In order to handle swap bodies and semitrailers, these are taken at the bottom with the gripper.¹⁰³

⁹⁹ Cf. overall Posset et al. (2014), p. 202.

¹⁰⁰ Cf. Gronalt et al (2011), p. 82.

¹⁰¹ Cf. overall Posset et al. (2014), p. 200.

¹⁰² Cf. Posset et al. (2014), p. 191f.

¹⁰³ Cf. overall Arndt, Büscher and overall Gohlke (2013), p. 200.



Figure 23: Transshipment of a craneable semitrailer with help of a gantry crane¹⁰⁴

Mobile transshipment modules, which are also equipped with a combined spreader grapples are usually used to support the gantry crane. They can be used flexible and also reach areas beyond the reach of the gantry crane.¹⁰⁵



Figure 24: Transshipment of container with reach stacker¹⁰⁶

For internal terminal handlings terminal tractors are frequently used. In comparison to the containers and swap bodies, which are transported by the terminal tractor on chassis, semitrailers can be coupled directly to the terminal tractors¹⁰⁷ (see Figure 25)

¹⁰⁴ LKZ Prien GmbH

¹⁰⁵ Cf. overall Arndt, Büscher and Gohlke (2013), p. 200.

¹⁰⁶ LKZ Prien GmbH

¹⁰⁷ Cf. overall Posset et.al. (2014), p. 222.



Figure 25: Terminal tractor with coupled semitrailer¹⁰⁸

The transshipment process itself can be carried out with or without intermediate storage respectively indirect and direct.¹⁰⁹ Within direct transshipment between rail and road, the load unit is transshipped directly from rail wagon to the truck and vice versa.¹¹⁰ In contrast to this, in a first step the loading unit is transshipped indirectly into an intermediate parking area, before it is transshipped to another mode of transport in a second step.¹¹¹

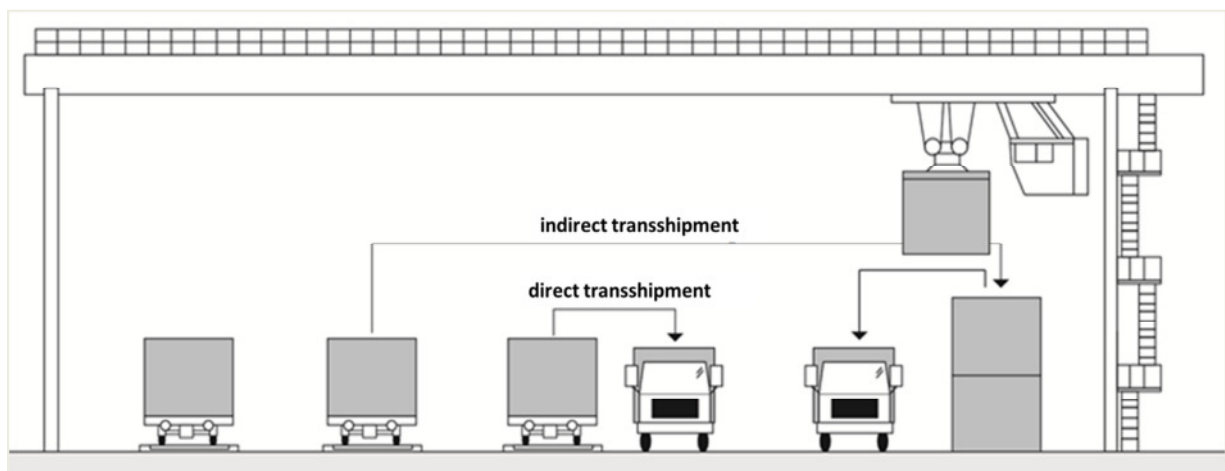


Figure 26: Direct and indirect transshipment between rail and road¹¹²

¹⁰⁸ LKZ Prien GmbH

¹⁰⁹ Cf. Posset et al. (2014), p. 192.

¹¹⁰ Cf. Seidelmann (2010), p. 50.

¹¹¹ Cf. Lampe (2006), p. 23.

¹¹² LKZ Prien GmbH following Lampe (2006), p. 23

Annex 4: Information to craneable and non-craneable Semitrailers

Craneable Semitrailers

Craneable semitrailers dispose biting edges at four lifting points which are at the outer frame of the semitrailer. They can be transported through the use of pocket wagons. Before the trailer are technically approved and codified by the railway company, the relevant technical requirements of each trailer must be met.¹¹³

Non-craneable semitrailers

Not craneable semitrailers on the other hand do not have these biting edges for crane handling, due to the complicated loading within Europe they are hardly transported. These are in contrast to the craneable types only suitable in the accompanied Combined Transport.¹¹⁴ However, the market potential for the CT is very high, as the following graph shows.

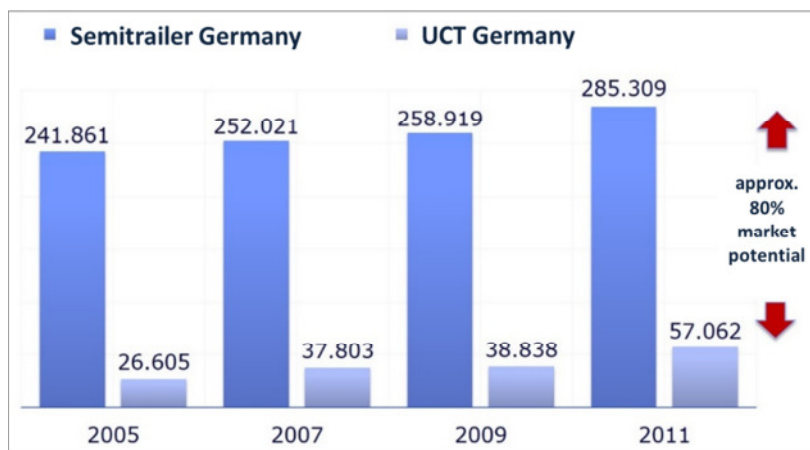


Figure 27: Example: Development in Germany - trailer & UCT¹¹⁵

The real potential for non-craneable semitrailers is in practice often even higher than the shown 80%. Many craneable trailers are namely not used exclusively or not at all in CT.¹¹⁶ It is time to seize the enormous potential. Therefore, already more and more companies use test transports, in which special cars with different loading and unloading techniques are being tested. Before selected concepts of this innovative technology are presented and assessed, the requirements for such systems had to be clarified.

Requirements of a system

To meet the needs of the involved actors in CT and to allow a financially viable solution, the following factors should be given:

- No changes to the semitrailer

¹¹³ Cf. overall Gronalt et al. (2011), p. 59.

¹¹⁴ Cf. Gronalt et al. (2011), p. 58.

¹¹⁵ LKZ Prien GmbH representation based on UIC (2012) – Report on CT in Europe

¹¹⁶ Cf. overall Fischer (2014), p. 29.

- No changes to the wagon
- Use of existing transshipment facilities (infrastructure)
- No changes to the business processes
- Market-driven solution compared to road transport¹¹⁷

These requirements will now be discussed briefly below.

No changes to the semitrailer

The semitrailer is equipped with almost three quarters of the total transport performance in inland, the dominant load unit on German roads for freight. In the area of rail freight transport on the other hand still exists an enormous potential which concerns the transport capacity of the semitrailer in unaccompanied Combined Transport (see Figure 27) ¹¹⁸.

In general transport companies mainly own non-craneable semitrailers in their fleet. These trailers are not handled by crane as easily as craneable trailers, but they have the great advantage of the lower weight and the associated payload optimization. The figures from the past show the significant increase of this mean of transport in recent years. It is expected that this trend continues in the future. Decisive for many companies is in fact that they do not need to replace their existing fleet and thus allowing them to save the money for additional investments. ¹¹⁹

No changes to the wagon

In the railway sector it has been invested heavily in modern equipment in the past years.¹²⁰ While commercial vehicles (including the semitrailer) according to tax depreciation table can be used usually for eight years, wagons are used about 25 years for rail transportation after an elaborate development phase.¹²¹ Therefore there will be a great interest of operators and railway companies to use the very expensive wagon in a long term.¹²²

Use of existing transshipment facilities (infrastructure)

The new handling facility in Burghausen (see 2.4.8) is a good example for the long time period from planning to put into operation of such a terminal. In 2004 the planning process started and in 2015 the terminal was finished. Handling facilities need big areas that are rarely available. As mentioned in point 2.2.1 high subsidies are given to CT assets in recent years. It is therefore of great importance to use the existing standards (cranes, reach stackers) as well as the handling facility.¹²³

¹¹⁷ Cf. overall Fischer (2014), p. 28 ff.

¹¹⁸ Cf. overall Sonntag/Jung/Meimbremse (2014), p. 47.

¹¹⁹ Cf. overall Fischer (2014), p. 29 f.

¹²⁰ Cf. Fischer (2014), p. 30.

¹²¹ Cf.

http://www.bundesfinanzministerium.de/Web/DE/Themen/Steuern/Weitere_Steuerthemen/Betriebspruefung/Afa_Tabellen/afa_tabellen.html, (22.11.2015).

¹²² Cf. Fischer (2014), p. 30.

¹²³ Cf. Fischer (2014), p. 30.

No changes to the business processes

The demands on the driver or staff in the terminal are already very high in any case by e.g. load securing, customs regulations, permits, and so on. Therefore standardized processes over the years should not be complicated even more by additional burdens. Each additional work and area of responsibility namely cost more time and that may lead to higher costs.¹²⁴

Market-driven solution compared to road transport

In general, it is very difficult for CT to prevail against the pure road freight transport. A reason is the increased disposition expenses due to the long main run, the initial and final leg by road. Therefore it is important to pay attention not only to cost structure, but also on reliability, quality and speed. This means a fundamental optimization of all components of the supply chain, without making major changes to business processes and equipment. Therefore solutions are needed that meet these requirements in order to gain acceptance in the market.¹²⁵

¹²⁴ Cf. overall Fischer (2014), p. 30.

¹²⁵ Cf. overall Fischer (2014), p. 30 f.