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Tagung der Alpenkonferenz
Réunion de la Conférence alpine
Sessione della Conferenza delle Alpi
Zasedanje Alpske konference

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REPORT OF CHAIR OF THE WORKING GROUP
Transport on the mandate 2015-2016

1. Overview of mandate 2015 - 2016

Summary of the main mandate points
• Continuation of work relating to the implementation of article 14 of the Transport • Protocol (application of Directive Eurovignette; External costs in mountain). • Analysis of innovative logistics solutions. • Analysis of deployment of alternatve fuels infrastructure in the Alps.

2. Meetings and activities

Report on activities carried out (including meetings, conferences)
1) <u>Analysis of the enforcement of the "polluter pays" principle as applied to the transport of road freight in the Alpine countries (Article 14 of the Alpine Convention's Transport Protocol)</u> **a)** Updating of the document monitoring the measures adopted in the various Alpine countries, in particular following the adoption of the latest version of the Eurovignette Directive (2011) that authorises taking into account a number of external costs when charging heavy goods vehicles (HGVs). The document confirms the following points : • tolls or user charges are quite widespread in all Alpine countries, in relation to the high costs of infrastructures (tunnels, viaducts ...) ; • rates are highly variable from one infrastructure to another and difficult to compare between countries. Differentiation based on euro classes is increasing ; • in general, income is allocated to transport infrastructure; • the effects of these tolls on the modal split or rerouting are difficult to analyse; however, there has been a rationalisation of the use of HGV; • except for Switzerland, the Member States of the Alpine Convention do not yet apply

external charging.

b) On the question of external costs of Transport, notably HGV in the Alps, and the comparison with figures in the directive Eurovignette (2011), a document presents a first analysis and comparison of existing studies on the subject. At this stage the document is only a progress report which requires further work to arrive to precise figures.

With this first analysis we can take note of significant differences in general external costs of transport according to the studies

Regarding specifically the HGV external costs in the Alps only very few existing studies present sources and figures. They only cover air pollution and noise. According to this limited sources the coefficient to be applied in the mountainous regions might be higher than the authorised coefficient in the directive Eurovignette (2011).

2) Inovative logistic solutions

Every alpine country has communicate information and report on combined and multimodal freight transport. Many innovative solutions have been mentionned. A report was produced. This work underlines the need for, among other: develop potentials of digitization for the logistics sector, support for creation of digital interfaces for transport by rail and the Unification of European standards in the freight transport.

3) Alternative fuels infrastructure

According to the provisions of the EU Directive 2014/94, every Member State are called upon to develop national strategic framework, targets and supporting actions.
Alpine Member States, and Switzerland, have communicated detailed informations on their national plans.
A good coordination will be necessary between countries, and local authorities, to developp harmonised alternative fuels infrastructures.

4) Best practices for sustainable mobility in Alpine sparsely populated and / or remote areas and for urban freigt deliverie.

The “Sustainable Mobility” subgroup worked to identify and gather good practices and strategies implemented to develop:

- alternatives for the use of private cars in sparsely populated and / or remote areas of the Alpine Convention region in order to draw lessons and recommendations to promote sustainable mobility in those regions. More than 50 best practices have been retained.
- logistics and freight deliveries in Alpine cities, in order to improve both the efficiency

and the quality of life.

Every good practice has been edited in a standard file, with different criteria, to facilitate searches.

A data base has been created to gather this elements and is now accessible on the AlpConv site.

5) <u>Project AlpInfoNet</u>

On 18 June 2015, the final Conference of the international cooperation project “AlpInfoNet” took place on the island of Herrenchiemsee. The Working Group Transport was the inspirator of the project in the framework of the “Alpine Space” programme with the contribution of the EU. Its purpose was to improve the information on means of transport, excluding cars, to access the Alpine zone and to move within the entire area. This project, which was led by Bavaria and brought together 13 partners from 5 Alpine countries and many observers can present following achievements:

- AlpInfoNet website (www.alpinfonet.org) and project flyer in five languages to inform the relevant stakeholders and interested audience about the project
- 5 pilot regions with implemented transnational Sustainable Mobility Information Network serving as good practice examples.
- AlpInfoNet toolbox, which includes detailed specifications of many different technical solutions that can be helpful for enhancing and improving existing information systems, as well as for building connections between two or more of these systems. Tools are for example: Smart Links (Static links simply direct the user to relevant information on the linked website, while smart links lead the user to a web service on another website in a smart way); Journey planner Widgets (configurable small area to be displayed on a third-party website eg. hotel website); Time Table Completion.
- High valuable Handbook for transport and tourism operators ("Better informed, better travel - towards a sustainable mobility information network") summarizing the project's results adressing further regions to adapt the solutions developed in the pilot regions.
- Policy statement with recommendations to improve cross-border cooperation with regard to the information on sustainable travel.

The main lessons learnt in AlpInfoNet were that it is not easy to create a Sustainable Mobility Information Network for the whole Alpine Space. The five participating heterogenous countries are on (very) different levels with their national information systems regarding legal and technical requirements.

6) <u>Exchange of information with the Zurich Group</u>

The Working Group was regularly informed of the work carried out by the Zurich Group. Good information and mutual coordination will remain necessary in the future to enrich the work of both these groups and avoid overlaps.

3. Outputs

Description of main outputs achieved
• Updated document on present application of directive Eurovignette in the different alpine countries • Progress report on calculation of external transport costs in the Alps. • Synthesis document on inovative logistic solutions (combined and multi-modal transport, rolling highways...) • Electronic database with best practices for sustainable mobility in Alpine sparsely populated and / or remote areas and for urban freigt deliverie. • AlpInfoNet Handbook “Better informed, better travel-towards a sustainable mobility information network”. • In reference to the AlpInfoNet project a Policy statement with recommendations to improve cross-border cooperation with regard to the informatio on sustainable travel.

4. Cooperation with other WGs/PFs

Description of cooperation initiatives and activities with other WGs/PFs
No present cooperation with other WG-PF.

5. Links to EUSALP

Description of concrete links and contribution to EUSALP
The presidency of the Working Group Transport was represented in most of the launching meeting of this strategy at the end of 2015 and beginning of 2016. In particular the presidency and other members of the Group participed activily in the first two meetings of EUSALP-AG4 on mobility. A good coordination will be maintained betwenn the Working Group and EUSALP initiatives on mobility.

6. Attachments

List of the attached documents	
Annex 1:	Updated document on present application of directive Eurovignette in the different alpine countries
Annex 2:	Progress report on calculation of external transport costs in the Alps
Annex 3:	Synthesis document on inovative logistic solutions (combined and multi-modal transport, rolling highways...)
Annex 4:	AlpInfoNet Handbook “Better informed, better travel-towards a sustainable mobility information network”.

Annex 1

Synthesis
Questionnaire on application of Directive Eurovignette

(for WGT Activity Report 2015-2016)

According to the WGT mandate 2015-2016 and in application of the article 14 of the Transport Protocol of the Alpine Convention the Group had to update a Synthesisn on present application of Eurovignette Directive (HGV pricing) and more generally in the framework of the implementation of real costs, including the external costs, in the various Alpine Countries.

In application of the previous WGT mandate 2013-2014 a questionnaire on the application of Eurovignette was distributed and filled by every Alpine Countries. A first synthesis was drawn from this gathered informations showing that dispositions of the last version of Eurovignette Directive (2011) were yet only partially implemented. Besides the application is significatly different according to Countries.

In the framework of the present mandate 2015-2016 the responses to the questionnaire have been updated by most of the countries. The results show mainly a slow evolution in application of the Directive Eurovignette and significantly evolution in the distribution of the fleets according to the EURO standards.

Results of the updated survey

Scope

All countries are levying tolls on vehicles > 3.5 tons (GER >7.5 tons[1)]) maximum permissible laden weight (MPW) on all, or at least most, of their high-level road infrastructure (motorways and expressways). CH collects the performance related fee on the entire road network. FRA and ITA have delegated networks with tolls. Introduction of charges on part of the main road network, which is presently toll-free, is under reflexion.

[1)] The current coalition treaty agreement, however, envisages an extension of the heavy goods vehicle toll to vehicles between > 3,5 to 12 tons.

Tolls

Differentiation of rates

AUT and GER differentiate their current toll rates on the basis of weight, axles and EURO emission-classes. FRA differentiates its current toll rates on the basis of weight and axles. A differentiation of toll rates on the basis of EURO emission-classes currently exists only for tunnels of the Mont Blanc and Frejus. ITA differs on the basis of weight and axles, but is also planning to differentiate tolls according to EURO emission-classes for certain motorways, e.g. for the A22 motorway Modena – Brenner (the only one in Italy, where the concession recently expired and is being renewed). CH differs on the basis of weight and EURO emission-classes.

Special (higher) tolls or fees are collected on certain Alpine crossing motorways (in AUT) and certain tunnels (Great Saint Bernhard in CH or Mont-Blanc and Fréjus in FRA).

GER and CH grant rebates for “retrofitted” EURO II and III vehicles equipped with particle-filters. No VAT on the toll is charged in GER and CH. On one motorway in AUT, tariffs are varied according to the time of day.

Comparison of rates

One of the main objectives of the survey was the comparison of the toll rates for heavy goods vehicles with 4 axles and more for the EURO emission-classes III, V and VI. Due to fact that the vehicle categories are so different and differentiation according to EURO emission-classes is not practiced in every Member State this appeared to be a rather difficult exercise.

A range of average net toll rates for a heavy goods vehicle equipped with the best EURO category between 15 € Ct/km (ITA) up to 74 € Ct/km (CH) could be identified in the Alpine area.

Mark-ups

AUT is the only country, which introduced mark-ups so far. ITA collects a cross-financing contribution, but not according to the provisions of the currently applicable Eurovignette Directive. In order to shift the HGV traffic from road to rail the additional revenues are used for the cross-financing of railway tunnels (Brenner Base Tunnel) or will be used for selected railway projects (Lyon-Turin).

Earmarking of revenues

There is no obligation for earmarking of revenues in the Directive. But where Member States levy tolls or user charges for use of roads in the Trans-European Road Network, the roads subject to charging should be given appropriate priority in the maintenance schedules of Member States. Revenues from tolls or user charges should be used for the maintenance of the infrastructure concerned and for the transport sector as a whole, in the interest of the balanced and sustainable development of transport networks.

All countries replied that either all or most of the revenues from road charging are earmarked for network management or the planning, construction, maintenance and refinancing of the designated road network.

Some countries transfer (or have plans to do so) either all or at least parts of their revenues to national agencies or public transport funds in order to finance special priority railway projects as well as selected new transalpine railway tunnels (e.g. Gotthard and Lötschberg).

Impacts of tolling vehicles with more than 3.5 tons

Diversion of HGV-traffic

Diversion of HGV traffic to non-tolled parallel roads seems to be either a minor or even no problem. Toll caused diversion can be observed, where the diversion routes do not lead to a loss of time. Successful measures in AUT (such as speed/weight limits or traffic bans for HGV´s) are considered as useful in order to re-divert traffic from the parallel road network.

Development of EURO emission-classes

There is the general trend in all countries, that the share of EURO 0 to IV vehicles declined between 2010 and 2015. The share of EURO V, EEV´s and EURO VI increased significantly, EEV´s especially in AUT and GER. The introduction of EURO VI started in 2011.

Impacts on traffic performance, degree of loading or empty runs and on modal split

All countries confirmed the impacts of infrastructure charging on the traffic performance, an increase of effectiveness in the degree of loading and the share of empty runs. However the

impacts of tolls on the modal split are low so far. Due to the efficiency gains and a constant shift towards better EURO emission-classes in the composition of the HGV-fleet, a decrease of air pollutant emissions can be supposed.

In CH, parallel to the introduction of a heavy vehicle fee, the weight limit was increased stepwise from 28 to 40 tons. The national hauliers realised productivity gains, which compensated more or less the effects of the fee. The high share of rail in goods transport of about 40%[2] could be maintained.

External costs

A preliminary meta study of the WG Transport compared the results of 15 national studies on external costs, four of them were addressing also mountain areas. The study focuses on costs of air pollution and noise induced by freight transport. In general, the costs calculated according to the Eurovignette Directive are lower than the costs calculated in the different studies for air pollution and for noise.
Furthermore air pollution and noise effects in mountain areas cause costs, which exceed the average costs applied in the Eurovignette Directive by a factor of 5 for air pollution and a factor of 2 to 5 for noise. Therefore the general factor 2 for higher environmental effects in mountain areas foreseen in the Eurovignette Directive seems not appropriate.

Additional measures

AUT plans the inclusion of external costs for air pollution and noise according to Directive 2011/76/EU. The respective work and administrative steps are in progress. In GER external costs of air pollution considering Euro classes are included in tolling since October 2015 for heavy vehicles above 7.5 tons and are charged not only on motorways but also on federal roads with four lanes[3]. External costs are updated regularly in national transport cost studies.

Within the framework of the implementation of the railway project Lyon-Turin, FRA and ITA will study the implementation of the tariff provisions of the "Eurovignette" Directive on road routes crossing the Alps, through the tunnels of Mont Blanc and Frejus or the axis of Ventimiglia. FRA will also examine the conditions and possibility for the implementation of the Directive 2011/76/EU.

[3] Third adaptation of the Federal Road Tolling Act (Bundesfernstraßenmautgesetz)

ITA plans to carry out a possible bonus-malus system based on EURO emission-classes. This would cause higher tariffs for bad EURO-classes and a price-benefit for EURO V and VI vehicles with >12 tons maximum permissible laden weight (MPW) and on the TEN-T Brenner Corridor at first.

CH plans to move in the long term to a more incentive-based policy. In the frame of this mobility pricing policy, the tariffs for road and rail could be varied according to location, time of day or quality of offer.

Conclusions

The Eurovignette Directive 2011/76/EU allows the inclusion of external costs for air pollution and noise in order to better reflect the real costs of transport. The results of the work carried out by the WG Transport point out

- the Eurovignette Directive is not comprehensively applied and, if implemented, this follows heterogeneous approaches in the Alpine countries;
- toll rates are calculated following different approaches, Euro-classes are considered in Austria, Germany, and on selected road sections in France and Italy;
- The impact of tolling leads to a shift to higher Euro classes in the vehicle fleets, and higher transport effectiveness (lower empty runs, higher degree of loading) in all countries, but a modal shift towards rail transport could not be observed.
- First results of a meta study on external costs reveals that external costs of air pollution and noise are underestimated by the Eurovignette Directive in general. In particular, in mountain areas external costs only for air pollution and noise exceed the suggested values of the Eurovignette Directive by factor 2-5.

To sum up, the assessment of the WG Transport in its previous mandate is confirmed by updated data and meta study: The Eurovignette Directive does not sufficiently reflect the real costs for transport in mountain areas. Therefore it is presently not fulfilling the requirements of Article 14 Transport Protocol.

A further deepening of the work in the following mandate of the WG Transport will continue the work on external cost calculation and will delineate sections of main transport routes which meet specific characteristics of mountain areas.

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National survey on the application of the Eurovignette Directive 1999/62/EC as amended by 2006/38/EC

1 Background and purpose

The actual mandate 2013/2014 of the Working Group on Transport (WGT) of the Alpine Convention (Doc. PC 51/B4 from 7th November 2012) also deals with article 14 of the transport protocol and the gradually full implementation of the polluters pay principle in road freight transport in Alpine countries.

In this context Italy and Austria have been invited by the Ministers of Environment through the Permanent Committee to jointly elaborate a schedule of work for the implementation of 1.) a) ii) (1) and (2). This task has to be done in the institutional framework of the Working Group on Transport (WGT) and should be finalised until the XIIIth Alpine Conference in December 2014 in Torino.

The first aspect of the mandate [ii) (1)] is to analyse to which extent the Eurovignette Directive is in line with the provisions of article 14. In order to be able to proceed to this analysis, Member States are asked in a first step to indicate the experiences made with respect to the implementation of Eurovignette Directive 1999/62/EC as amended by 2006/38/EC. Therefore, the following questionnaire has been elaborated by Austria and finalized with Italy.

Your answers to the questions, which should please give all relevant information as short and concise as possible, will be used to get an overview on the national challenges, special circumstances, benefits, difficulties and obstacles with respect to the implementation of the EU-Directive 1999/62/EC as amended by 2006/38/EC. If you consider it useful you can also indicate relevant web-links.

Please save your responses in a Microsoft Word *.doc or *.docx format and email the completed survey **on 15th of September 2013 at the latest** to wolfgang.grubert@bmvit.gv.at, Angelini.paolo@minambiente.it and Thierry.Louis@developpement-durable.gouv.fr.

The consolidated version of Directive 1999/62/EC of the European Parliament and of the Council of 17 June 1999 on the charging of heavy good vehicles for the use of certain infrastructures can be a downloaded with this Hyperlink in English and in German.

2 Contact details

Name of person responsible for completing the questionnaire:	Wolfgang Grubert
Name of Authority:	Federal Ministry of Transport, Innovation and Technology
Email:	wolfgang.grubert@bmvit.gv.at
Telephone:	+43 1 71162 651208

3 Questionnaire

1)	Please provide all relevant national legal principles and rules for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) in your country.
	Concerning user charges: - Bundesstraßen-Mautgesetz 2002 (Federal Road Toll Act 2002) sets the general legal framework for tolling - Mauttarifverordnung (Regulation on tariffs): tariffs proposed by ASFINAG are set by the Minister for Transport, Innovation and Technology (BMVIT) in agreement with the Minister for Finance (BMF) - Mautstreckenausnahmenverordnung (Regulation on sections exempt from road pricing): sections of federal roads not fulfilling the constructional requirements for tolling are exempt from road pricing (only one short section of S5 Stockerauer Schnellstraße left) - Mautordnung (tolling regulations): detailed terms and conditions for tolling are fixed by ASFINAG in agreement with the bmvit and the bmf - ASFINAG-Gesetz (ASFINAG Act) and ASFINAG-Ermächtigungsgesetz (Act on the Authorization of ASFINAG) including Fruchtgenussvertrag (Contract on Usufruct Rights) giving ASFINAG the right of usufruct in all Austrian motorways and expressways and of levying of tolls.

2)	Please attach a map (e.g. as pdf-document) showing where tolls and user charges are collected in your country.
	See map in ANNEX 1. The entire motorway and expressway network (2.183 km) operated by ASFINAG is subject to tolling, including special toll routes (142 km).

3a)	Does your Member State apply tolls and/or user charges on roads not included in the trans-European road network?
	X☐ Yes ☐ No
3b)	If yes to 3a), please provide information on the roads and/or the road network concerned.
	See map in ANNEX 1

4)

One of the main benefits of this survey should be to identify and compare the current toll rates and/or levels of user charges for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW).

Therefore please indicate the current toll rates and/or user charges for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) applied in your country.

Please indicate also, if toll rates and/or user charges are subject to the value added tax (VAT) in your country and if yes, if the VAT is included in the listed rates.

Toll rates for motor vehicles weighing more than 3.5 tons MPW from 1 January 2015			
Rate group	**Category 2** 2 axis	**Category 3** 3 axis	**Category 4+** 4 and more axis
A EURO-emission class EURO VI	**0,156**	**0,2184**	**0,3276**
B EURO-emission class EURO EEV	**0,170**	**0,2380**	**0,3570**
C EURO-emission class EURO IV and. V	**0,188**	**0,2632**	**0,3948**
D EURO-emission class EURO 0 to III	**0,211**	**0,2954**	**0,4431**

Net rates in EUR per km, excl. 20% VAT

See Annex 2 for toll rates on special toll routes or visit https://www.go-maut.at/portal/portal

5)	In order to be able to compare toll rates and/or user charges for the different categories of vehicles, please indicate the toll rates and user charges for for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) with more than 4 axles, EURO III, V and VI.
	See table in 4) EURO VI: € 0,3276/km EURO IV and V: € 0,3948/km EURO III: € 0,4431/km *Net rates in EUR per km, excl. 20% VAT*

6a)	Does your country vary toll rates according to EURO emission classes as set out in Annex 0 of 2006/38/EC and/or the time of day, type of day or season?
	X☐ Yes ☐ No
6b)	If yes to 6a), please provide information about how this differentiation is implemented in your country.

	For variation of toll rates according to EURO emission classes see table in 4) and ANNEX 2. For variation according to time of the day, see toll rates on A13 (night rates on the A13 for vehicles with 4 and more axles +100% on day rates) in ANNEX 2 and https://www.go-maut.at/portal/portal)

6c)	Are the impacts of the differentiation of infrastructure charges according to EURO classes on air pollution being monitored?
	X☐ Yes ☐ No
6d)	If yes to 6c), please specify how they are being/will be monitored, and whether you are able to provide us with link to related documents.
	The differentiation according to EURO emission classes is being monitored by ASFINAG and bmvit. It is adapted in a two years rhythm, taking into account the development of the share of the different EURO emission classes and the necessary revenue neutrality. The impacts on air pollution are calculated.

7a)	Toll rates may in exceptional cases be subject to a mark-up for the financing of specific projects of high European interest. If your country does not already apply this exception, does it have any plans to do so?
	X☐ Yes ☐ No Mark-up already implemented on A12/A13 for cross-financing Brenner Base Tunnel
7b)	If yes to 7a), please provide information, on how this exception will be applied in your country (respective project, planned timetable for implementation and level of toll rates for each vehicle category).
	Stepwise introduction of mark-up on A12 (national border at Kiefersfelden - Innsbruck Amras) starting with 10% on toll rates in 2012, 15% in 2013 and 2014, 20 % in 2015 and 25 % in 2016. Mark-up of 25% on toll rates on A13 (Innsbruck-Brenner) added since 2006. See Annex 2 for toll rates on A12 and A13 (including mark-up) or visit https://www.go-maut.at/portal/portal)

8a)	Article 7a para 5 deals with the problem of shifting, especially of HGV traffic, from tolled high-ranked roads (motorways and/or expressways) to parallel road infrastructure. Does in your country have such problems caused by avoiding road charges and/or tolls for HGV's and using not high ranked roads?

	☐ Yes X☐ No As result of a study ("Traffic diversion caused by the introduction of a distance-related toll system in Austria in 2004"), which identified some "hot spots" with diversion at the start of the electronic road pricing system in 2004, measures were successfully taken on the parallel network in order to re-divert this (speed/weight limits, traffic bans for HGVs etc.)
8b)	If yes to 8a), how does your country manage these problems, are there examples for road tolls and/or charges on parallel roads to the high ranked networks? Are there traffic bans for HGV on parallel routes to the high ranked network, to help that no traffic is diverted?

9)	Please provide information on the development of traffic by vehicle categories on the tolled/charged road network and, if available, the development of the shares of EURO classes of HGV´s on this network since getting into force of the EU-Directive 2006/38/EC.

Data from ASFINAG (Aug. 2015)

10)	Are you able to provide information about whether infrastructure charging has had an impact on freight traffic on the interurban road network (e.g. traffic performance, degree of loading or empty runs)?
	☐ Yes ☐ No X☐ Don't know/No view

11)	Is revenue from infrastructure charging earmarked for reinvestment in the transport sector in your Member State?
	X☐ All of it ☐ Some of it ☐ None of it ☐Don't know
12)	Please provide details about your country's policy (and practice) in terms of earmarking infrastructure charging revenue.
	All revenues from road charging is earmarked for planning, construction, maintenance and refinancing of the (tolled) federal road network.

13a)	One of the main strategic objectives of the transport protocol of the Alpine Convention is shifting cargo from road to rail. Did the implementation of the EU-Directive 1999/62/EC as amended by 2006/38/EC or of similar measures contribute to achieve the objectives of a, b and c of Article 14 of the Transport Protocol.
	X☐ Yes ☐ No ☐Don't know/No view
13b)	If yes to 13a), please provide a short summary of these positive effects.
	The introduction of the differentiation of tariffs according to EURO emission classes (higher toll rates for higher emissions, see table in 4)) has contributed to a significant shift from EURO I - IV to EURO V and EEV (and later to EURO VI).

14a)	Are there any plans in your country to implement additional measures in the field of tolls and/or user charges?
	X☐ Yes ☐ No ☐Don't know/No view
14b)	If yes to 14a), please provide information which measures are planned and the schedule for their implementation.
	Inclusion of external costs for air pollution and noise according to Directive 2011/76/EU.

15a)	Is your country planning to implement the relevant provisions of the latest Eurovignette Directive 2011/76/EU for better reflecting the external costs of traffic-based air and noise pollution?
	X☐ Yes ☐ No ☐Don't know/No view
15b)	If yes to 15a), please provide information, which measures are planned and the schedule for their implementation.
	Work in progress

16)	Do you have any additional comments?

Thank you for your time and support.

ANNEX 1

Toll Road Network Austria

Trans European Road Network Austria

Toll Road Network, not TERN:

Some motorways or parts of motorways in or near urban areas (A22, A3 etc.), some expressways S3, S4, S5, S6, S31, S33, S34, S35, S36, S37

ANNEX 2: Toll rates on special toll routes (1 January 2015)

The payable toll for vehicles over 3.5 metric tons (maximum permissible weight) is calculated based on the total distance travelled, the vehicle category (number of axles) and its Euro Emission Class

Increased rates apply on certain sections of highways - in particular, the special toll routes:

- A9 Pyhrn freeway (Bosruck and Gleinalm tunnels),
- A10 Tauern freeway,
- A11 Karawanks freeway,
- A13 Brenner motorway,
  - Night-time rate: On the A13 freeway, a night-time rate applies for Category 4 trucks between 10:00pm and 5:00am. The night rate is double the day rate.
- S16 Arlberg Tunnel.
- A mark-up according to Art. 7f of Directive 1999/62/EC is added on A12 Inntal freeway (20 %, national border at Kiefersfelden - Innsbruck Amras) and A13 Brenner motorway (25 %). The revenue generated from the mark-up is invested in financing the construction of Brenner Base Tunnel.

(All toll rates in EUR, excl. 20% VAT)

Special toll route A9

Rate groups	Road section subject to tolling	km	Category 2 2 axles	Category 3 3 axles	Category 4+ 4 axles and more
A 9 Pyhrn Bosruck	Spital/Pyhrn - Ardning	10			
A EURO emission class EURO VI			**4,03**	**5,64**	**8,46**
B EURO emission class EURO EEV			**4,40**	**6,16**	**9,24**
C EURO emission classes EURO IV & V			**4,86**	**6,80**	**10,21**
D EURO emission classes EURO 0 to III			**5,46**	**7,64**	**11,47**
A 9 Pyhrn Gleinalm	Kn. St. Michael - Übelbach	25			
A EURO emission class EURO VI			**9,55**	**13,37**	**20,06**
B EURO emission class EURO EEV			**10,43**	**14,60**	**21,90**
C EURO emission classes EURO IV & V			**11,53**	**16,14**	**24,21**
D EURO emission classes EURO 0 to III			**12,96**	**18,14**	**27,22**

Special toll route A10

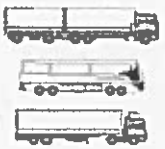
Rate groups	Road section subject to tolling	km	Category 2 2 axles	Category 3 3 axles	Category 4+ 4 axles and more
A 10 Tauern	Flachau - Rennweg	47			
A EURO emission class EURO VI			**13,67**	**19,13**	**28,70**
B EURO emission class EURO EEV			**14,94**	**20,91**	**31,37**
C EURO emission classes EURO IV & V			**16,50**	**23,10**	**34,66**
D EURO emission classes EURO 0 to III			**18,55**	**25,97**	**38,97**

Special toll route A11

Rate groups	Road section subject to tolling	km	Category 2 2 axles	Category 3 3 axles	Category 4+ 4 axles and more
A 11 Karawanken *	St. Jakob/Rosental - Tunnel, Südportal	10			
A EURO emission class EURO VI			**9,04**	**12,66**	**18,98**
B EURO emission class EURO EEV			**9,87**	**13,82**	**20,73**
C EURO emission classes EURO IV & V			**10,91**	**15,27**	**22,91**
D EURO emission classes EURO 0 to III			**12,26**	**17,16**	**25,75**

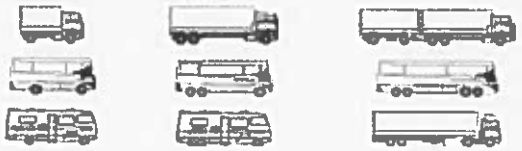
Special toll route A13





Rate groups	Road section subject to tolling	km	Category 2 2 axles	Category 3 3 axles	Category 4+ 4 axles and more
A 13 Brenner	Innsbruck Amras - Brenner	35			
A EURO emission class EURO VI			**23,62**	**33,05**	**49,59**
night-time rate					**99,18**
B EURO emission class EURO EEV			**25,79**	**36,11**	**54,16**
night-time rate					**108,32**
C EURO emission classes EURO IV & V			**28,51**	**39,91**	**59,88**
night-time rate					**119,76**
D EURO emission classes EURO 0 to III			**32,04**	**44,86**	**67,29**
night-time rate					**134,58**
A 13 Brenner	Innsbruck Wilten - Brenner	34			
A EURO emission class EURO VI			**22,93**	**32,09**	**48,14**
night-time rate					**96,28**
B EURO emission class EURO EEV			**25,03**	**35,05**	**52,57**
night-time rate					**105,14**
C EURO emission classes EURO IV & V			**27,67**	**38,73**	**58,11**
night-time rate					**116,22**
D EURO emission classes EURO 0 to III			**31,09**	**43,53**	**65,29**
night-time rate					**130,58**

Special toll route S16



Rate groups	Road section subject to tolling	km	Category 2 2 axles	Category 3 3 axles	Category 4+ 4 axles and more
S 16 Arlberg	St. Anton/Arlberg - Langen/Arlberg	16			
A EURO emission class EURO VI			**8,74**	**12,24**	**18,35**
B EURO emission class EURO EEV			**9,55**	**13,37**	**20,06**
C EURO emission classes EURO IV & V			**10,55**	**14,77**	**22,16**
D EURO emission classes EURO 0 to III			**11,86**	**16,60**	**24,91**

A12

Rate groups	Road section subject to tolling	km	Category 2 2 axles	Category 3 3 axles	Category 4+ 4 axles and more
A 12 Unterinntal	Border Kiefersfelden - Innsbruck Amras	74,8			
A EURO emission class EURO VI			**14,00**	**19,59**	**29,40**
B EURO emission class EURO EEV			**15,26**	**21,34**	**32,04**
C EURO emission classes EURO IV & V			**16,86**	**23,62**	**35,43**
D EURO emission class EURO 0 to III			**18,94**	**26,51**	**39,76**

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National survey on the application of the Eurovignette Directive 1999/62/EC as amended by 2006/38/EC

1 Background and purpose

The actual mandate 2013/2014 of the Working Group on Transport (WGT) of the Alpine Convention (Doc. PC 51/B4 from 7th November 2012) also deals with article 14 of the transport protocol and the gradually full implementation of the polluters pay principle in road freight transport in Alpine countries.

In this context Italy and Austria have been invited by the Ministers of Environment through the Permanent Committee to jointly elaborate a schedule of work for the implementation of 1.) a) ii) (1) and (2). This task has to be done in the institutional framework of the Working Group on Transport (WGT) and should be finalised until the XIIIth Alpine Conference in December 2014 in Torino.

The first aspect of the mandate [ii) (1)] is to analyse to which extent the Eurovignette Directive is in line with the provisions of article 14. In order to be able to proceed to this analysis, Member States are asked in a first step to indicate the experiences made with respect to the implementation of Eurovignette Directive 1999/62/EC as amended by 2006/38/EC. Therefore, the following questionnaire has been elaborated by Austria and finalized with Italy.

Your answers to the questions, which should please give all relevant information as short and concise as possible, will be used to get an overview on the national challenges, special circumstances, benefits, difficulties and obstacles with respect to the implementation of the EU-Directive 1999/62/EC as amended by 2006/38/EC. If you consider it useful you can also indicate relevant web-links.

Please save your responses in a Microsoft Word *.doc or *.docx format and email the completed survey **on 15th of September 2015 at the latest** to wolfgang.grubert@bmvit.gv.at, Angelini.paolo@minambiente.it and Thierry.Louis@developpement-durable.gouv.fr.

The consolidated version of Directive 1999/62/EC of the European Parliament and of the Council of 17 June 1999 on the charging of heavy good vehicles for the use of certain infrastructures can be a downloaded with this Hyperlink in English and in German.

2 Contact details Swiss Delegation

Name of person responsible for completing the questionnaire:	Matthias Rinderknecht, Franziska Borer Blindenbacher
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Telephone:	+41 58 46 2 58 24 (MR) +41 58 46 2 55 76 (FBB)

3 Questionnaire

1) Please provide all relevant national legal principles and rules for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) in your country.

Concerning user charges:

LSVA / HGV-fee: *Federal law*

- de: https://www.admin.ch/opc/de/classified-compilation/20000031/200804010000/641.81.pdf ;
- fr: https://www.admin.ch/opc/fr/classified-compilation/20000031/200804010000/641.81.pdf ;
- it: https://www.admin.ch/opc/it/classified-compilation/20000031/200804010000/641.81.pdf

Regulation:

-de: https://www.admin.ch/opc/de/classified-compilation/20000323/201301010000/641.811.pdf ;
- fr : https://www.admin.ch/opc/fr/classified-compilation/20000323/201301010000/641.811.pdf
- it: https://www.admin.ch/opc/it/classified-compilation/20000323/201301010000/641.811.pdf

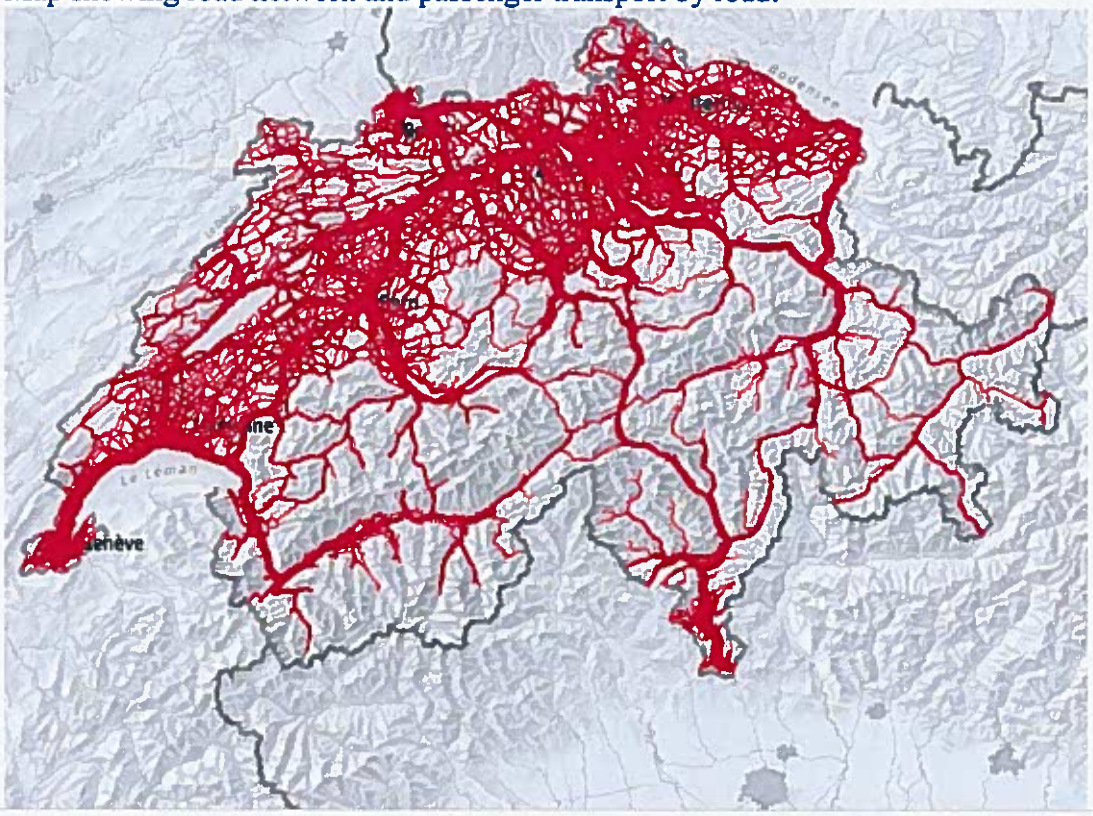
Brochure about LSVA "Fair and efficient":

http://www.are.admin.ch/themen/verkehr/00250/00461/index.html?lang=en&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ad1IZn4Z2qZpnO2Yuq2Z6gpJCDd4F3hGym162epYbg2c_JjKbNoKSn6A--

2) Please attach a map (e.g. as pdf-document) showing where tolls and user charges are collected in your country.

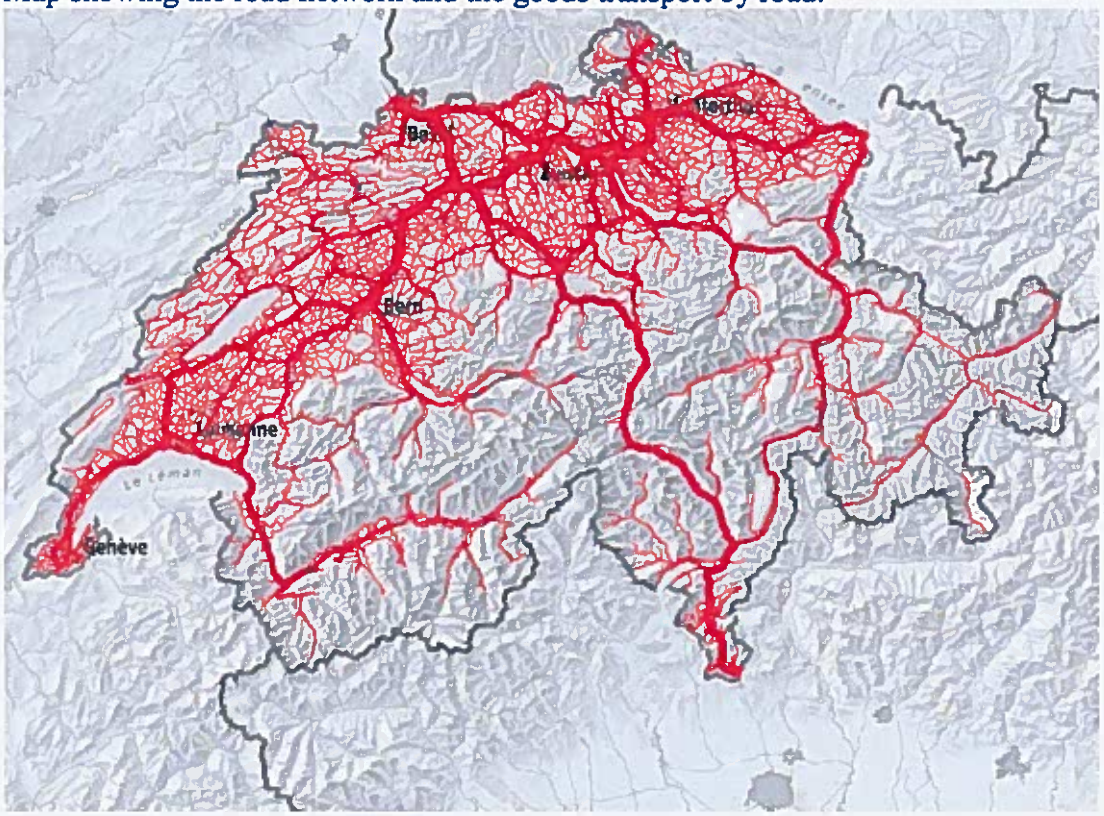
https://map.geo.admin.ch/?Y=653000&X=174500&zoom=1&bgLayer=ch.swisstopo.pixelkarte-grau&layers=ch.are.gueteklassen_oev&layers_opacity=0.5&layers_visibility=true&lang=de&topic=are

Map showing road network and passenger transport by road:

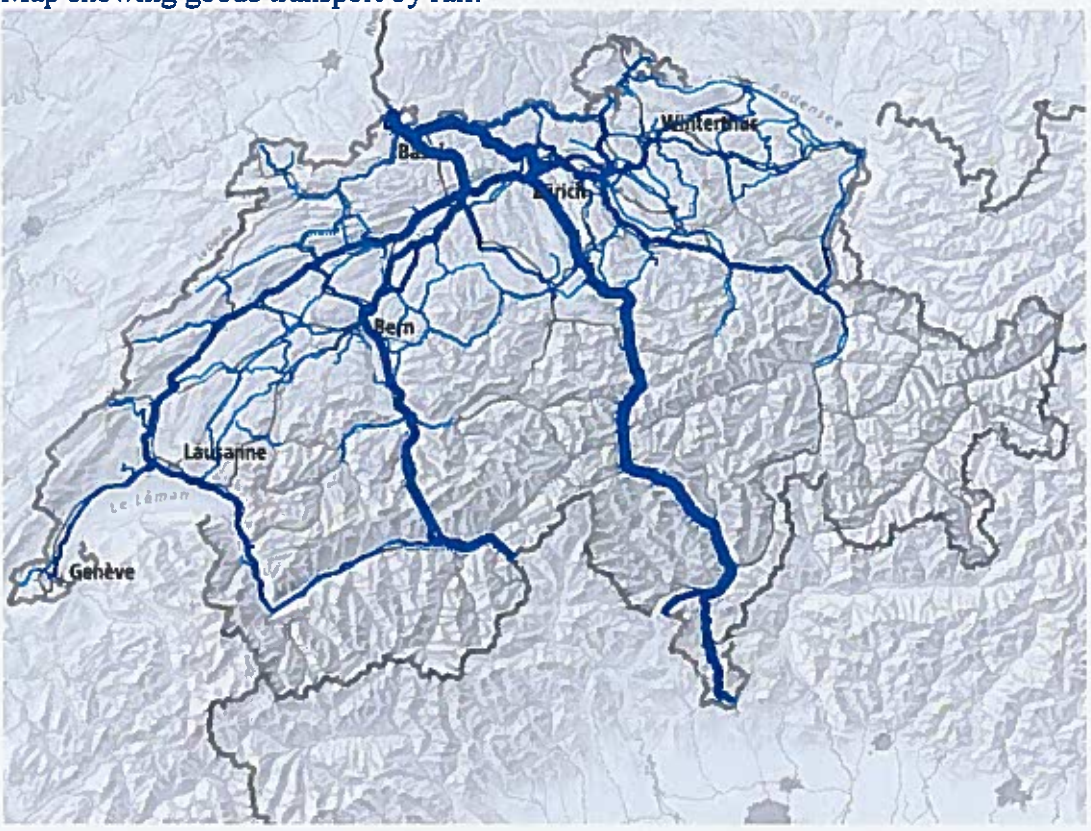


2)	Please attach a map (e.g. as pdf-document) showing where tolls and user charges are collected in your country.

Map showing the road network and the goods transport by road:



Map showing goods transport by rail:



3a)	Does your Member State apply tolls and/or user charges on roads not included in the trans-European road network?
	X☐ Yes ☐ No on the entire road network in Switzerland
3b)	If yes to 3a), please provide information on the roads and/or the road network concerned.

LSVA on the entire road network in Switzerland. See map in question/answer 2. Special case of Grand Saint Bernard bi-national tunnel: tunnel fee without LSVA on the Swiss side

Toll tariffs and special offers at Grand Saint Bernard:

TOLLS AND SPECIAL OFFERS

CURRENT PRICES

CLASS	ONE WAY	RETURN WITHIN 30 DAYS	10 CROSSINGS VALIDITY 1 YEAR	20 CROSSINGS VALIDITY 1 YEAR
A1	16,40 EUR 17,20 CHF	22,20 EUR 23,30 CHF	112,00 EUR 117,50 CHF	150,00 EUR 157,50 CHF
A2	27,90 EUR 29,30 CHF	44,60 EUR 45,90 CHF	112,00 EUR 117,50 CHF	150,00 EUR 157,50 CHF
B1	43,40 EUR 46,50 CHF	69,40 EUR 72,90 CHF	261,00 EUR 274,00 CHF	347,00 EUR 364,00 CHF
B2/B3	75,50 EUR 79,00 CHF	122,50 EUR 128,50 CHF	564,00 EUR 592,00 CHF	982,00 EUR 1031,00 CHF
3A/3B	110,00 EUR 115,50 CHF	175,50 EUR 184,50 CHF	825,00 EUR 866,00 CHF	1426,00 EUR 1497,00 CHF
4	167,00 EUR 175,50 CHF	266,50 EUR 280,00 CHF	1258,00 EUR 1321,00 CHF	2156,00 EUR 2263,00 CHF

PAYMENT AT ITALIAN BORDER

Cash, cash cards and the following credit cards are accepted (NB: DKV, MS,UTA, ROUTEX cards are only accepted for the purchase of one-waycommercial traffic tickets)

http://www.letunnel.com/homepage.asp?l=3

4) One of the main benefits of this survey should be to identify and compare the current toll rates and/or levels of user charges for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW).

Therefore please indicate the current toll rates and/or user charges for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) applied in your country.

Please indicate also, if toll rates and/or user charges are subject to the value added tax (VAT) in your country and if yes, if the VAT is included in the listed rates.

http://www.ezv.admin.ch/zollinfo_firmen/04020/04204/04208/04744/index.html?lang=en

http://www.are.admin.ch/themen/verkehr/00250/00461/index.html?lang=en

The HVC is calculated on the basis of the kilometres driven, the total permissible laden weight as well as the emission values of the towing vehicle.

Tariffs:

	Fee category 1			Fee category 2	Fee category 3		
Emission standard	EURO 0	EURO 1	EURO 2*	EURO 3+	EURO 4	EURO 5	EURO 6*
Rate per ton and per kilometre (tkm)	3.10 cents/tkm			2.69 cents/tkm	2.28 cents/tkm		

* 2,79 Rp./tkm for vehicles retrofitted with particle filter systems
+ 2,42 Rp./tkm for vehicles retrofitted with particle filter systems
* 2,05 Rp./tkm; discount

The relevant weight for the charge corresponds to the lowest value of the following options:

- total permissible laden weight of the truck plus total permissible laden weight of the trailer – for articulated lorries: net weight tractor plus total permissible laden weight semi-trailer *or*
- total permissible laden weight of the vehicle train *or*
- national weight limit (40 tons)

The principles of calculation can be explained with the following examples:

Tariff level in cents. 1	2	3		Kilometres driven		Relevant weight [1] towing vehicle and trailer		Charge in CHF
3.10			X	300	X		18 t	167.40
	2.69		X	300	X		34 t	274.40
		2.28	X	300	X		38 t [2]	259.90
		2.05*	X	300	X		40 t [3]	246.–

Tariff per ton and kilometre (tkm)
Level 1 = fee category 1 (corresponding to emission level EURO 0 / 1 / 2)
Level 2 = fee category 2 (corresponding to emission level EURO 3)
Level 3 = fee category 3 (corresponding to emission level EURO 4 / 5 / 6*)

Kilometres driven on the public roads of Switzerland and/or of the Principality of Liechtenstein

[1] Relevant weight: = total permissible laden weight according to the vehicle registration document. For combined vehicles (with trailer), the total permissible laden weights are added.
[2] For separately matriculated artics: = net weight of the tractor and total permissible laden weight of the semi-trailer
[3] The national weight limit is 40 tons (therefore, this limit applies to the collection of the fee).

3 Recording equipment

3.1 Overview

All Swiss vehicles that are subject to the charge must be fitted with a recording device. A total of some 55,000 heavy vehicles fall into this category. Exceptions are made only in a few cases, which must be justified.

Each foreign vehicle that crosses the border into Switzerland for the first time is allotted an identification card specifically for that vehicle, which will then allow formalities to be completed simply and quickly at future border-crossings. Foreign vehicles may also be fitted with a recording device but this is not obligatory.

Domestic Vehicles	Foreign Vehicles
Mandatory equipped with: On Board Unit 	In principle unsing: ID-Card & Self-service Machine  
In approved exceptional cases: Log Book & TAG  	Voluntary equipped with: On Board Unit 

5)	In order to be able to compare toll rates and/or user charges for the different categories of vehicles, please indicate the toll rates and user charges for for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) with more than 4 axles, EURO III, V and VI.
	See table in 4) Tariffs per km: Application of the Fee depending on the maximum permissible laden weight of the vehicle and the Euro emission category (number of axles not relevant!) 40t vehicle EURO VI currently including a discount rate: 40x 2,05 cts (CHF)= 82 cts (CHF)/km 40t vehicle EURO IV or V: 40tx2,28cts (CHF) = 91,2 cts (CHF)/km

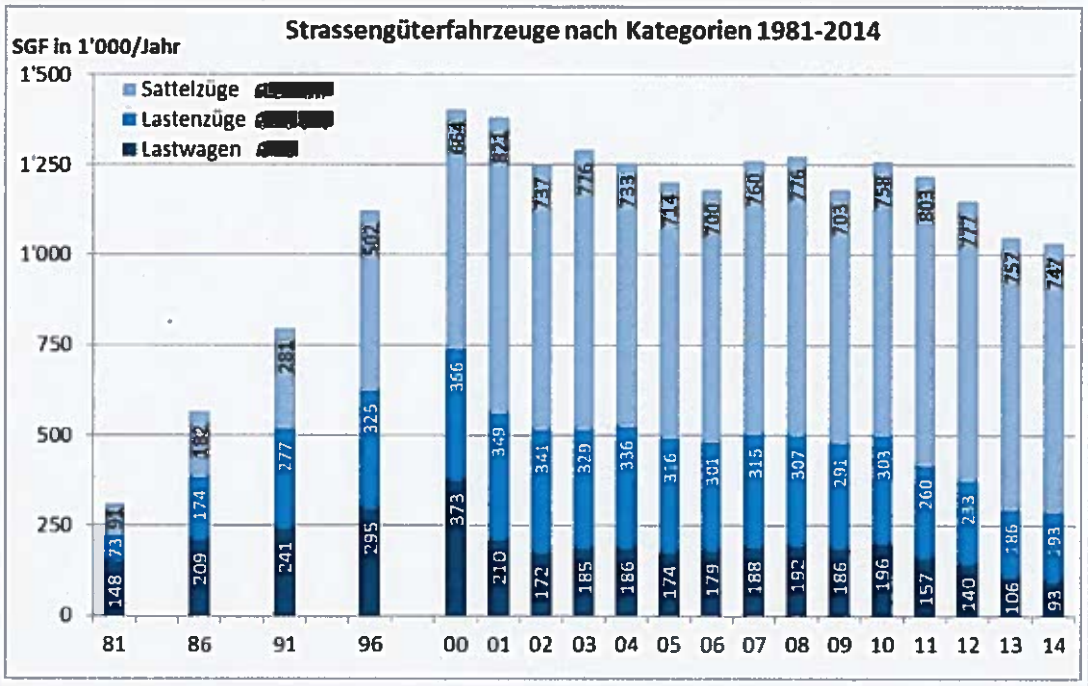
6a)	Does your country vary toll rates according to EURO emission classes as set out in Annex 0 of 2006/38/EC and/or the time of day, type of day or season?
	X☐ Yes ☐ No only emission classes, see N° 4-6 , no variation in time (**night driving ban [22.00 – 05.00] and driving ban on Sundays**) , nor day or season
6b)	If yes to 6a), please provide information about how this differentiation is implemented in your country.

6c)	Are the impacts of the differentiation of infrastructure charges according to EURO classes on air pollution being monitored?

X☐ Yes ☐ No

Internal monitoring report, modal shift report every two years (newest figures will follow after publication of 2015 Report in Nov 2015!)

Evolution of categories of heavy goods vehicles in Alpine crossing through Switzerland:



Sattelzüge
Lastenzüge
Lastwagen

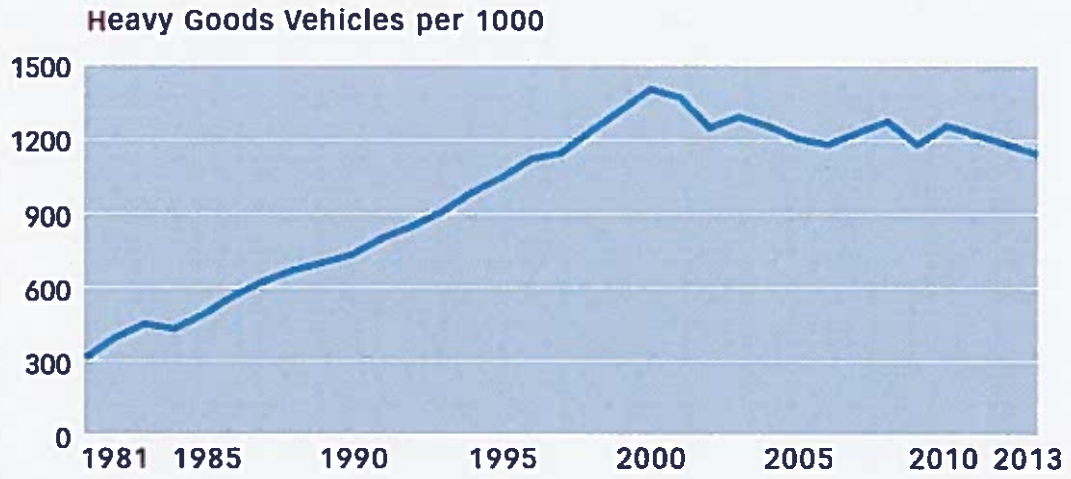
= Semitrailer
= truck and trailer
= truck

General economic Impact report after LSVA introduction (only in german) :

(volkswirtschaftliche Auswirkungen mit LSVA und höherer Gewichtslimite):
http://www.are.admin.ch/themen/verkehr/00250/00461/index.html?lang=fr&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ae2IZn4Z2qZpnO2Yuq2Z6gpJCDfHt4hGym162epYbg2c_JjKbNoKSn6A--

Transalpine goods traffic on the road from 1980 – 2014:

Heavy goods vehicles through the Swiss Alps



6d)	If yes to 6c), please specify how they are being/will be monitored, and whether you are able to provide us with link to related documents.
	Application of HGV fee on the entire road network, no detour traffic for tolling roads and not tolled roads, but shorter trips on low category of roads instead of Highways: Report about this kind of "detour traffic": http://www.are.admin.ch/themen/verkehr/00250/00461/index.html?lang=en&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ad1IZn4Z2qZpnO2Yuq2Z6gpJCEdYR4fmym162epYbg2c_JjKbNoKSn6A--
7a)	Toll rates may in exceptional cases be subject to a mark-up for the financing of specific projects of high European interest. If your country does not already apply this exception, does it have any plans to do so?
	☐ Yes X☐ No No mark-up in Switzerland, partial earmark/dedication of HVF revenues to a Fund for public transport projects like NEAT / alptransit project: **Use of revenue** • One-third of net revenue goes to the cantons • Two-thirds of net revenue goes to the federal government The cantons use their allocation mainly to meet their share of the uncovered road transport costs. The federal government's share is primarily used to finance the following major public transport projects: • Rail 2000 • New transalpine rail routes (NEAT) • Links to the European high-speed network • Rail noise control program Up from 2016, the same share of revenues goes to a new Rail Infrastructure Fund .
7b)	If yes to 7a), please provide information, on how this exception will be applied in your country (respective project, planned timetable for implementation and level of toll rates for each vehicle category).

8a)	Article 7a para 5 deals with the problem of shifting, especially of HGV traffic, from tolled high-ranked roads (motorways and/or expressways) to parallel road infrastructure. Does in your country have such problems caused by avoiding road charges and/or tolls for HGV´s and using not high ranked roads?
	☐ Yes X☐ No the system is an area tolling: the entire road network of the Swiss territory (with the exception of the access route to the Grand Saint Bernard tunnel until the border inside the tunnel / lump tunnel fee instead of HGV fee) As result of a study ("Traffic diversion caused by the introduction of a distance-related toll system in Austria in 2004"), which identified some "hot spots" with diversion at the start of the electronic road pricing system in 2004, measures were successfully taken on the parallel network in order to re-divert this (speed/weight limits, traffic bans for HGVs etc.)
8b)	If yes to 8a), how does your country manage these problems, are there examples for road tolls and/or charges on parallel roads to the high ranked networks? Are there traffic bans for HGV on parallel routes to the high ranked network, to help that no traffic is diverted?

9)	Please provide information on the development of traffic by vehicle categories on the tolled/charged road network and, if available, the development of the shares of EURO classes of HGV´s on this network since getting into force of the EU-Directive 2006/38/EC.
	Data will follow (Modal Shift Report Nov 2015)

10)	Are you able to provide information about whether infrastructure charging has had an impact on freight traffic on the interurban road network (e.g. traffic performance, degree of loading or empty runs)?
	☐ X Yes ☐ No ☐
	In general the loading charge is increased after the introduction of the stepwise 40 ton limit and HGV fee (2001: 7,8 t/veh) to an average of 12.1 t /veh (all categories of heavy good vehicles mixed).

11)	Is revenue from infrastructure charging earmarked for reinvestment in the transport sector in your Member State?

	☐ All of it X☐ Some of it, see under N° 7a ☐ None of it ☐Don't know
12)	Please provide details about your country's policy (and practice) in terms of earmarking infrastructure charging revenue.
	All revenues from road charging is earmarked for planning, construction, maintenance and refinancing of the (tolled) federal road network.

13a)	One of the main strategic objectives of the transport protocol of the Alpine Convention is shifting cargo from road to rail. Did the implementation of the EU-Directive 1999/62/EC as amended by 2006/38/EC or of similar measures contribute to achieve the objectives of a, b and c of Article 14 of the Transport Protocol Switzerland : HGV-fee (LSVA), not Eurovignette Directive
	☐ X Yes ☐ No ☐Don't know/No view: introduction of **HGV-fee (LSVA)** in 2001
13b)	If yes to 13a), please provide a short summary of these positive effects.
	Table will follow

14a)	Are there any plans in your country to implement additional measures in the field of tolls and/or user charges?
	X☐ Yes ☐ No ☐Don't know/No view
14b)	If yes to 14a), please provide information which measures are planned and the schedule for their implementation.
	Further measures under examination

15a)	Is your country planning to implement the relevant provisions of the latest Eurovignette Directive 2011/76/EU for better reflecting the external costs of traffic-based air and noise pollution? Switzerland: HGV-fee (LSVA) already including uncovered infrastructure costs **and** external costs

	☐ Yes ☐ No ☐Don't know/No view
15b)	If yes to 15a), please provide information, which measures are planned and the schedule for their implementation.

16)	Do you have any additional comments?

Thank you for your time and support.

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National survey on the application of the Eurovignette Directive 1999/62/EC as amended by 2006/38/EC

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2 Contact details

Name of person responsible for completing the questionnaire:	Jens Staats
Name of Authority:	Bundesministerium für Verkehr und digitale Infrastruktur
Email:	Jens.staats@bmvi.bund.de
Telephone:	+49 (0)30-18300-2613

3 Questionnaire

1)	Please provide all relevant national legal principles and rules for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) in your country.
	HGV toll was raised until 30.09.2015 from a maximum permission weight (MPW) of over 12 t, since 01.10.2015 for HGV from a gvw of 7,5 t and more. The relevant regulations are: - Law for toll on federal roads "Bundesfernstraßenmautgesetz (BFStrMG)" - Regulation for HGV toll "Lkw-Maut-Verordnung (LKW-MautV)" - Law fort he toll system „Mautsystemgesetz (MautSysG)" - Regulation to order the beginning of toll charging at sections of federal roads „Verordnung zur Anordnung des Beginns der Mauterhebung auf Abschnitten von Bundesstraßen (BStrMautErhebV)" - Regulation to enlarge the toll routes „Mautstreckenausdehnungsverordnung (MautStrAusdehnV)" - Regulation to regulate the toll nodes for certain segments of fedaral roads „Verordnung zur Regelung der Maut-Knotenpunkte für bestimmte Abschnitte von Bundesstraßen (BFStrMKnotV)"

2)	Please attach a map (e.g. as pdf-document) showing where tolls and user charges are collected in your country.
	The toll tables of the Federal Road Research Institute (BASt) list the current highways and federal roads subject to the toll, including the tariff-relevant lengths: www.mauttabelle.de A currrent map of the road network under toll dating from 01.07.2015 is attached as Appendix 1 and available in the Internet: http://www.bmvi.de/SharedDocs/DE/Anlage/VerkehrUndMobilitaet/Strasse/karte-mautpflichtige-bundesstrassen-ab-2015-07-01.pdf?__blob=publicationFile

3a)	Does your Member State apply tolls and/or user charges on roads not included in the trans-European road network?
	☒ Yes ☐ No
3b)	If yes to 3a), please provide information on the roads and/or the road network concerned.
	(cp. 2. Segments under toll) The German TEN does not contain all segments of highways and federal roads subject to the toll.

4) One of the main benefits of this survey should be to identify and compare the current toll rates and/or levels of user charges for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW).

Therefore please indicate the current toll rates and/or user charges for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) applied in your country.

Please indicate also, if toll rates and/or user charges are subject to the value added tax (VAT) in your country and if yes, if the VAT is included in the listed rates.

As example see the respective table for Austria (http://www.asfinag.at/en/maut/maut-fuer-lkw-und-bus).

To determine the toll the following classification in pollution classes is applied:

Emission classes according to the German Federal Trunk Road Toll Act (BFStrMG)

	Category A	Category B	Category C	Category D	Category E	Category F
Emission class	S6	EEV Klasse 1, S5	S4, S3 mit PMK 2*	S3, S2 mit PMK 1*	S2	S1, keine SSK
Euro emission class	Euro 6	EEV 1, Euro 5	Euro 4, Euro 3 + PMK 2*	Euro 3, Euro 2 + PMK 1*	Euro 2	Euro 1, Euro 0

* Particulate reduction classes are retrofitting standards to lower particulate emissions. Particulate reduction class 1 or higher is required for category; for category C, particulate reduction class 2 or higher is required.

Starting from 01.01.2015 the external cost of air pollution were introduced as part of the toll. Therefore the toll categories in dependence of the emission classes of the vehicle were enlarged from 4 to 6. With the lowering of the toll obligation from 12 t MPW to 7.5 t MPW from 01.10.2015 onwards, also the number of axes classes was enlarged from 2 to 4.

Toll per kilometre from 01.01.2015 (no longer valid)

Category	*Proportion of toll rate (in cents) Costs for air pollution*	*Number of axles***	*Proportion of toll rate (in cents) Costs for infrastructure*	*Toll rate (in cents*
A	*0*	*bis 3*	*12,5*	***12,5***
		ab 4	*13,1*	***13,1***
B	*2,1*	*bis 3*	*12,5*	***14,6***
		ab 4	*13,1*	***15,2***
C	*3,2*	*bis 3*	*12,5*	***15,7***
		ab 4	*13,1*	***16,3***
D	*6,3*	*bis 3*	*12,5*	***18,8***
		ab 4	*13,1*	***19,4***

		ab 4	13,1	20,4
F	8,3	bis 3	12,5	20,8
		ab 4	13,1	21,4

Toll rates per kilometre from 1 October 2015

Category	Proportion of toll rate (in cents) Costs for air pollution	Number of axles**	Proportion of toll rate (in cents) Costs for infrastructure	Toll rate (in cents
A	0	2	8,1	8,1
		3	11,3	11,3
		4	11,7	11,7
		ab 5	13,5	13,5
B	2,1	2	8,1	10,2
		3	11,3	13,4
		4	11,7	13,8
		ab 5	13,5	15,6
C	3,2	2	8,1	11,3
		3	11,3	14,5
		4	11,7	14,9
		ab 5	13,5	16,7
D	6,3	2	8,1	14,4
		3	11,3	17,6
		4	11,7	18,0
		ab 5	13,5	19,8
E	7,3	2	8,1	15,4
		3	11,3	18,6
		4	11,7	19,0
		ab 5	13,5	20,8
F	8,3	2	8,1	16,4
		3	11,3	19,6
		4	11,7	20,0
		ab 5	13,5	21,8

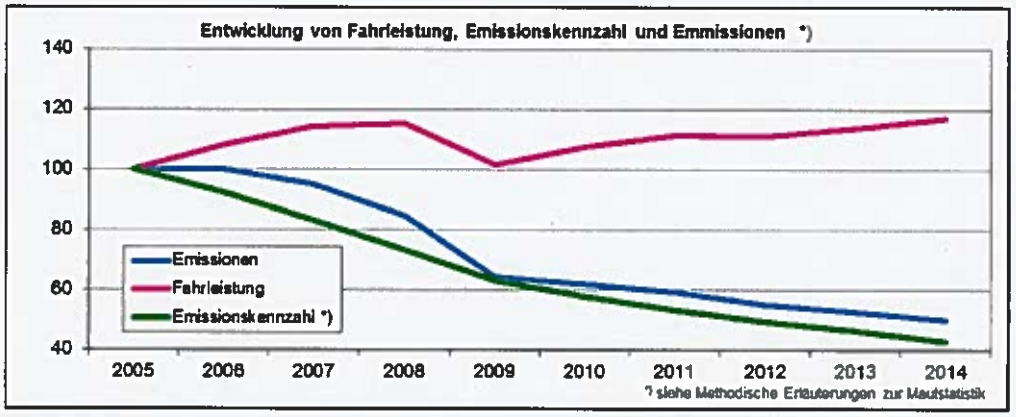
**The tandem axle counts as two axles, the tridem axle counts as three axles. Lift and retractable axles are always taken into account, regardless of whether a vehicle axle is being used or is lifted during transportation, in other words has no road contact.

Toll is free of VAT.

5)	In order to be able to compare toll rates and/or user charges for the different categories of vehicles, please indicate the toll rates and user charges for for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) with more than 4 axles, EURO III, V and VI.
	Cp. 4

6a)	Does your country vary toll rates according to EURO emission classes as set out in Annex 0 of 2006/38/EC and/or the time of day, type of day or season?
	☒ Yes ☐ No
6b)	If yes to 6a), please provide information about how this differentiation is implemented in your country.
	Cp. 4, toll is differentiated by EURO-classes, not by parameters like location or time.

6c)	Are the impacts of the differentiation of infrastructure charges according to EURO classes on air pollution being monitored?
	☒ Yes ☐ No

6d)	If yes to 6c), please specify how they are being/will be monitored, and whether you are able to provide us with link to related documents. The kilometre performance subject to the toll and generated by the different EURO-classes is statistically evaluated. Toll statistics differentiate the pollutant load of rides subject to toll by identifying the emission indicators (g/kwh, see methods) per county of vehicle registration. **The emission indicator is a fictional value, used to compare, related to the state where the vehicle is registered, the pollutant load basing on the kilometres driven in each single emission class.** Compared to 2013 the emission indicators declined clearly in 2014 by the continuous substitution of relative more polluting to relative more environmentally friendly vehicles – by in average 8.5 %. The value declined for german vehicles by 8.8% and by 8.4% for foreign vehicles. (Bundesamt für Güterverkehr 2015: Mautstatistik Jahrestabellen 2014) **Appendix 2** 
7a)	Toll rates may in exceptional cases be subject to a mark-up for the financing of specific projects of high European interest. If your country does not already apply this exception, does it have any plans to do so?
	☐ Yes ☒ No
7b)	If yes to 7a), please provide information, on how this exception will be applied in your country (respective project, planned timetable for implementation and level of toll rates for each vehicle category).
	Click here to enter text.
8a)	Article 7a para 5 deals with the problem of shifting, especially of HGV traffic, from tolled high-ranked roads (motorways and/or expressways) to parallel road infrastructure. Does in your country have such problems caused by avoiding road charges and/or tolls for HGV´s and using not high ranked roads?
	☒ Yes ☐ No
8b)	If yes to 8a), how does your country manage these problems, are there examples for road tolls and/or charges on parallel roads to the high ranked networks? Are there traffic bans for HGV on parallel routes to the high ranked network, to help that no traffic is diverted?

Cp Appendix 3 "Bericht über Verkehrsverlagerungen auf das nachgeordnete Straßennetz in Folge der Einführung der Lkw-Maut".

Diversions to avoid toll charges are not an area-wide issue. If traffic relocations occure in relevant scales, the extension of toll charge to further federal roads is allowed as well as line blocking for HGV (e.g. for cross-town segments)

9) Please provide information on the development of traffic by vehicle categories on the tolled/charged road network and, if available, the development of the shares of EURO classes of HGV´s on this network since getting into force of the EU-Directive 2006/38/EC.

Cp. Appendices 2 and 4.

10) Are you able to provide information about whether infrastructure charging has had an impact on freight traffic on the interurban road network (e.g. traffic performance, degree of loading or empty runs)?

☒ Yes ☐ No ☐ Don't know/No view

There are several special reports dedicated to this issue, which are available in the Internet (but only in German):

http://www.bag.bund.de/DE/Navigation/Verkehrsaufgaben/Marktbeobachtung/Sonderberichte/sonderberichte_node.html

- Special report about the effects of distance-related HGV toll „Sonderbericht über die Auswirkungen der streckenbezogenen Lkw-Maut" September 2005
- Special report: 1½ years HGV toll – Effects tot he German goods transport industry „Sonderbericht: Eineinhalb Jahre Lkw-Maut – Auswirkungen auf das deutsche Güterverkehrsgewerbe" Nov. 2006

Moreover there are current autumn reports and yearly reports from the Federal Office for goods Transport (BAG):

http://www.bag.bund.de/DE/Navigation/Verkehrsaufgaben/Marktbeobachtung/Herbst_und_Jahresberichte/herbst_und_jahresberichte_node.html

Short summary:

- The share of empty trips has been reduced, the utilized capacity increased.
- The toll is taken into account when investing in new HGVs.
- The toll is declared with transport costs or taken into account for calculations. The shift of toll costs to the client is not always complete (it depends on the market power of the enterprise)
- The effects of the toll on modal split are low an depend heavily on the transported good, the length of the transport and the existence of an alternative (ship, Terminal for combined transport etc.).

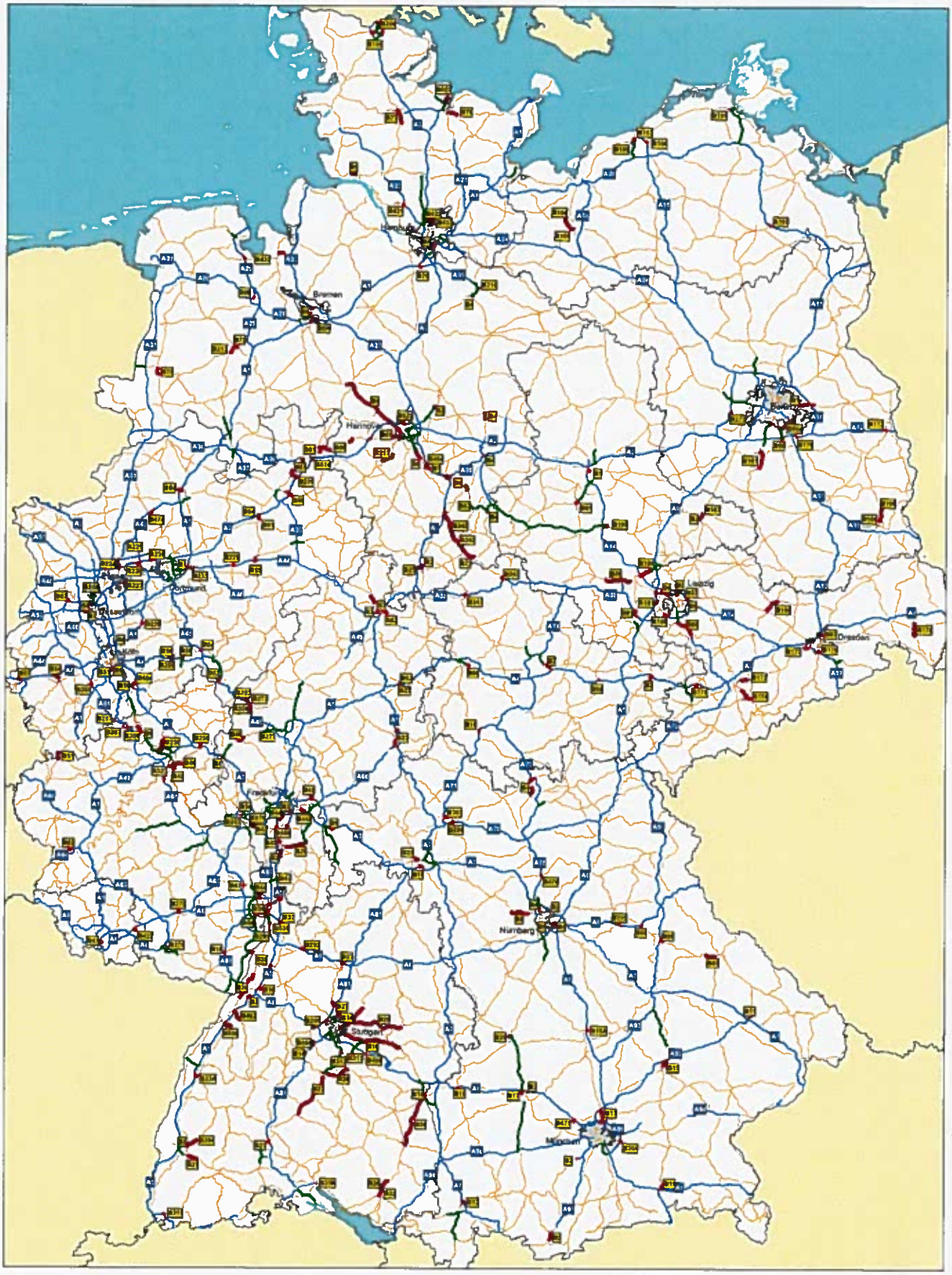
11)	Is revenue from infrastructure charging earmarked for reinvestment in the transport sector in your Member State?
	☐ All of it ☒ Some of it ☐ None of it ☐Don't know
12)	Please provide details about your country's policy (and practice) in terms of earmarking infrastructure charging revenue.
	The *Law for toll on federal roads, Art. 11* foresees that the toll belongs to the Bund. The costs for the whole toll system are fully covered by the toll. The rest of the toll, except 150 Million Euro per year, are fed into the federal household and completely used for infrastructure improvements and federal highways and roads. The respective income and costs are listed and operated separately in the federal household. Deviant from above up to 450 Million Euro per year are used for federal programs to implement the goals employment, qualification, environment and security in enterprises of the good transport branch under toll obligation. *Original text of the law (not available in English):* *B*FStrMG - § 11 Mautaufkommen (1) Das Mautaufkommen steht dem Bund zu. Ausgaben für Betrieb, Überwachung und Kontrolle des Mautsystems sowie Finanzmittel, die zur Verwaltung der nach § 1 des Verkehrsinfrastrukturfinanzierungsgesellschaftsgesetzes errichteten Gesellschaft dienen und dieser Gesellschaft vom Bund als Eigentümer zur Verfügung gestellt werden, werden aus dem Mautaufkommen geleistet. Das verbleibende Mautaufkommen wird abzüglich eines jährlichen Betrages von 150 Millionen Euro zusätzlich dem Verkehrshaushalt zugeführt und in vollem Umfang zweckgebunden für die Verbesserung der Verkehrsinfrastruktur für die Bundesfernstraßen verwendet. Im Bundeshaushalt werden die entsprechenden Einnahmen und Ausgaben getrennt voneinander dargestellt und bewirtschaftet. (2) Abweichend von Absatz 1 Satz 3 werden jährlich bis zu 450 Millionen Euro von dem verbleibenden Mautaufkommen für die Durchführung von Programmen des Bundes zur Umsetzung der Ziele Beschäftigung, Qualifizierung, Umwelt und Sicherheit in Unternehmen des mautpflichtigen Güterkraftverkehrs verwendet.
13a)	One of the main strategic objectives of the transport protocol of the Alpine Convention is shifting cargo from road to rail. Did the implementation of the EU-Directive 1999/62/EC as amended by 2006/38/EC or of similar measures contribute to achieve the objectives of a, b and c of Article 14 of the Transport Protocol.
	☒ Yes ☐ No ☐Don't know/No view
13b)	If yes to 13a), please provide a short summary of these positive effects.
	The toll has only a minor influence on modal split, but positive effects on emission classes, the use of capacities and the share of empty trips (cp. Question 10).

14a)	Are there any plans in your country to implement additional measures in the field of tolls and/or user charges?
	☒ Yes ☐ No ☐Don't know/No view
14b)	If yes to 14a), please provide information which measures are planned and the schedule for their implementation.
	At the moment a so-called infrastructure fee for cars on highways and federal roads is planned. (The respective law is already adopted, but the implementation not yet). The future infrastructure fee has to be paid by all keepers of in Germany registered cars for one year. The price of the yearly vignette depends on the cubic capacity, the fuel and the environmental properties of the car. Keepers of not in Germany registered cars can choose between a vignette for 10 days, 2 months or 1 year and book it via Internet. Additionally a purchase at sales offices, e.g. at petrol stations should be possible. The yearly vignette can be validated at each day of the year and has then a validity for 12 months.

15a)	Is your country planning to implement the relevant provisions of the latest Eurovignette Directive 2011/76/EU for better reflecting the external costs of traffic-based air and noise pollution?
	☒ Yes ☐ No ☐Don't know/No view
15b)	If yes to 15a), please provide information, which measures are planned and the schedule for their implementation.
	Since 01.01.2015 external costs caused by air pollution are included in the toll (cp. 4)

16)	Do you have any additional comments?
	Click here to enter text.

Thank you for your time and support.



BAB

Mautfreie Bundesstraßen

Seit 1.1.2007 (MautStAusdehnV) bzw. 1.8.2012 mautpflichtige Bundesstraßen

Weitere mautpflichtige Bundesstraßen ab 1.7.2015

Maßstab: 1:2.500.000

Erstellt am:
22.03.2015

Erstellt von:
BASt (V2)
BMVI (StB 12)

Maut auf Bundesstraßen ab 1.7.2015

BISStra

bast

Bundesamt
für Güterverkehr

... aktiv für den Güterverkehr

Mautstatistik

Jahrestabellen 2014

Inhaltsverzeichnis

Bundesamt
für Güterverkehr

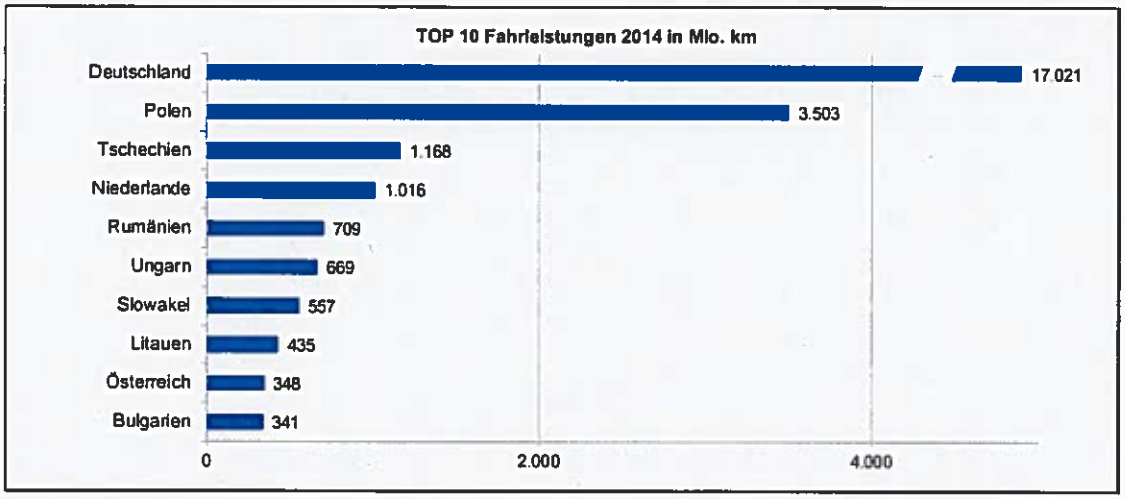
Einführung

Seit 2005 wird in Deutschland eine streckenbezogene Gebühr für schwere Lkw auf Autobahnen erhoben. Die Mautpflicht[1] gilt für LKW ab einem zulässigen Gesamtgewicht von 12 Tonnen grundsätzlich auf den rund 12.800 km Bundesautobahnen (BAB) sowie auf rund 1.200 km autobahnähnlichen Bundesstraßen. Die LKW-Maut gibt es nun seit 10 Jahren. Seitdem wurden von mautpflichtigen Fahrzeugen auf dem mautpflichtigen Streckennetz rund 263 Mrd. km zurückgelegt.

Im Rahmen der Mautstatistik werden Daten über die Fahrleistungen und Fahrten nach verschiedenen Kriterien statistisch ausgewertet. Die Statistiken werden seit Anfang 2008 in einer monatlichen und jährlichen Erscheinungsfolge auf der BAG-Homepage publiziert.

Im Jahr 2014 haben mautpflichtige schwere Nutzfahrzeuge rund 28 Mrd. km auf dem gebührenpflichtigen Streckennetz zurückgelegt. Damit ist die Fahrleistung gegenüber dem Vorjahr um insgesamt 2,9 % gestiegen.

Fahrleistungen	
Jahr	Mrd. km
2005	24,0
2006	25,8
2007	27,4
2008	27,6
2009	24,4
2010	25,7
2011	26,7
2012	26,6
2013	27,2
2014	28,0



[1] Bundesfernstraßenmautgesetz (BFStrMG) http://www.gesetze-im-internet.de/bfstrmg/index.html

Vorwort Jahrestabellen 2014

Die Aufbereitung der Tabellen und Übersichten der Mautstatistik erfolgt zeitnah durch das Bundesamt für Güterverkehr. Die Daten werden kontinuierlich durch den Vertragspartner geliefert. Da die anschließende Datenaufbereitung durch das Bundesamt systembedingt z. T. mit geringen zeitlichen Differenzen erfolgt, kann die vorliegende Veröffentlichung nicht in jedem Fall zu Vergleichszwecken mit früheren Veröffentlichungen auch anderer Stellen herangezogen werden. Weitere Informationen zur Datenbasis können den **„Methodischen Erläuterungen"** im Anhang entnommen werden.

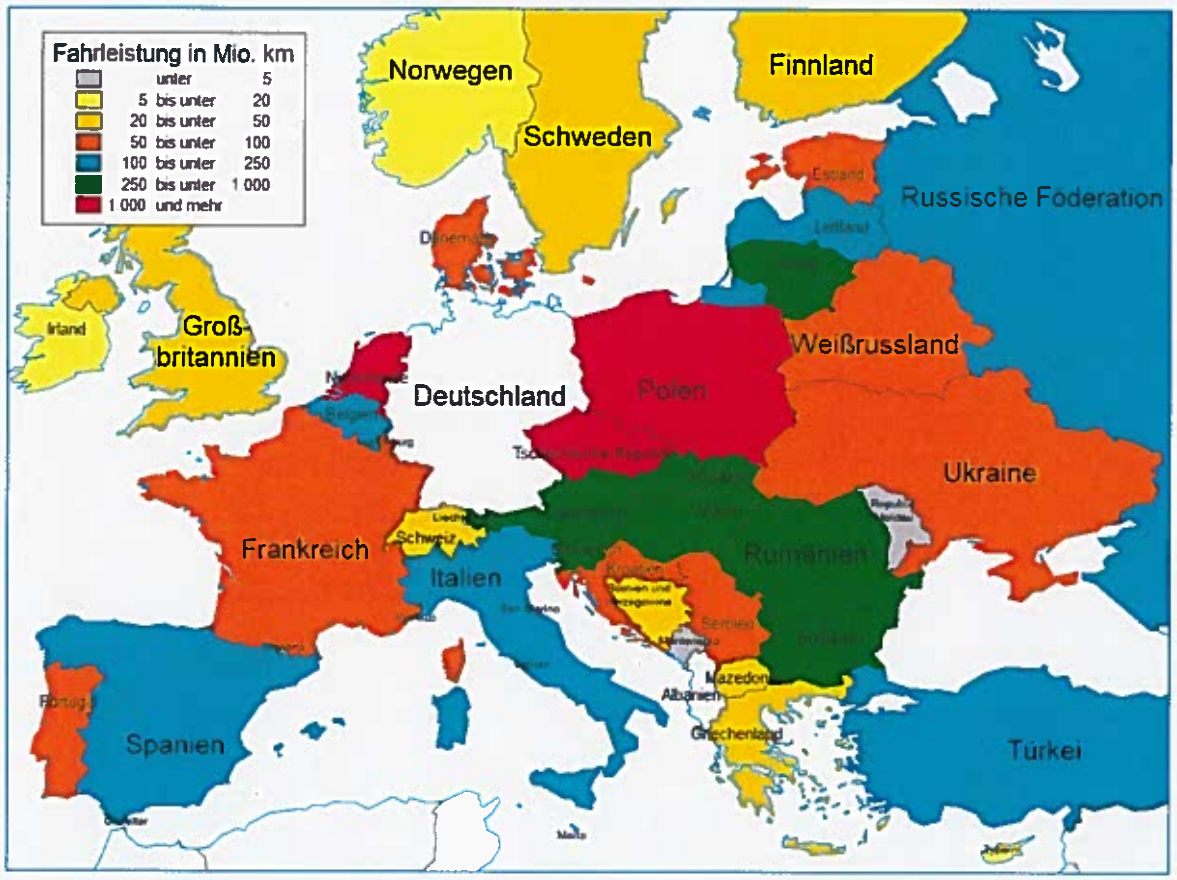
Die nachfolgenden Tabellen und Grafiken stellen die mautpflichtigen Fahrleistungen in Deutschland im Jahr 2014, zum Teil im Vergleich zum Jahr 2013 sowie in Zeitreihen dar. Dabei werden zunächst die mautpflichtigen Fahrleistungen und Mautfahrten insgesamt und differenziert nach den Nationalitäten dargestellt (Tabellen J 1 und J 2). In diesem Text und auch in den Tabellen ist mit dem Begriff Nation oder Nationalität der Staat gemeint, in dem das Kraftfahrzeug zugelassen wurde (Zulassungsstaat). Anschließend folgen Daten zum grenzüberschreitenden Straßengüterverkehr über Grenzübergänge an mautpflichtigen Autobahnen (Tabellen J 3 bis J 5) sowie eine Differenzierung nach Emissionskennzahlen und Schadstoffklassen (Tabellen J 6 und J 7). Detaillierte Auswertungen des mautpflichtigen LKW-Verkehrs einzelner Nationalitäten bezüglich Achs- und Schadstoffklassen (Tabellen J 8 und J 9) sowie die fahrzeugbezogenen Werte der Fahrleistungen und durchschnittlichen Streckenlängen sind in weiteren Tabellen dargestellt (Tabellen J 10 und J 11).

Nach den Jahrestabellen folgen Zeitreihen für die Fahrleistungen (Tabelle Z 1) und Mautfahrten (Tabelle Z 2) nach Nationalität sowie nach Schadstoffklassen (Tabelle Z 7). In den Zeitreihendarstellungen ist bei Jahresvergleichen zu beachten, dass mit Wirkung zum 1.8.2012 das mautpflichtige Streckennetz um mehr als 1.100 km auf mehrstreifige Bundesstraßenabschnitte erweitert wurde.
Zusätzlich enthält die Zusammenstellung als Sonderauswertung Schaubilder zu den Anteilen der Mautfahrten nach Fahrtlänge (Schaubild S 1) sowie nach den Anteilen der Fahrthäufigkeit je eingesetztem Fahrzeug (Schaubild S 2).

Mautpflichtige Fahrleistungen (Tabelle J 1)

- insgesamt

Deutsche und ausländische LKW[2] ab 12 t zGG legten im Jahr 2014 insgesamt rund 28 Mrd. Kilometer auf mautpflichtigen Straßen zurück. Dies bedeutet einen Zuwachs von 2,9 % gegenüber dem Vorjahr und ist damit die höchste jährliche Fahrleistung seit der Einführung der LKW-Maut im Jahr 2005[3]. Die nachfolgende Karte bildet die Fahrleistung von Fahrzeugen aus Europa (ohne Deutschland) auf den mautpflichtigen deutschen Straßen ab.



- nach Zulassungsstaaten

Differenziert man die Fahrleistungswerte nach den Zulassungsstaaten der Kraftfahrzeuge, so erzielten deutsche Fahrzeuge mit einem Plus von 0,6 % der mautpflichtigen Fahrleistung nur ein geringes Wachstum gegenüber dem Vorjahreszeitraum. Der Fahrleistungsanstieg gebietsfremder LKW betrug dagegen insgesamt 6,9 %, wobei die zur EU gehörenden Länder eine Anstieg um 7,4 % und Fahrzeuge aus Ländern außerhalb der EU ein negatives

[2] Lastkraftwagen, Lastkraftwagen mit Anhänger, Sattelkraftfahrzeuge.
[3] Ohne Berücksichtigung der erst nach dem 1.8.2012 mautpflichtigen Bundesfernstraßen wurden die höchsten Fahrleistungen nach wie vor im Jahr 2008, dem letzten Jahr vor der Wirtschaftskrise, erzielt.

Wachstum um -0,5 % verursachten. Insbesondere die Fahrleistung der jungen Mitgliedsstaaten ab 2004 erhöhte sich gegenüber dem Vorjahreszeitraum um 7,9 %.
Der Anteil deutscher LKW bei den mautpflichtigen Fahrleistungen hat sich gegenüber dem Vorjahr von 62,2 % auf 60,7 % verringert.

Die Reihenfolge der nach den Fahrleistungen **zehn leistungsstärksten** Zulassungsstaaten mit Polen (Anteil 12,5 %), Tschechien (4,2 %), Niederlande (3,6 %), Rumänien (2,5 %), Ungarn (2,4 %), Slowakei (2,0 %), Litauen (1,6 %), Österreich (1,2 %), Bulgarien (1,2 %) und Slowenien (1,1 %) hat sich gegenüber dem Vorjahr leicht verändert. Die stärksten Zuwachsraten gegenüber dem Vorjahr haben die als letzte in der EU aufgenommenen Länder Kroatien (+ 25,4 %), Rumänien (+ 20,2 %) und Bulgarien (+ 15,7 %) erzielt. Die größten prozentualen Rückgänge lagen bei den LKW aus Schweden (-12,2 %), Italien (-9,6 %), Frankreich (-6,9 %) und Dänemark (- 6,8 %).

Mautfahrten (Tabelle J 2)
Aufgrund der Erfassungsmöglichkeiten entsprechen „Mautfahrten" nicht den Beförderungen oder Leerfahrten nach der Verkehrsleistungsstatistik des Kraftfahrt-Bundesamtes (vgl. „Methodische Erläuterungen"). Insgesamt stieg die Anzahl der Mautfahrten im Jahr 2014 um 3,9 %.
Für die Anzahl der Mautfahrten von im Inland zugelassenen mautpflichtigen LKW ist ein unterdurchschnittlicher Zuwachs von 2,6 % (+ 7,5 Mio.) zu verzeichnen. Die anderen EU-Staaten konnten in dieser Wertung insgesamt um 9,3 % (+ 6,1 Mio.) gegenüber dem Vorjahreszeitraum zulegen. Für besondere Steigerungsraten sind Fahrzeuge aus Polen (+2,8 Mio.), Rumänien (+1,0 Mio.) und Tschechien (+ 0,6 Mio.) verantwortlich. Mit 18,7 Mio. Mautfahrten führten polnische LKW weiterhin die meisten mautpflichtigen Fahrten gebietsfremder LKW in Deutschland durch.

Grenzüberschreitender Straßengüterverkehr über Grenzübergänge an mautpflichtigen Straßen (Tabellen J 3 bis J 5)
Daten zum grenzüberschreitenden Straßengüterverkehr liegen nicht für alle deutschen Autobahn-Grenzübergänge vor, da verschiedene Autobahnabschnitte an den Grenzen zu Frankreich und der Schweiz mautfrei sind. Hierdurch können für diese beiden Nachbarstaaten im Folgenden keine weiteren länderbezogenen Analysen dargestellt werden. Die Anzahl der mautpflichtigen Fahrten über die erfassten Grenzübergänge hat sich gegenüber dem Vorjahr von insgesamt 36,2 Mio. auf 37,7 Mio. erhöht Betrachtet man die

einzelnen Grenzübergänge, so zeigen sich besondere Zuwächse an den Grenzübergängen A4 Görlitz (+11,9 %) zu Polen, A61 Schwanenhaus (+10,5 %) zu den Niederlanden und A7 Füssen (+ 8,9 %) zu Österreich. Der am stärksten frequentierte Grenzübergang war Straelen (BAB A40, D/NL) mit 3,4 Mio. mautpflichtigen Fahrten, gefolgt von Frankfurt/Oder (BAB A12, D/PL) mit 3,2 Mio. und Suben (BAB A3, D/A) mit 2,8 Mio. mautpflichtigen Fahrten.
Die Grafiken in der Übersicht J 3a stellen eine weitere Aufteilung des grenzüberschreitenden Verkehrs mit den fünf stärksten Zulassungsstaaten je angrenzendem Nachbarstaat dar. Beim grenzüberschreitenden Verkehr mit den Nachbarstaaten Dänemark, Belgien und Luxemburg erreichten deutsche LKW die höchsten Anteile. Bei den Grenzen zu den Nachbarstaaten Niederlande, Tschechien, Österreich und Polen dominierten die in dem jeweiligen Nachbarstaat angemeldeten LKW.

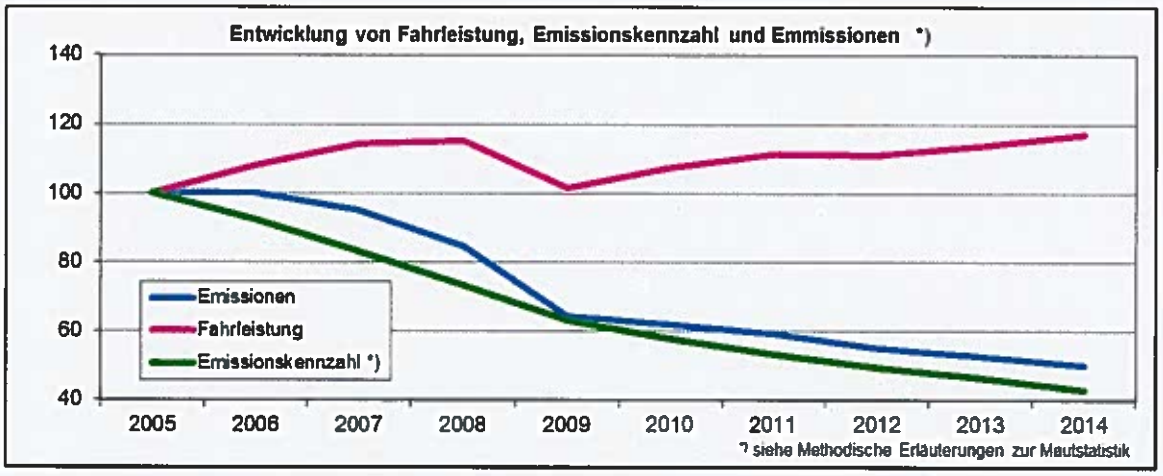
Emissionskennzahlen und Schadstoffklassen (Tabellen J 6 und J 7)

Die Mautstatistik unterscheidet die Schadstoffbelastung bei den mautpflichtigen Fahrten, indem Emissionskennzahlen (g/kwh, vgl. „Methodische Erläuterungen") nach Zulassungsstaaten ausgewiesen werden. Die Emissionskennzahl ist ein fiktiver Wert, um bezogen auf die Zulassungsstaaten die Schadstoffbelastung auf Basis der in den einzelnen Schadstoffklassen gefahrenen Kilometer miteinander zu vergleichen. Gegenüber dem Vorjahr haben sich die Emissionskennzahlen im Jahr 2014 durch die anhaltende Substitution vergleichsweise umweltschädlicher durch umweltfreundlichere Fahrzeuge sehr deutlich - um durchschnittlich 8,5 % - verringert. Dabei gingen der Wert für deutsche LKW um 8,8 % und der für gebietsfremde LKW um 8,4 % zurück. Die niedrigste Emissionskennzahl erreichten Fahrzeuge aus Österreich mit 3,83 g/kWh, dicht gefolgt von Fahrzeugen aus Deutschland (3,91), Slowenien (3,91), Dänemark (3,96) und Ungarn (3,97). Dagegen wiesen mautpflichtige LKW aus Griechenland (6,65) und Irland (5,15) weiterhin die höchsten Emissionskennzahlen auf.

Die Verbesserung der Emissionskennzahlen spiegelt sich in den Fahrleistungsanteilen der verschiedenen Schadstoffklassen wider. Die Höhe der Maut ist unter anderem abhängig von der Schadstoffklasse des eingesetzten Fahrzeuges, so dass inzwischen der Anteil aller mautpflichtiger Fahrleistungen in Deutschland mit Fahrzeugen der Emissionsklassen S 6/Euro 6 , EEV und S 5/Euro 5 im Jahr 2014 durchschnittlich 89 % betrug (Vorjahr 84,2 %). Nur noch 11 % der Fahrleistung wird damit in den Emissionsklassen S 1/Euro 1 bis S 4/Euro 4 zurückgelegt.

Um die kostengünstigste Mautkategorie zu nutzen, investierten Unternehmen im Jahr 2014 verstärkt in S 6/Euro 6-LKW. Zum 1.1.2015 hat die Klasse S 6/Euro 6 einen eigenen (den niedrigsten) Mautsatz erhalten, so dass hierdurch zusätzliche Anreize geschaffen wurden. Im Jahr 2014 wurden bereits 12,7 % der Fahrleistung von Fahrzeugen in der Emissionsklasse S 6/Euro 6 zurückgelegt.

Bei der Betrachtung der Fahrleistungsanteile nach Fahrzeugherkunft ergeben sich folgende Differenzierungen. Während 24,3 % der ausländischen Gesamtfahrleistung (2,7 von 11,0 Mrd. km) mit Fahrzeugen der Emissionsklassen S 6/Euro 6 und EEV erbracht wurden, lag der Anteil für Fahrzeuge mit deutscher Nationalität bereits bei 33,2 % (5,7 von 17,0 Mrd. km). Vergleichsweise höhere kumulierte Anteilswerte als Deutschland weisen die Fahrleistungen von Fahrzeugen aus Österreich (64,8 %), Ungarn (53,3 %), Slowenien (48,4 %), der Slowakei (47,6 %) und Tschechien (38,7 %) in diesen beiden Emissionsklassen auf.



Die vorstehende Abbildung stellt die Entwicklung (2005 = 100 der Fahrleistung, der durchschnittlichen Emissionskennzahl und der mit der jeweiligen höchstzulässigen Schadstoffmenge je Schadstoffklasse (s. „Methodischen Erläuterungen" im Anhang) multipliziert mit den in dieser Klasse gefahrenen Kilometern errechneten Schadstoffmenge dar. Während die Fahrleistung im Jahr 2014 im Vergleich zum Jahr 2005 um etwa 17 % zugenommen hat, reduzierte sich der so ermittelte Schadstoffausstoß[4] um fast die Hälfte (49,9 %).

[4] Hinweis: Der CO_2-Ausstoß wird bei dieser Berechnung nicht berücksichtigt.

Fahrleistungen und Mautfahrten nach Emissionsklasse und Achsklasse (Tabellen J 8 und J 9)

Der Fahrleistungsanteil der mautpflichtigen Fahrzeuge mit mehr als drei Achsen lag im Jahr 2014 wie in den Vorjahren bei etwa 95 %. Differenziert man dabei zusätzlich nach der Fahrleistung im Inland bzw. im Ausland zugelassener LKW, so liegen die jeweiligen Anteile bei 92,6 % bzw. 98,3 %.

In der Differenzierung nach den Schadstoffklassen zeigt sich, dass der Anteil der schadstoffärmeren Klassen S 5 und EEV/S 6 innerhalb der Achsklasse > 3 bei 90 % und innerhalb der Achsklasse ≤ 3 bei 74 % liegt.

Der Anteil der Mautfahrten (Tabelle J 9) mit mehr als drei Achsen betrug im Jahr 2014 87,2 % (Fahrleistung 95 %). Der Unterschied ist darin begründet, dass mit solchen Fahrzeugen eher weniger, dafür aber Fahrten über weitere Strecken durchgeführt werden.

Mautfahrten (Tabellen J 10 und J 11)

In der Tabelle J 10 werden Durchschnittswerte für die mautpflichtige Fahrleistung und die Anzahl der Fahrten von Mautfahrzeugen dargestellt. Grundlage hierfür ist die Berechnung der Anzahl der Mautfahrzeuge, die anhand der im System in anonymisierter Form registrierten unterschiedlichen KFZ-Kennzeichen ermittelt wird. In diesem Zusammenhang wird **insbesondere** auf die Definitionen und Erklärungen in den „Methodischen Erläuterungen" hingewiesen. Während in den monatlich veröffentlichten Tabellen M 10 je Monat etwa 750.000 unterschiedliche KFZ-Kennzeichen ermittelt wurden, liegt der Jahreswert bei über 1,3 Mio. Hierbei ist zu berücksichtigen, dass zum einen ein reales Fahrzeug innerhalb eines Jahres mehrfach als Mautfahrzeug gezählt wird, wenn ein Kennzeichenwechsel erfolgt. Zum anderen werden bei den Jahresberechnungen auch Fahrzeuge gezählt, die nur wenige mautpflichtige Fahrten oder nur einmal im Laufe des Jahres eine mautpflichtige Fahrt durchführen. Dabei handelt es sich insbesondere um LKW, die nicht mit einer OBU ausgestattet sind und daher manuell eingebucht wurden. So haben fast 560.000 Mautfahrzeuge mit unterschiedlichen KFZ-Kennzeichen im Jahr 2014 nur 4 oder weniger Mautfahrten durchgeführt.

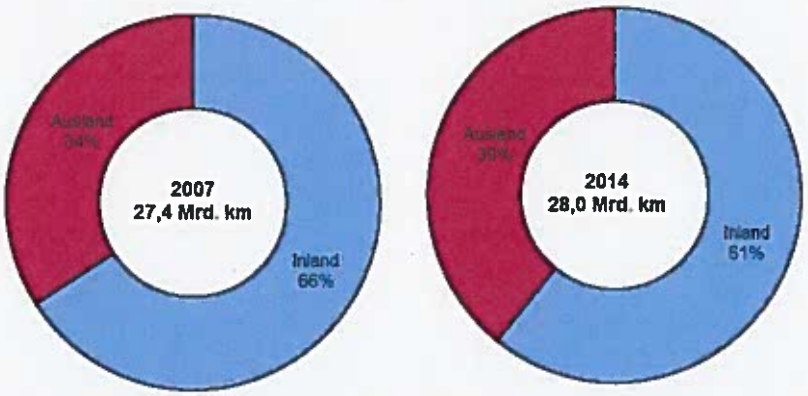
Aus der Tabelle J 10 geht hervor, dass bei Auswertung der mittleren Fahrleistung je Fahrzeug – hierbei werden die Werte aus den Tabellen J 1 und J 2 herangezogen - neben den im Inland zugelassenen Fahrzeugen mit 29.567 km die Fahrzeuge aus den Zulassungsstaaten Tschechien mit 23.916 km, Slowenien mit 23.468 km, Ungarn mit

23.213 km, Zypern mit 23.058 km, und Polen mit 21.698 km über dem Durchschnittswert (20.635 km) liegen.

Demgegenüber liegen bei den gebietsfremden LKW diejenigen aus Luxemburg und den Niederlanden mit durchschnittlich 189 bzw. 158 Fahrten weiterhin an der Spitze der Mautfahrten. Ein wesentlicher Grund hierfür dürfte in den relativ kurzen Entfernungen zwischen den Grenzen dieser Staaten zu Deutschland und den deutschen Wirtschaftszentren an Rhein und Ruhr zu suchen sein. Entsprechend führen die relativ großen Entfernungen zwischen der deutschen Grenze und den wichtigsten deutschen Wirtschaftszentren und Seehäfen zu überdurchschnittlich großen Fahrtweiten (J 11) pro Mautfahrt bei Fahrzeugen aus Kroatien (197,2 km), Griechenland (188,6 km) und Polen (187,6 km).

Zeitreihen

Die Veröffentlichung der Daten zur Mautstatistik erfolgt seit Januar 2008. In den Monatsstatistiken 2008 sind auch die Vorjahresergebnisse (2007) enthalten.



Die vorstehende Abbildung zeigt die Entwicklung der Anteile an der Fahrleistung in der Unterscheidung Inland/Ausland zwischen den Jahren 2007 und 2014.

In weiteren grafischen Übersichten werden ausgewählte Werte in Zeitreihen dargestellt. Diesen Übersichten wird im Einklang mit der Nomenklatur (M bzw. J für Monatstabelle bzw. Jahrestabelle) ein Z für Zeitreihe vorangestellt.

Die Fahrleistungen der mautpflichtigen Fahrzeuge für die Jahre 2007 bis 2014 sind nach unterschiedlichen Gesichtspunkten unter der Tabelle Z 1 dargestellt. Die

Gesamtfahrleistungen der Jahre seit 2005 ist in Tabelle Z 1-1 dargestellt. Tabelle Z 1-2 berücksichtigt zudem die Erweiterungen des mautpflichtigen Netzes ab dem 1.8.2012 durch zusätzliche Abschnitte auf Bundesstraßen (ca. 1.100 Km). Um einen direkten Jahresvergleich zu ermöglichen, erfolgt die Darstellung der Jahresfahrleistungen **ohne** Berücksichtigung dieser zusätzlichen Abschnitte. Der Anteil der jährlichen Fahrleistungen (Z 1-3) der jungen EU-Mitgliedsstaaten (Beitritt ab 2004) ist von 18,4 % im Jahre 2007 auf inzwischen 30,0 % angewachsen, während der Anteil der alten EU-Staaten (ohne Deutschland) von 12,9 % um 4,1 Prozentpunkte auf 8,8 % geschrumpft ist.
Weitere Grafiken zeigen die Veränderungen der Anteile an der jährlichen Fahrleistung (2007 = 100). In der detaillierten Betrachtung der Top 8 (Fahrleistung in 2014) der Fahrzeuge aus den alten EU-Staaten (EU-15) hat sich lediglich der Fahrleistungsanteil von portugiesischen mautpflichtigen Fahrzeugen über die Jahre positiv entwickelt (Z 1-4). In der Grafik der Top 8 aus den jungen EU-Ländern heben sich weiterhin Bulgarien und Rumänien mit besonders hohen und stetigen Zuwächsen heraus (Z 1-5).

Die Anzahl der monatlichen Mautfahrten ist unter Tabelle Z 2 dargestellt. Die Erweiterung der mautpflichtigen Abschnitte auf Bundesstraßen ab August 2012 führt bei den Mautfahrten zu einem höheren Anstieg als dies bei den Fahrleistungen der Fall ist und ist darin begründet, dass diese zusätzlichen Abschnitte insbesondere durch den regionalen Verkehr genutzt werden. Es sei darauf hingewiesen, dass selbst die Nutzung nur eines einzigen mautpflichtigen Straßenabschnittes zur Zählung einer Mautfahrt führt.
Die LKW auf dem mautpflichtigen Straßennetz werden immer umweltfreundlicher. Das zeigen die Entwicklungen der Anteile bzw. der Fahrleistungen in den unterschiedlichen Schadstoffklassen (Tabelle Z 7). Insbesondere die anfangs hohe Fahrleistung in der Klasse S 3/Euro 3 wurde bereits 2008/2009 von der Fahrleistung in der Klasse S 5/Euro 5 und 2012 von der Fahrleistung in der Klasse EEV übertroffen. Inzwischen nimmt die Fahrleistung von Fahrzeugen in der Klasse EEV - nun dicht gefolgt von S 6/Euro 6 - den zweiten Rang ein. Der Einsatz von LKW der Schadstoffklassen S 1 bis S 4 hat inzwischen nur noch einen Anteil an der Gesamtfahrleistung von insgesamt 11 % (gegenüber 99 % im Jahr 2005 bzw. 50 % im Jahr 2009).

Sonderauswertungen

Zwei Sonderdarstellungen für das Jahr 2014 runden die Jahresstatistik LKW-Maut ab. Es werden die Anteile von Mautfahrzeugen dargestellt, die – in Anlehnung an die Entfernungsklassen der Verkehrsleistungsstatistik des KBA – bestimmte Entfernungen (bis

50 km, 51 bis 150 km und über 151 km) entsprechend der Definition der Mautfahrt zurückgelegt haben (Tabelle S 1). Insbesondere Fahrzeuge aus den Nachbarstaaten Belgien, Frankreich, Luxemburg und Österreich zeigen hier geografisch bedingt einen durchschnittlich höheren Anteil an Mautfahrten mit einer Entfernung bis 50 bzw. bis 150 km.

Mautfahrzeuge führen innerhalb eines Jahres eine unterschiedliche Anzahl von Mautfahrten durch. Die Tabelle S 2-1 gibt hierzu eine übersichtliche Darstellung unterteilt nach Klassen der Fahrtenanzahlen. Ein besonders hoher Anteil von Mautfahrzeugen, die eher wenige Fahrten (1 bis 9) zurückgelegt haben, ist bei den Ländern Großbritannien und Frankreich zu verzeichnen: über 70 % der Fahrzeuge aus diesen Ländern haben lediglich jeweils 1 bis 9 Fahrten durchgeführt. In Tabelle S 2-2 wird die Frage beantwortet, wie hoch der jeweilige Anteil von Fahrzeugen aus bestimmten Ländern in den dort festgelegten Fahrtenklassen ist. So haben deutsche Fahrzeuge, die im Jahr 2014 jeweils 50 bis 99 Fahrten durchgeführt haben, einen Anteil von 35,2 % gefolgt von Fahrzeugen aus Polen (14,7 %) und aus den Niederlanden (5,5 %).

Mautstatistik

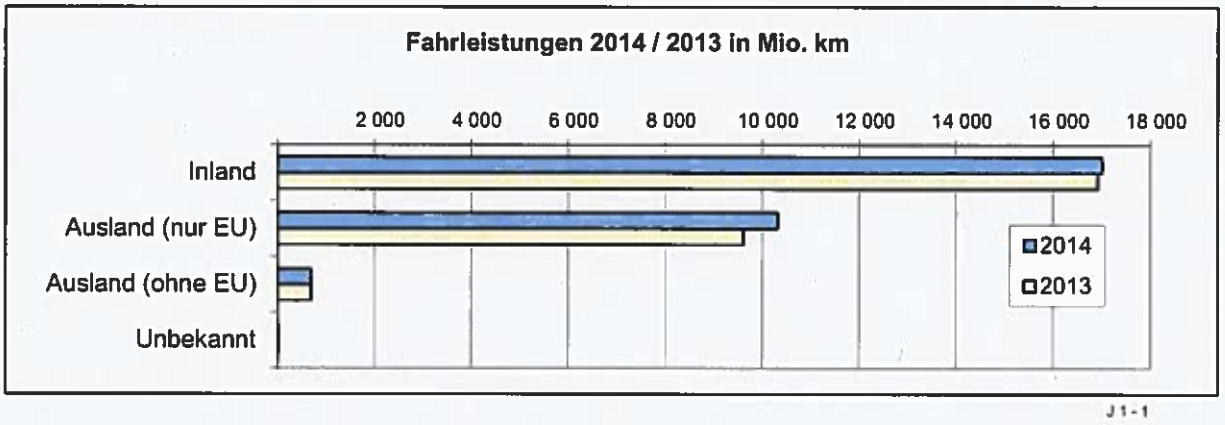
J 1 Fahrleistungen der Mautfahrzeuge nach Nationalität [1)]

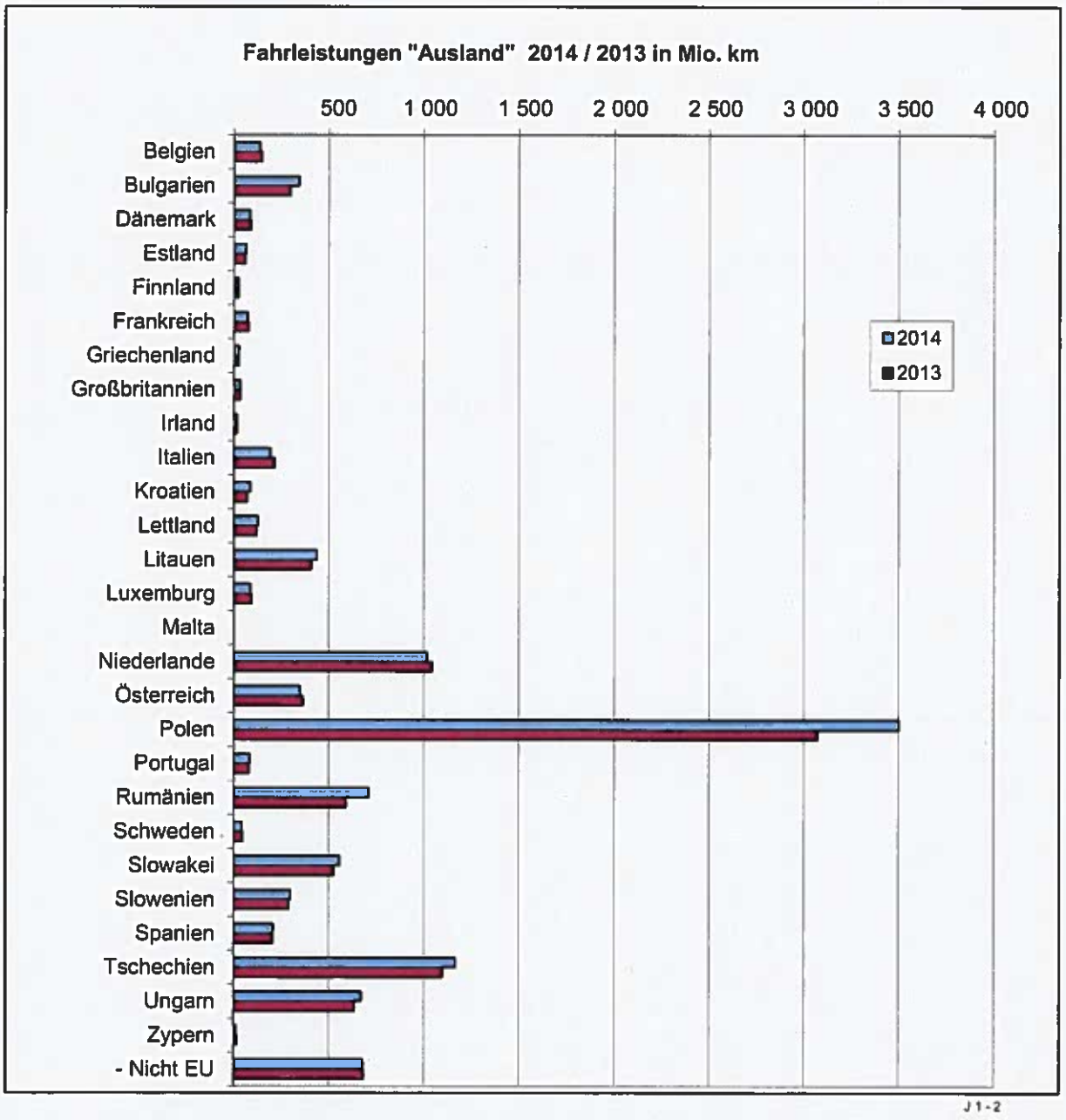
Nationalität	2014		2013		Veränderung zum Vorjahr
	[1000 km]	Anteil in [%]	[1000 km]	Anteil in [%]	[%]
Inland	**17 021 061**	**60,7**	**16 925 367**	**62,2**	**0,6**
Ausland	**10 993 685**	**39,2**	**10 288 421**	**37,8**	**6,9**
- EU	10 315 140	36,8	9 606 532	35,3	7,4
Belgien	136 392	0,5	145 899	0,5	-6,5
Bulgarien	341 066	1,2	294 673	1,1	15,7
Dänemark	81 808	0,3	87 796	0,3	-6,8
Estland	61 945	0,2	56 926	0,2	8,8
Finnland	22 967	0,1	23 555	0,1	-2,5
Frankreich	69 790	0,2	74 945	0,3	-6,9
Griechenland	25 230	0,1	25 182	0,1	0,2
Großbritannien	32 104	0,1	31 088	0,1	3,3
Irland	14 618	0,1	14 202	0,1	2,9
Italien	191 032	0,7	211 262	0,8	-9,6
Kroatien [2)]	85 338	0,3	68 049	0,2	25,4
Lettland	126 152	0,5	119 423	0,4	5,6
Litauen	434 687	1,6	406 815	1,5	6,9
Luxemburg	87 040	0,3	92 137	0,3	-5,5
Malta	1 357	0,0	1 274	0,0	6,5
Niederlande	1 015 925	3,6	1 044 462	3,8	-2,7
Österreich	347 841	1,2	362 583	1,3	-4,1
Polen	3 503 261	12,5	3 072 236	11,3	14,0
Portugal	82 216	0,3	78 759	0,3	4,4
Rumänien	709 307	2,5	589 978	2,2	20,2
Schweden	40 321	0,1	45 920	0,2	-12,2
Slowakei	556 503	2,0	524 656	1,9	6,1
Slowenien	296 421	1,1	285 060	1,0	4,0
Spanien	203 152	0,7	203 345	0,7	-0,1
Tschechien	1 168 397	4,2	1 098 882	4,0	6,3
Ungarn	669 340	2,4	634 340	2,3	5,5
Zypern	10 930	0,0	13 084	0,0	-16,5
- Nicht EU	678 545	2,4	681 889	2,5	-0,5
Unbekannt	**17 186**	**0,1**	**15 464**	**0,1**	**11,1**
Gesamt	28 031 933		27 229 252		2,9

[1)] Der Begriff Mautfahrzeug ist in den Methodischen Erläuterungen definiert.
[2)] Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU

Mautstatistik

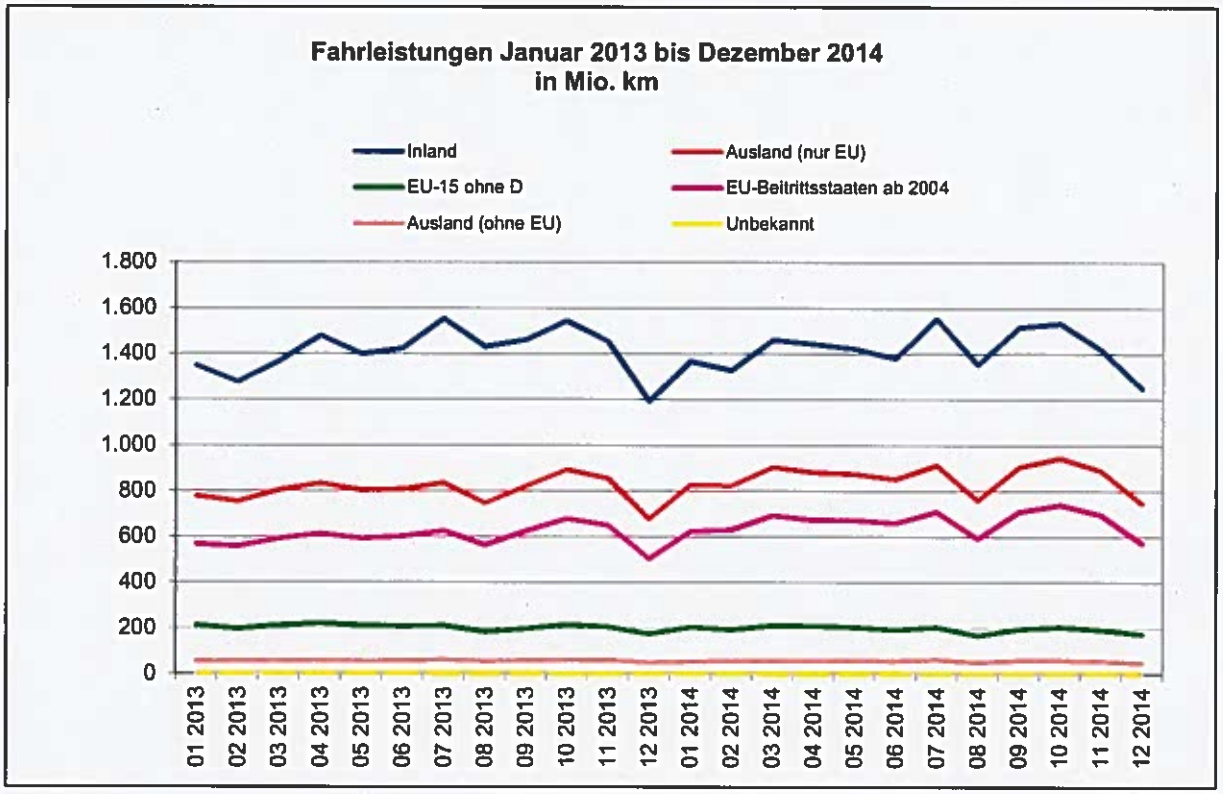
J 1 Fahrleistungen der Mautfahrzeuge nach Nationalität



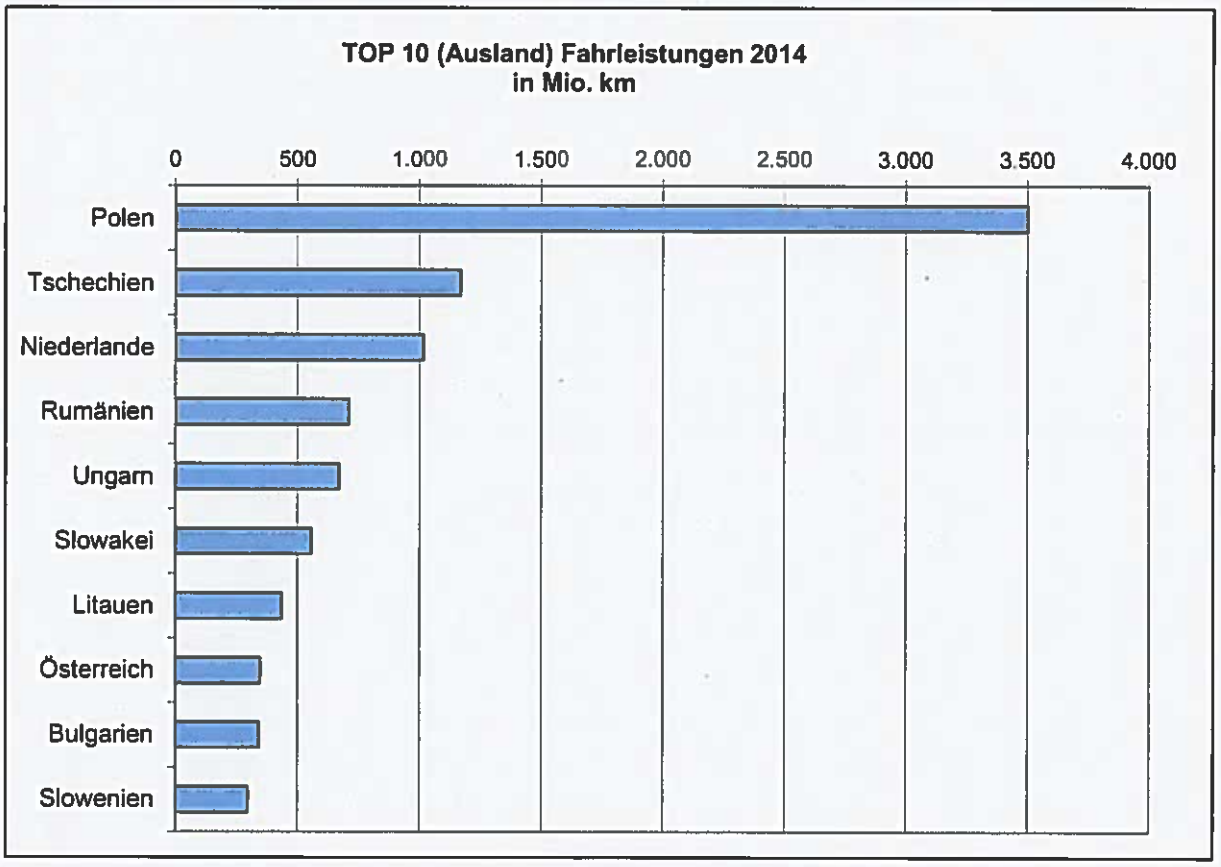


Mautstatistik

J 1 Fahrleistungen der Mautfahrzeuge nach Nationalität



J 1 - 3



J 1 - 4

Mautstatistik

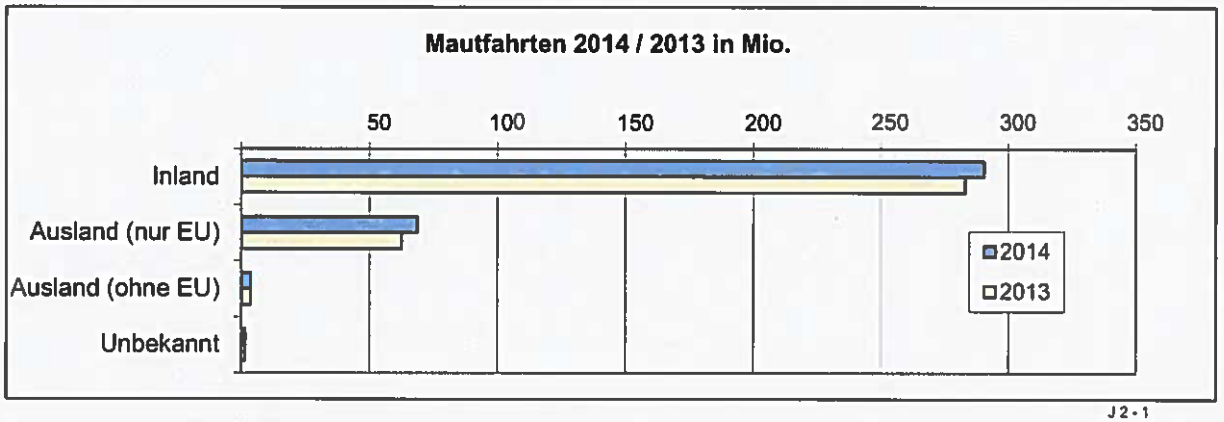
J 2 Mautfahrten der Mautfahrzeuge nach Nationalität [1]

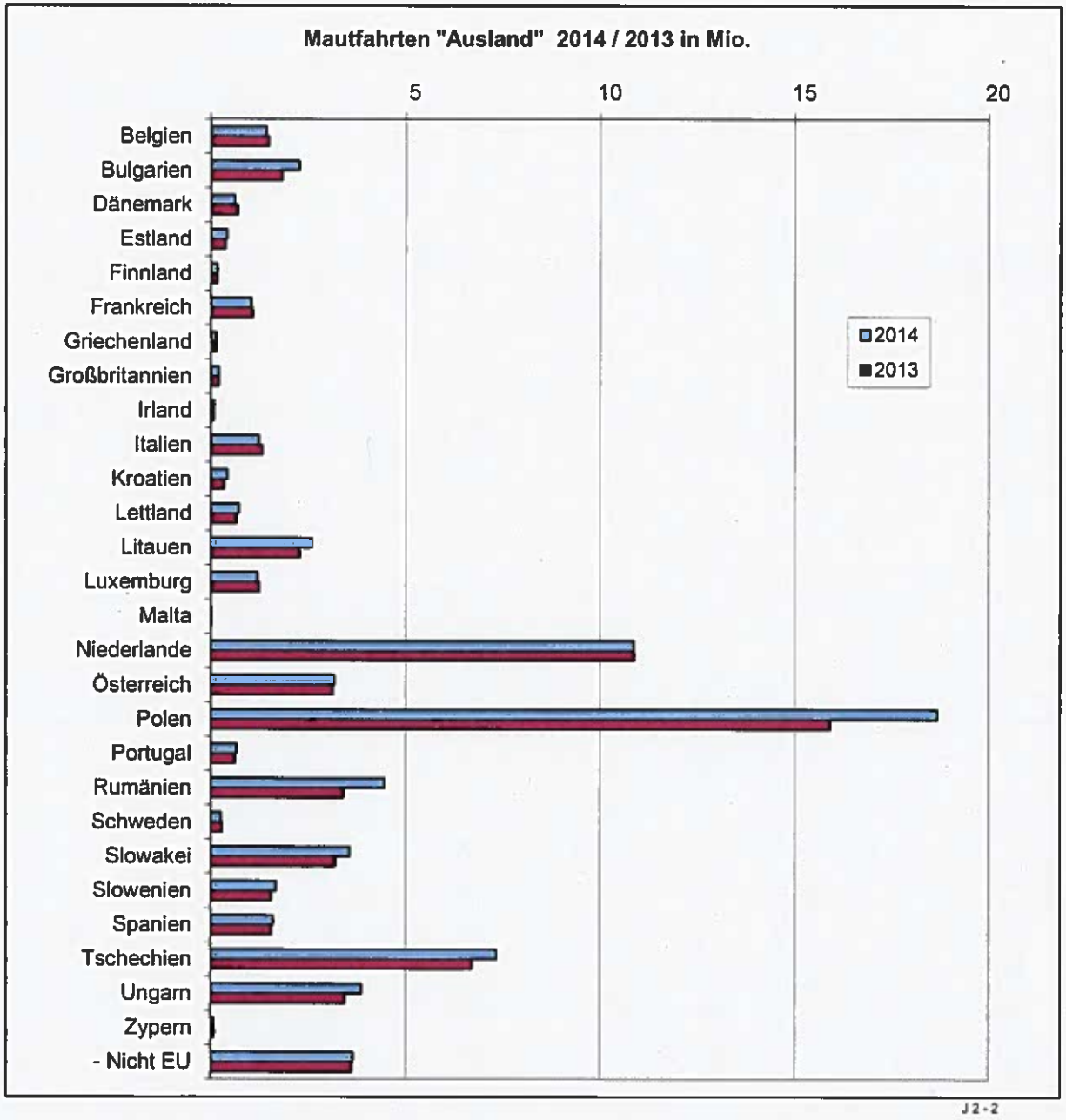
Nationalität	2014		2013		Veränderung zum Vorjahr
	[Anzahl]	Anteil in [%]	[Anzahl]	Anteil in [%]	[%]
Inland	**290 495 331**	**79,8**	**283 028 255**	**80,7**	**2,6**
Ausland	**72 261 286**	**19,8**	**66 112 638**	**18,9**	**9,3**
- EU	68 625 173	18,8	62 500 787	17,8	9,8
Belgien	1 410 513	0,4	1 472 024	0,4	-4,2
Bulgarien	2 255 776	0,6	1 811 430	0,5	24,5
Dänemark	607 195	0,2	684 998	0,2	-11,4
Estland	410 543	0,1	369 524	0,1	11,1
Finnland	165 414	0,0	160 085	0,0	3,3
Frankreich	1 036 313	0,3	1 069 383	0,3	-3,1
Griechenland	133 795	0,0	132 478	0,0	1,0
Großbritannien	194 224	0,1	192 303	0,1	1,0
Irland	85 168	0,0	83 204	0,0	2,4
Italien	1 237 614	0,3	1 314 415	0,4	-5,8
Kroatien [2]	432 690	0,1	327 194	0,1	32,2
Lettland	717 232	0,2	659 131	0,2	8,8
Litauen	2 587 585	0,7	2 268 392	0,6	14,1
Luxemburg	1 201 322	0,3	1 240 553	0,4	-3,2
Malta	9 795	0,0	9 107	0,0	7,6
Niederlande	10 862 422	3,0	10 873 777	3,1	-0,1
Österreich	3 167 716	0,9	3 131 468	0,9	1,2
Polen	18 676 793	5,1	15 911 720	4,5	17,4
Portugal	660 085	0,2	616 154	0,2	7,1
Rumänien	4 445 239	1,2	3 406 079	1,0	30,5
Schweden	262 206	0,1	288 777	0,1	-9,2
Slowakei	3 556 122	1,0	3 183 060	0,9	11,7
Slowenien	1 667 542	0,5	1 535 420	0,4	8,6
Spanien	1 584 788	0,4	1 544 406	0,4	2,6
Tschechien	7 332 639	2,0	6 697 260	1,9	9,5
Ungarn	3 861 132	1,1	3 437 423	1,0	12,3
Zypern	63 310	0,0	81 022	0,0	-21,9
- Nicht EU	3 636 113	1,0	3 611 851	1,0	0,7
Unbekannt	**1 494 659**	**0,4**	**1 581 756**	**0,5**	**-5,5**
Gesamt	364 251 276		350 722 649		3,9

[1] Die Begriffe Mautfahrzeug und Mautfahrten sind in den Methodischen Erläuterungen definiert.
[2] Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU.

Mautstatistik

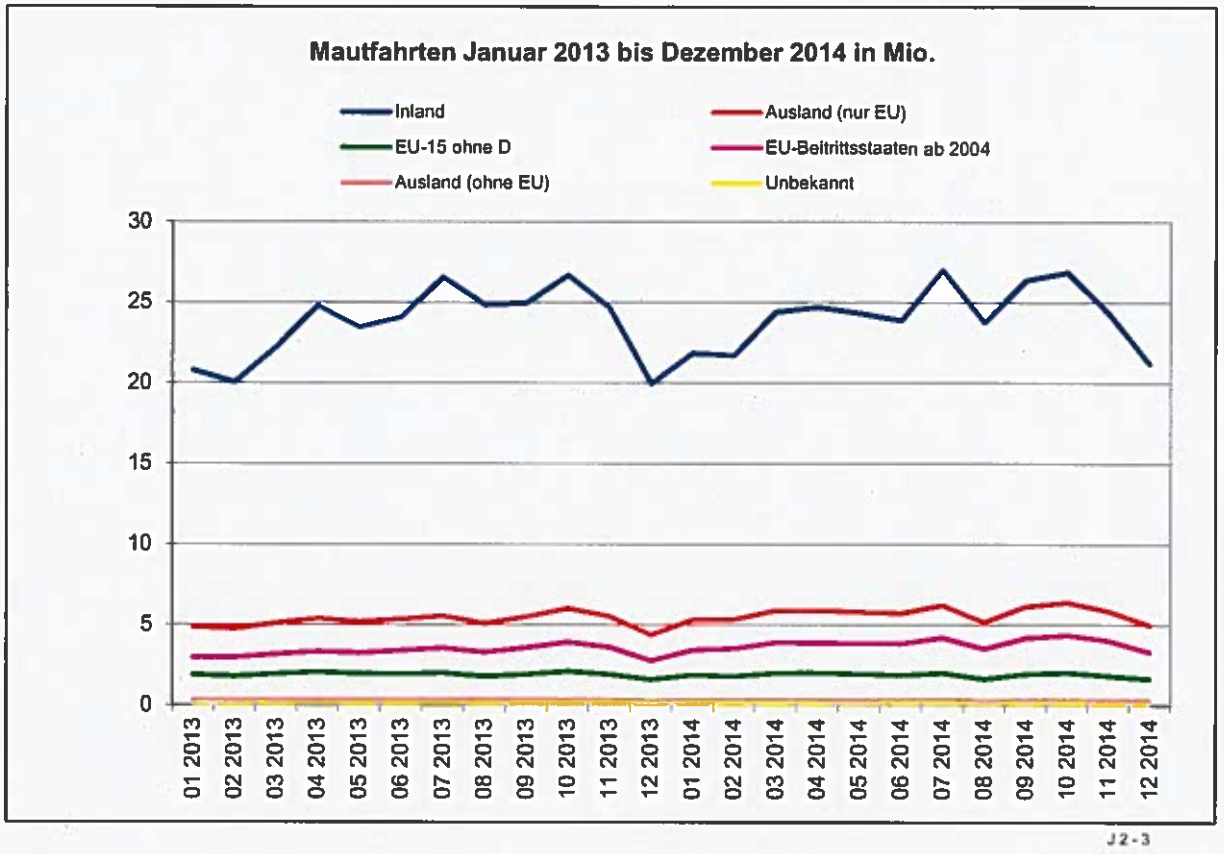
J 2 Mautfahrten der Mautfahrzeuge nach Nationalität

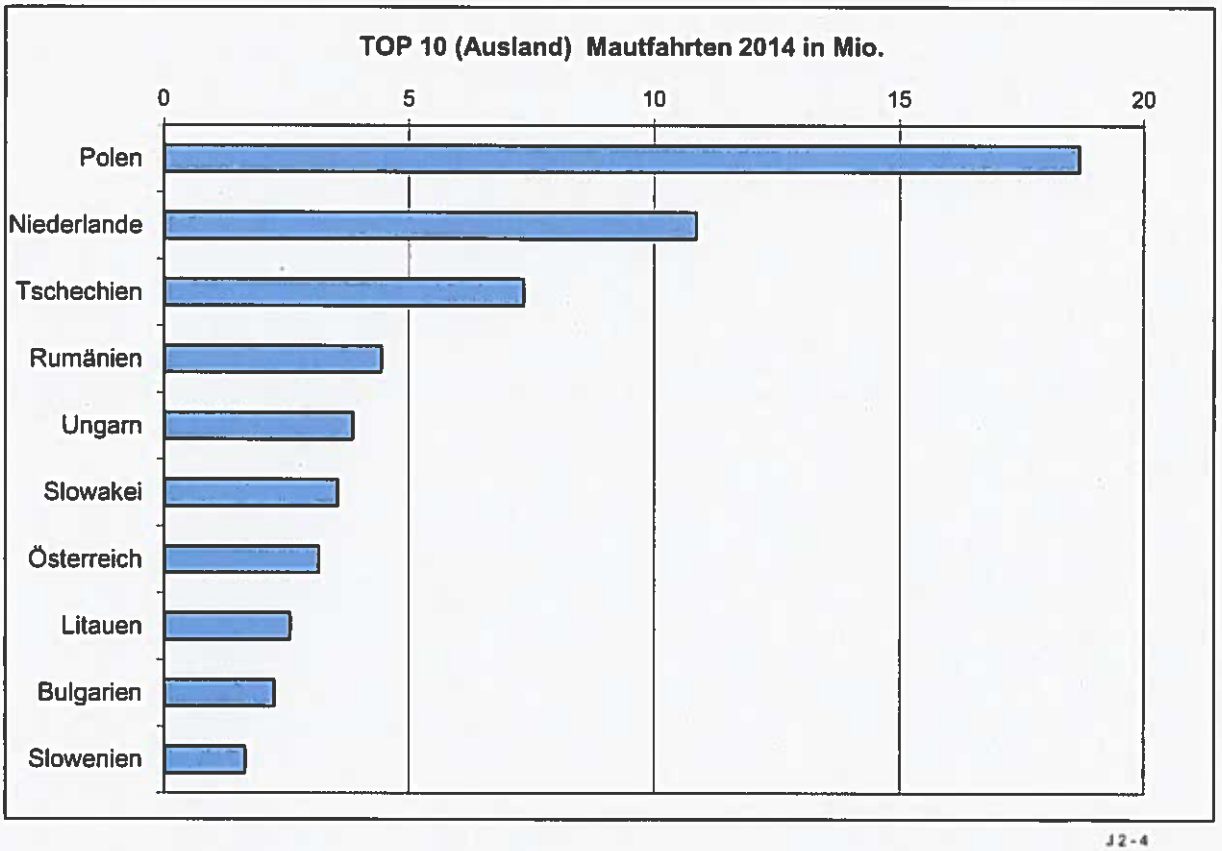




Mautstatistik

J 2 Mautfahrten der Mautfahrzeuge nach Nationalität





Mautstatistik

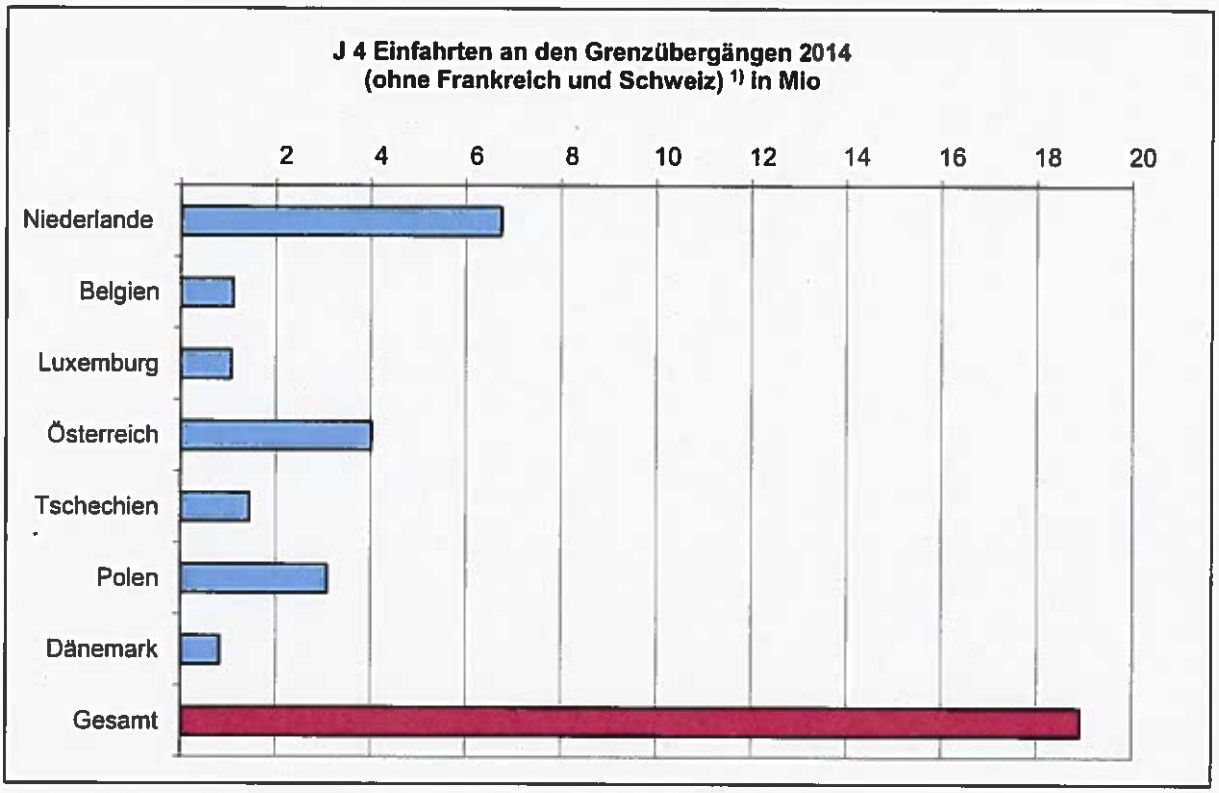
J 3 Anzahl der ein- und ausfahrenden Mautfahrzeuge an den Grenzübergängen [1)]

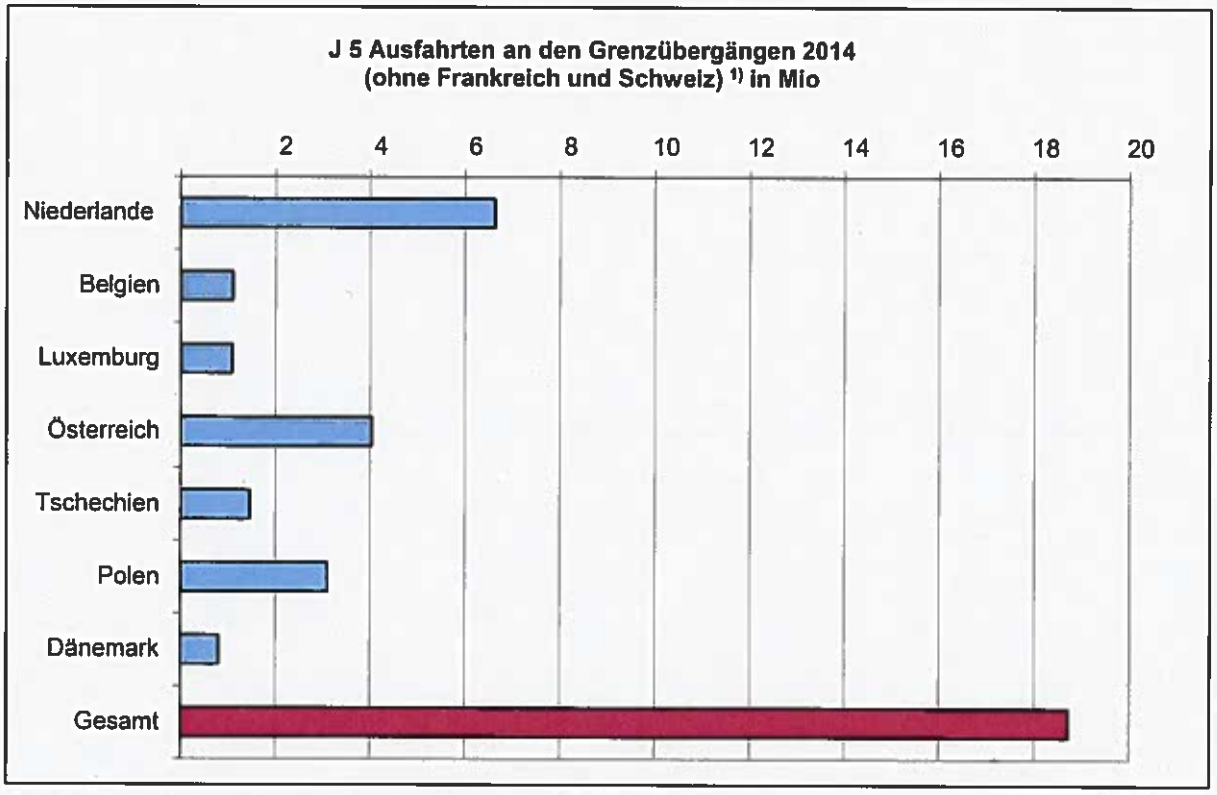
Grenzübergang	2014		2013		Veränderung zum Vorjahr
	[Kfz]	Anteil in [%]	[Kfz]	Anteil in [%]	[%]
Niederlande	**13 373 479**	**35,5**	**12 832 560**	**35,5**	**4,2**
A280 Bunde	439 981	1,2	440 463	1,2	-0,1
A30 Bad Bentheim	2 033 491	5,4	1 979 950	5,5	2,7
A3 Elten	1 328 075	3,5	1 282 686	3,5	3,5
A57 Goch	789 838	2,1	763 716	2,1	3,4
A40 Straelen	3 448 115	9,2	3 322 811	9,2	3,8
A61 Schwanenhaus	1 705 891	4,5	1 543 246	4,3	10,5
A52 Elmpt	599 548	1,6	580 355	1,6	3,3
A4 Vetschau	1 973 854	5,2	1 908 042	5,3	3,4
B402 Hebelermeer	1 054 686	2,8	1 011 291	2,8	4,3
Belgien	**2 202 692**	**5,9**	**2 140 174**	**5,9**	**2,9**
A44 Lichtenbusch	1 787 754	4,7	1 755 239	4,9	1,9
A60 Steinebrück	414 938	1,1	384 935	1,1	7,8
Luxemburg	**2 154 082**	**5,7**	**2 126 947**	**5,9**	**1,3**
A64 Sauertalbrücke	1 310 211	3,5	1 281 929	3,5	2,2
A8 Perl	843 871	2,2	845 018	2,3	-0,1
Frankreich	**769 093**	**2,0**	**806 923**	**2,2**	**-4,7**
B9 Lauterburg	769 093	2,0	806 923	2,2	-4,7
Schweiz	**371 559**	**1,0**	**374 296**	**1,0**	**-0,7**
A861 Rheinfelden	371 559	1,0	374 296	1,0	-0,7
Österreich	**8 055 364**	**21,4**	**7 787 318**	**21,5**	**3,4**
A96 Lindau	1 126 962	3,0	1 108 649	3,1	1,7
A93 Kiefersfelden	2 295 582	6,1	2 217 490	6,1	3,5
A8 Bad Reichenhall	1 686 110	4,5	1 651 166	4,6	2,1
A3 Suben	2 756 710	7,3	2 635 487	7,3	4,6
A7 Füssen	190 000	0,5	174 526	0,5	8,9
Tschechien	**2 911 340**	**7,7**	**2 769 264**	**7,7**	**5,1**
A6 Waidhaus	1 452 840	3,9	1 376 503	3,8	5,5
A17 Breitenau	1 458 500	3,9	1 392 761	3,9	4,7
Polen	**6 176 922**	**16,4**	**5 750 003**	**15,9**	**7,4**
A4 Görlitz	1 564 698	4,2	1 398 065	3,9	11,9
A15 Forst	875 750	2,3	823 332	2,3	6,4
A12 Frankfurt/Oder	3 170 328	8,4	2 981 695	8,2	6,3
A11 Pomellen	566 146	1,5	546 911	1,5	3,5
Dänemark	**1 625 456**	**4,3**	**1 568 503**	**4,3**	**3,6**
A7 Ellund	1 609 699	4,3	1 553 538	4,3	3,6
B200 Kupfermühle	15 757	0,0	14 965	0,0	5,3
Gesamt	37 639 987		36 155 988		

[1)] Der Begriff Mautfahrzeug ist in den Methodischen Erläuterungen definiert.

Mautstatistik

J 3 Anzahl der ein- und ausfahrenden Mautfahrzeuge an den Grenzübergängen

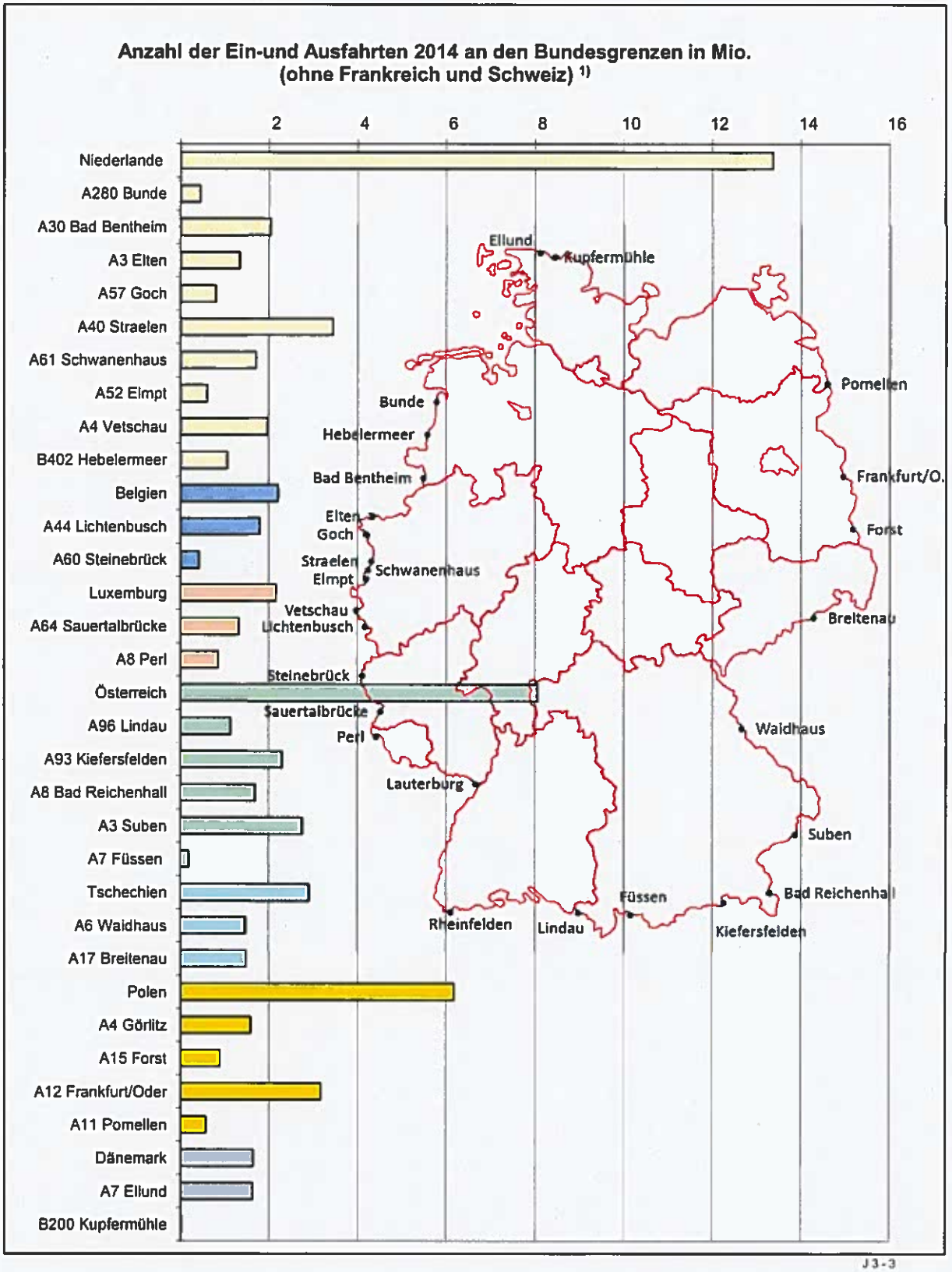




1) Auf die grafische Darstellung der Grenzübergänge zu Frankreich und der Schweiz wurde verzichtet. Zu beiden Ländern bestehen Autobahngrenzübergänge, die nicht mautpflichtig sind.

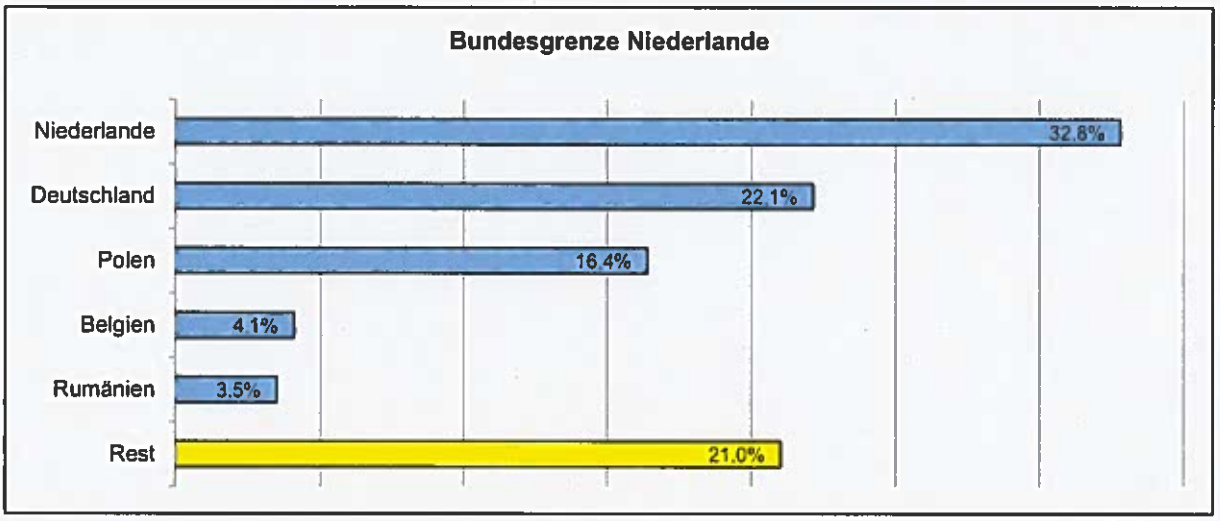
Mautstatistik

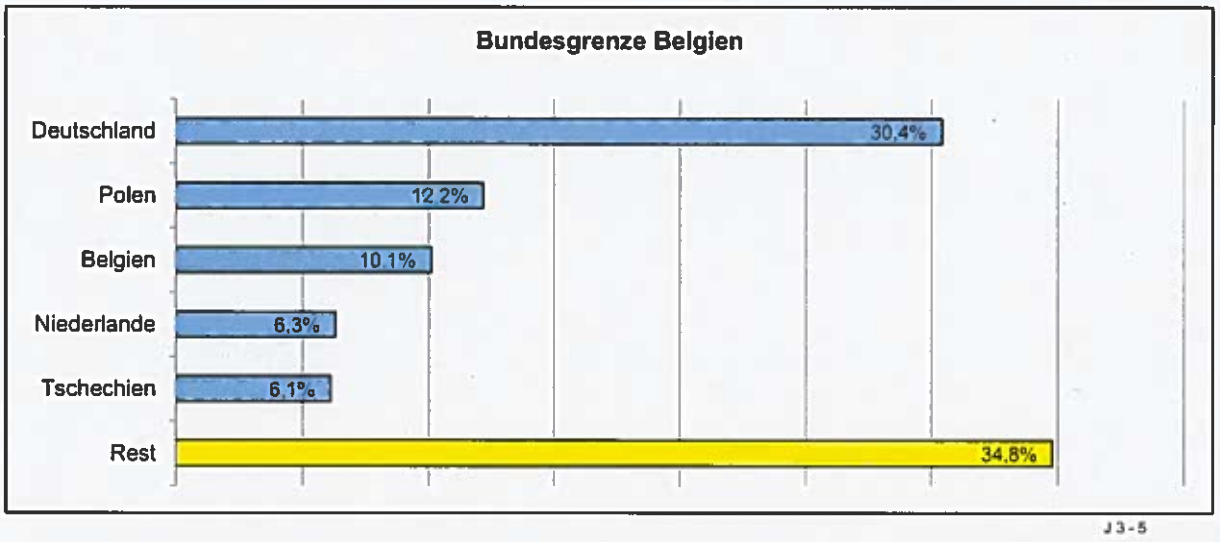
J 3 Anzahl der ein- und ausfahrenden Mautfahrzeuge an den Grenzübergängen

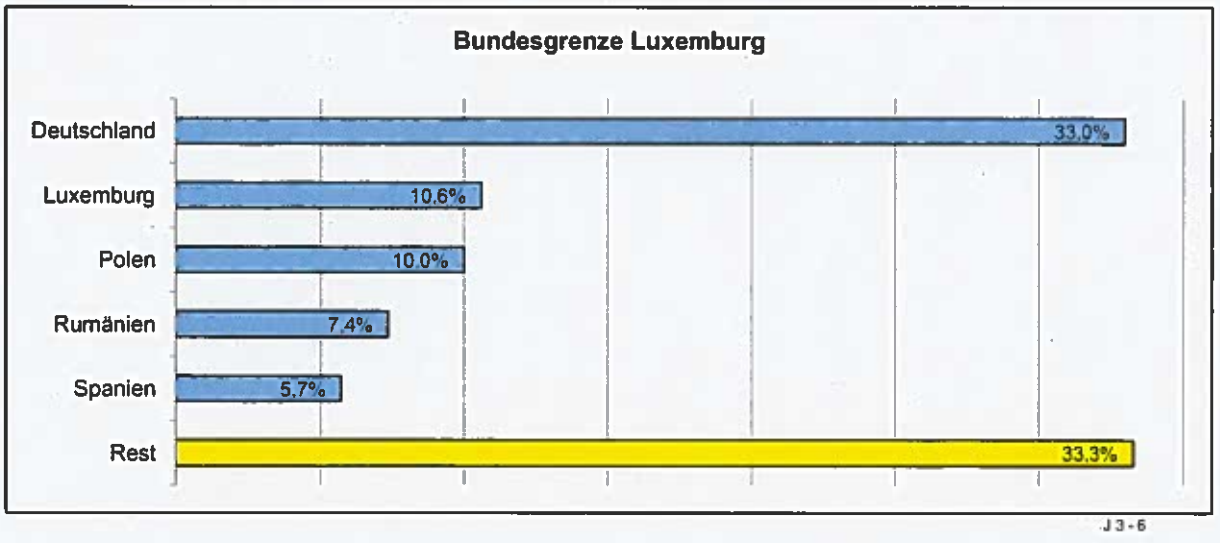


Mautstatistik

J 3a Die stärksten Nationen der ein- und ausfahrenden Mautfahrzeuge an den Bundesgrenzen

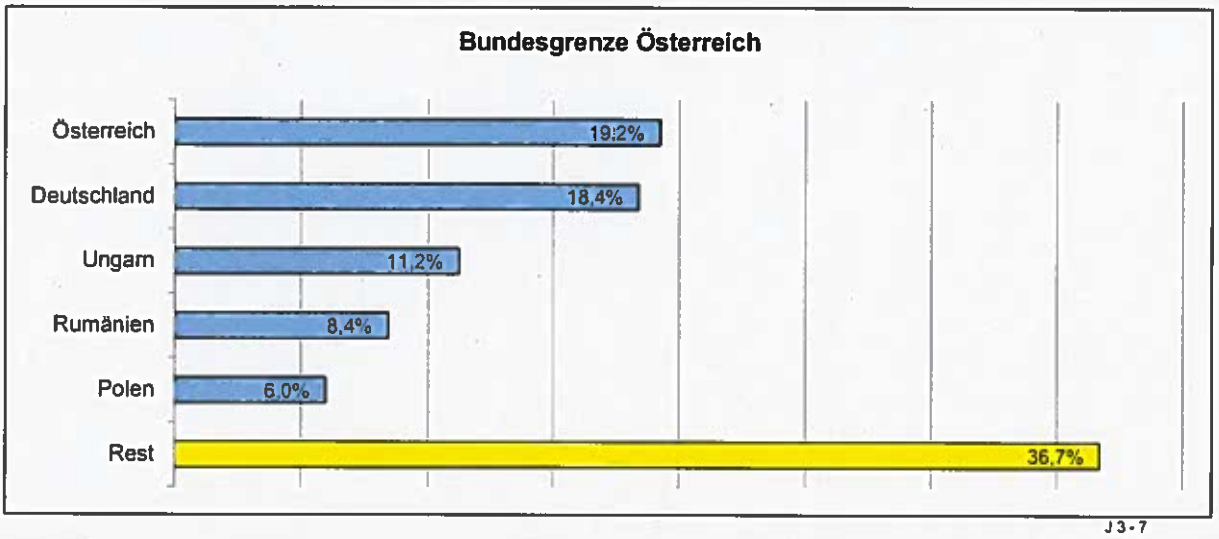


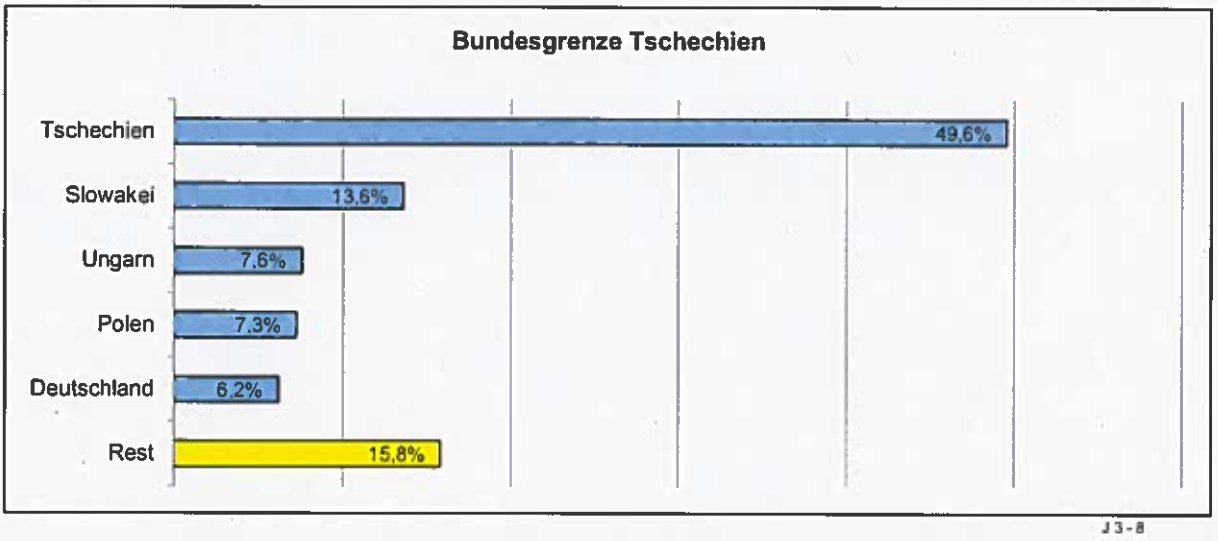


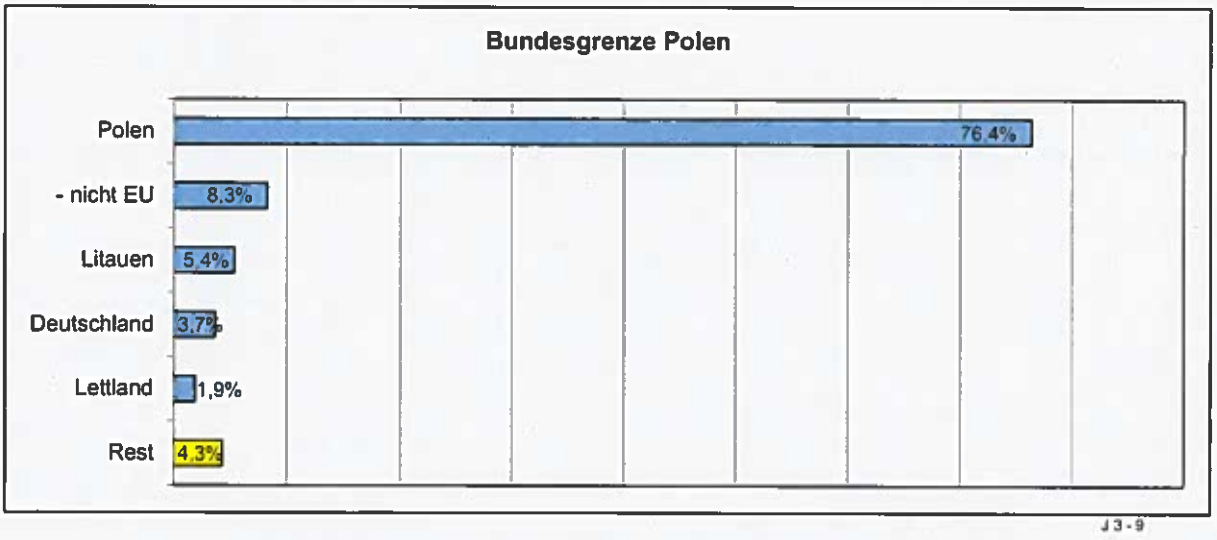


Mautstatistik

J 3a Die stärksten Nationen der ein- und ausfahrenden Mautfahrzeuge an den Bundesgrenzen

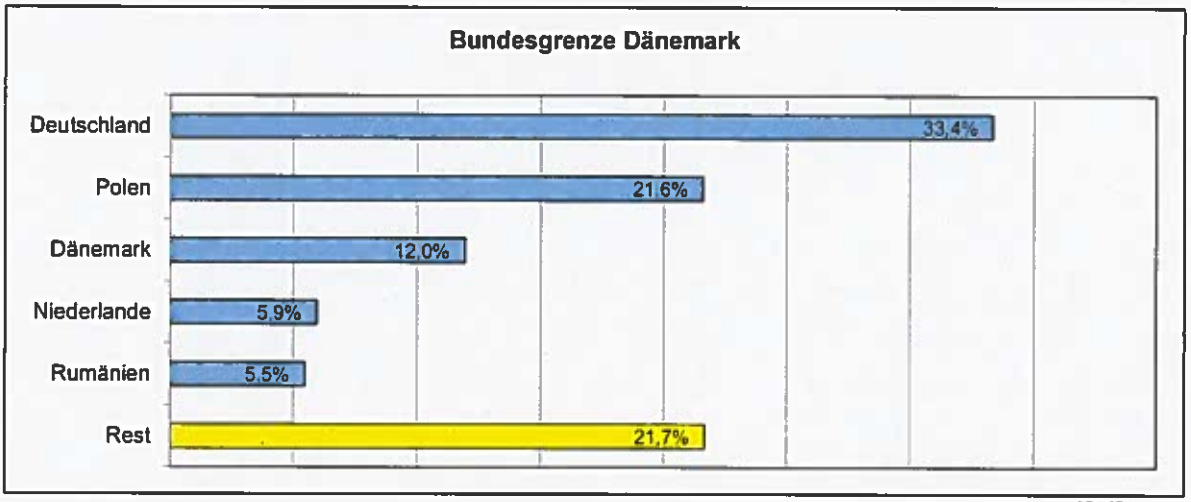


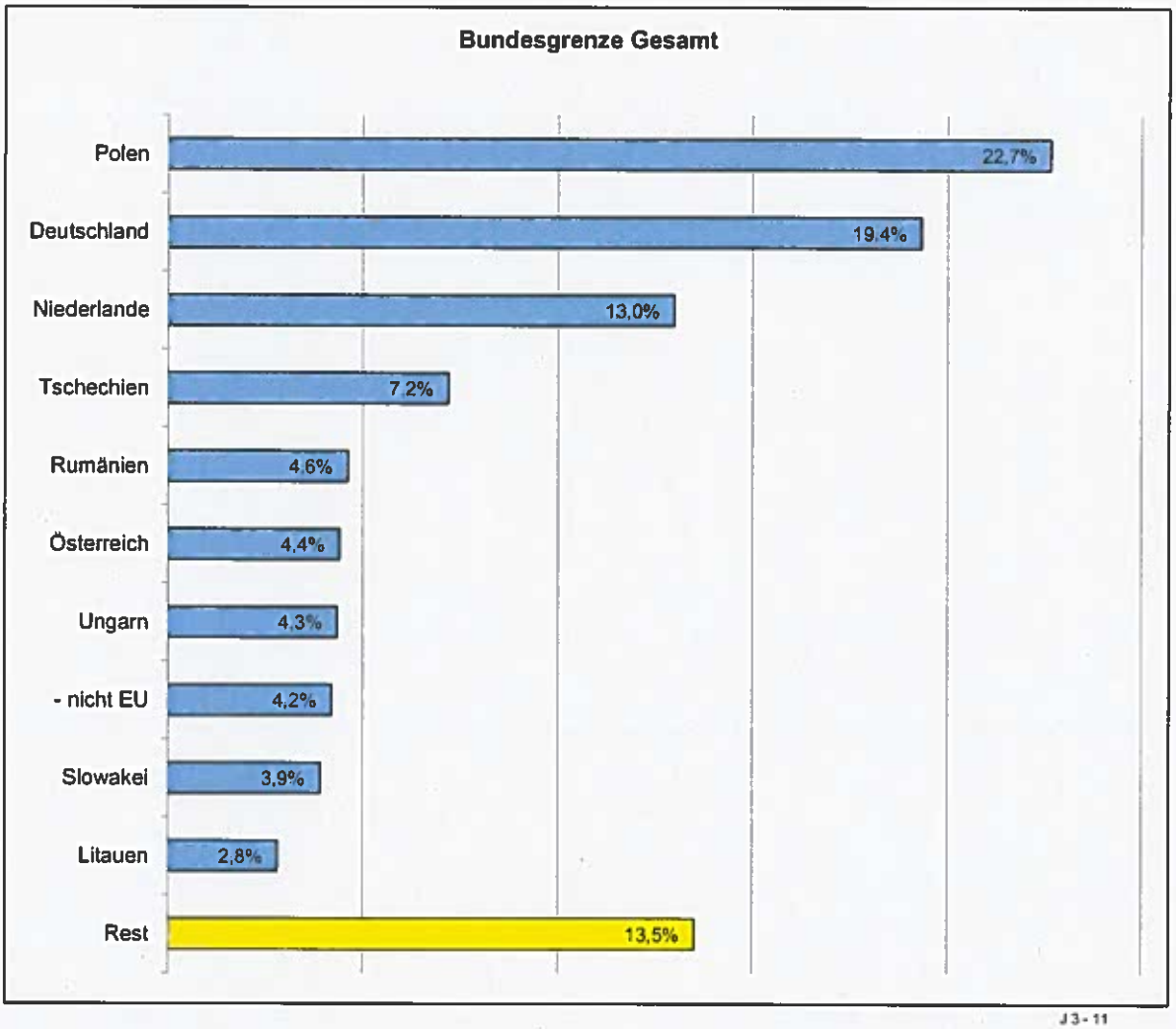




Mautstatistik

J 3a Die stärksten Nationen der ein- und ausfahrenden Mautfahrzeuge an den Bundesgrenzen





Mautstatistik

J 4 Anzahl der einfahrenden Mautfahrzeuge an den Grenzübergängen [1)]

Grenzübergang	2014		2013		Veränderung zum Vorjahr
	[Kfz]	Anteil in [%]	[Kfz]	Anteil in [%]	[%]
Niederlande	**6 743 556**	**35,7**	**6 460 510**	**35,6**	**4,4**
A280 Bunde	222 207	1,2	221 807	1,2	0,2
A30 Bad Bentheim	1 035 160	5,5	1 011 669	5,6	2,3
A3 Elten	675 707	3,6	648 072	3,6	4,3
A57 Goch	395 515	2,1	380 555	2,1	3,9
A40 Straelen	1 728 325	9,1	1 673 693	9,2	3,3
A61 Schwanenhaus	869 931	4,6	774 426	4,3	12,3
A52 Elmpt	307 267	1,6	293 138	1,6	4,8
A4 Vetschau	985 591	5,2	950 788	5,2	3,7
B402 Hebelermeer	523 853	2,8	506 362	2,8	3,5
Belgien	**1 100 645**	**5,8**	**1 070 145**	**5,9**	**2,9**
A44 Lichtenbusch	898 124	4,7	882 805	4,9	1,7
A60 Steinebrück	202 521	1,1	187 340	1,0	8,1
Luxemburg	**1 063 762**	**5,6**	**1 051 788**	**5,8**	**1,1**
A64 Sauertalbrücke	675 440	3,6	658 274	3,6	2,6
A8 Perl	388 322	2,1	393 514	2,2	-1,3
Frankreich	**407 282**	**2,2**	**412 345**	**2,3**	**-1,2**
B9 Lauterburg	407 282	2,2	412 345	2,3	-1,2
Schweiz	**224 166**	**1,2**	**221 244**	**1,2**	**1,3**
A861 Rheinfelden	224 166	1,2	221 244	1,2	1,3
Österreich	**4 016 047**	**21,2**	**3 883 561**	**21,4**	**3,4**
A96 Lindau	575 835	3,0	566 072	3,1	1,7
A93 Kiefersfelden	1 132 788	6,0	1 094 811	6,0	3,5
A8 Bad Reichenhall	872 113	4,6	853 440	4,7	2,2
A3 Suben	1 337 253	7,1	1 280 338	7,1	4,4
A7 Füssen	98 058	0,5	88 900	0,5	10,3
Tschechien	**1 449 209**	**7,7**	**1 372 296**	**7,6**	**5,6**
A6 Waidhaus	745 909	3,9	703 026	3,9	6,1
A17 Breitenau	703 300	3,7	669 270	3,7	5,1
Polen	**3 083 679**	**16,3**	**2 857 786**	**15,8**	**7,9**
A4 Görlitz	742 050	3,9	668 980	3,7	10,9
A15 Forst	507 987	2,7	471 013	2,6	7,8
A12 Frankfurt/Oder	1 528 720	8,1	1 428 373	7,9	7,0
A11 Pomellen	304 922	1,6	289 420	1,6	5,4
Dänemark	**825 599**	**4,4**	**797 246**	**4,4**	**3,6**
A7 Ellund	818 323	4,3	789 994	4,4	3,6
B200 Kupfermühle	7 276	0,0	7 252	0,0	0,3
Gesamt	18 913 945		18 126 921		

[1)] Der Begriff Mautfahrzeug ist in den Methodischen Erläuterungen definiert.

Mautstatistik

J 5 Anzahl der ausfahrenden Mautfahrzeuge an den Grenzübergängen [1)]

Grenzübergang	2014		2013		Veränderung zum Vorjahr
	[Kfz]	Anteil in [%]	[Kfz]	Anteil in [%]	[%]
Niederlande	**6 629 923**	**35,4**	**6 372 050**	**35,3**	**4,0**
A280 Bunde	217 774	1,2	218 656	1,2	-0,4
A30 Bad Bentheim	998 331	5,3	968 281	5,4	3,1
A3 Elten	652 368	3,5	634 614	3,5	2,8
A57 Goch	394 323	2,1	383 161	2,1	2,9
A40 Straelen	1 719 790	9,2	1 649 118	9,1	4,3
A61 Schwanenhaus	835 960	4,5	768 820	4,3	8,7
A52 Elmpt	292 281	1,6	287 217	1,6	1,8
A4 Vetschau	988 263	5,3	957 254	5,3	3,2
B402 Hebelermeer	530 833	2,8	504 929	2,8	5,1
Belgien	**1 102 047**	**5,9**	**1 070 029**	**5,9**	**3,0**
A44 Lichtenbusch	889 630	4,8	872 434	4,8	2,0
A60 Steinebrück	212 417	1,1	197 595	1,1	7,5
Luxemburg	**1 090 320**	**5,8**	**1 075 159**	**6,0**	**1,4**
A64 Sauertalbrücke	634 771	3,4	623 655	3,5	1,8
A8 Perl	455 549	2,4	451 504	2,5	0,9
Frankreich	**361 811**	**1,9**	**394 578**	**2,2**	**-8,3**
B9 Lauterburg	361 811	1,9	394 578	2,2	-8,3
Schweiz	**147 393**	**0,8**	**153 052**	**0,8**	**-3,7**
A861 Rheinfelden	147 393	0,8	153 052	0,8	-3,7
Österreich	**4 039 317**	**21,6**	**3 903 757**	**21,7**	**3,5**
A96 Lindau	551 127	2,9	542 577	3,0	1,6
A93 Kiefersfelden	1 162 794	6,2	1 122 679	6,2	3,6
A8 Bad Reichenhall	813 997	4,3	797 726	4,4	2,0
A3 Suben	1 419 457	7,6	1 355 149	7,5	4,7
A7 Füssen	91 942	0,5	85 626	0,5	7,4
Tschechien	**1 462 131**	**7,8**	**1 396 968**	**7,7**	**4,7**
A6 Waidhaus	706 931	3,8	673 477	3,7	5,0
A17 Breitenau	755 200	4,0	723 491	4,0	4,4
Polen	**3 093 243**	**16,5**	**2 892 217**	**16,0**	**7,0**
A4 Görlitz	822 648	4,4	729 085	4,0	12,8
A15 Forst	367 763	2,0	352 319	2,0	4,4
A12 Frankfurt/Oder	1 641 608	8,8	1 553 322	8,6	5,7
A11 Pomellen	261 224	1,4	257 491	1,4	1,4
Dänemark	**799 857**	**4,3**	**771 257**	**4,3**	**3,7**
A7 Ellund	791 376	4,2	763 544	4,2	3,6
B200 Kupfermühle	8 481	0,0	7 713	0,0	10,0
Gesamt	18 726 042		18 029 067		

[1)] Der Begriff Mautfahrzeug ist in den Methodischen Erläuterungen definiert.

Mautstatistik

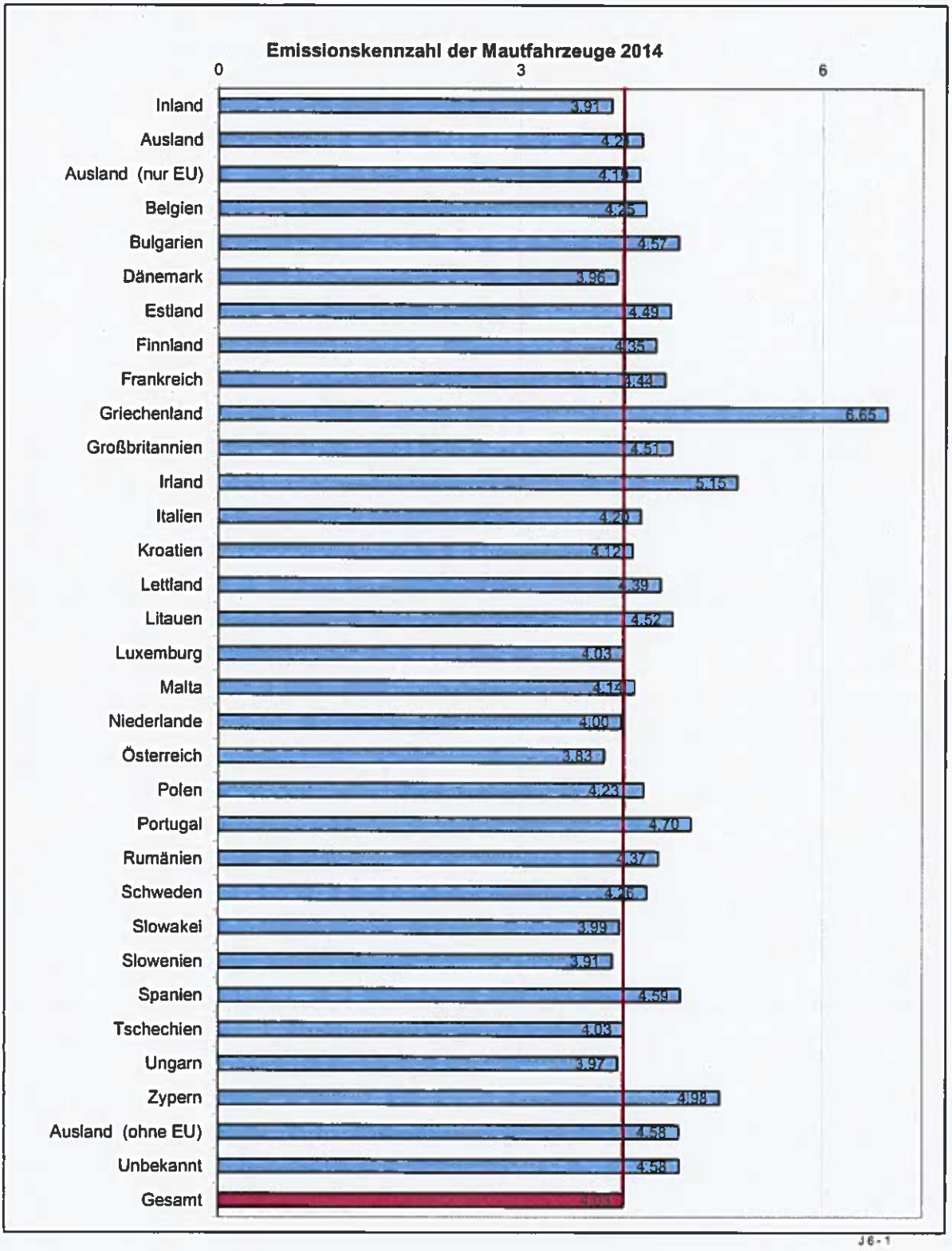
J 6 Emissionskennzahl der Mautfahrzeuge nach Nationalität [1]

Nationalität	2014		2013		Veränderung zum Vorjahr
	[g/kWh]	Anteil in [%] [2]	[g/kWh]	Anteil in [%] [2]	[%]
Inland	**3,91**	**60,7**	**4,28**	**62,2**	**-8,8**
Ausland	**4,21**	**39,2**	**4,59**	**37,8**	**-8,4**
- EU	4,19	36,8	4,57	35,3	-8,5
Belgien	4,25	0,5	4,64	0,5	-8,4
Bulgarien	4,57	1,2	4,89	1,1	-6,5
Dänemark	3,96	0,3	4,34	0,3	-8,7
Estland	4,49	0,2	4,94	0,2	-9,2
Finnland	4,35	0,1	4,80	0,1	-9,4
Frankreich	4,44	0,2	4,83	0,3	-8,2
Griechenland	6,65	0,1	7,07	0,1	-6,0
Großbritannien	4,51	0,1	5,05	0,1	-10,8
Irland	5,15	0,1	5,50	0,1	-6,3
Italien	4,20	0,7	4,54	0,8	-7,6
Kroatien [3]	4,12	0,3	4,44	0,2	-7,2
Lettland	4,39	0,5	4,68	0,4	-6,2
Litauen	4,52	1,6	4,88	1,5	-7,4
Luxemburg	4,03	0,3	4,35	0,3	-7,5
Malta	4,14	0,0	4,51	0,0	-8,3
Niederlande	4,00	3,6	4,41	3,8	-9,3
Österreich	3,83	1,2	4,21	1,3	-9,0
Polen	4,23	12,5	4,61	11,3	-8,3
Portugal	4,70	0,3	5,14	0,3	-8,7
Rumänien	4,37	2,5	4,85	2,2	-9,8
Schweden	4,26	0,1	4,74	0,2	-10,2
Slowakei	3,99	2,0	4,38	1,9	-9,0
Slowenien	3,91	1,1	4,28	1,0	-8,5
Spanien	4,59	0,7	5,00	0,7	-8,2
Tschechien	4,03	4,2	4,48	4,0	-10,0
Ungarn	3,97	2,4	4,31	2,3	-8,0
Zypern	4,98	0,0	5,40	0,0	-7,7
- Nicht EU	4,58	2,4	4,89	2,5	-6,4
Unbekannt	**4,58**	**0,1**	**5,37**	**0,1**	**-14,8**
Gesamt	4,03		4,40		-8,5

[1] Die Begriffe Mautfahrzeug und Emissionskennzahl sind in den Methodischen Erläuterungen definiert.
[2] Anteil an der Gesamtfahrleistung (s. Tabelle J1).
[3] Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU.

Mautstatistik

J 6 Emissionskennzahl der Mautfahrzeuge nach Nationalität



Mautstatistik

J 7 Fahrleistungen der Mautfahrzeuge nach Herkunft und Emissionsklasse [1)] Seite 1

Herkunft	2014		2013		Veränderung zum Vorjahr
	[1000 km]	Anteil in [%]	[1000 km]	Anteil in [%]	[%]
Gesamt					
Inland	**17 021 061**	**60,7**	**16 925 367**	**62,2**	**0,6**
Ausland	**10 993 685**	**39,2**	**10 288 421**	**37,8**	**6,9**
- EU	10 315 140	36,8	9 606 532	35,3	7,4
- Nicht EU	678 545	2,4	681 889	2,5	-0,5
Unbekannt	**17 186**	**0,1**	**15 464**	**0,1**	**11,1**
Gesamt	28 031 933		27 229 252		2,9
Schadstoffklasse S1 oder ohne Zuordnung nach STVZO					
Inland	**18 121**	**83,1**	**23 566**	**82,2**	**-23,1**
Ausland	**3 450**	**15,8**	**4 784**	**16,7**	**-27,9**
- EU	2 800	12,8	3 881	13,5	-27,8
- Nicht EU	650	3,0	903	3,1	-28,0
Unbekannt	**245**	**1,1**	**312**	**1,1**	**-21,5**
Gesamt	21 816		28 662		-23,9
Schadstoffklasse S2 nach STVZO					
Inland	**74 284**	**77,2**	**106 962**	**75,1**	**-30,6**
Ausland	**21 353**	**22,2**	**34 641**	**24,3**	**-38,4**
- EU	19 346	20,1	31 066	21,8	-37,7
- Nicht EU	2 007	2,1	3 575	2,5	-43,9
Unbekannt	**523**	**0,5**	**828**	**0,6**	**-36,8**
Gesamt	96 160		142 431		-32,5
Schadstoffklasse S3 nach STVZO					
Inland	**629 133**	**41,1**	**984 276**	**41,9**	**-36,1**
Ausland	**901 131**	**58,8**	**1 362 761**	**58,0**	**-33,9**
- EU	803 952	52,5	1 224 282	52,1	-34,3
- Nicht EU	97 180	6,3	138 480	5,9	-29,8
Unbekannt	**1 741**	**0,1**	**2 304**	**0,1**	**-24,4**
Gesamt	1 532 005		2 349 340		-34,8

[1)] Der Begriff Mautfahrzeug ist in den Methodischen Erläuterungen definiert.

Mautstatistik

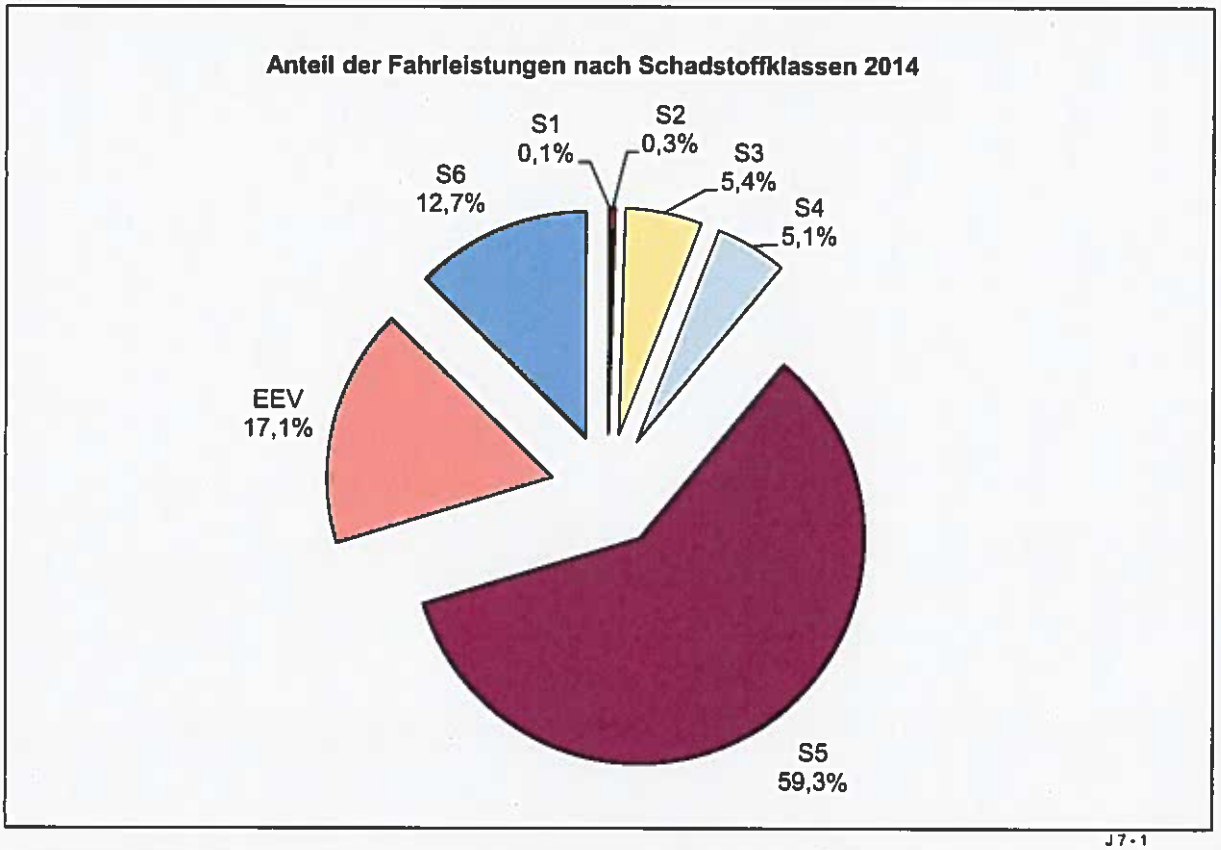
J 7 Fahrleistungen der Mautfahrzeuge nach Herkunft und Emissionsklasse [1] Seite 2

Herkunft	2014		2013		Veränderung zum Vorjahr
	[1000 km]	Anteil in [%]	[1000 km]	Anteil in [%]	[%]
Schadstoffklasse S4 nach STVZO					
Inland	**812 549**	**56,4**	**1 015 961**	**57,4**	**-20,0**
Ausland	**627 063**	**43,5**	**751 365**	**42,5**	**-16,5**
- EU	598 466	41,5	717 176	40,5	-16,6
- Nicht EU	28 598	2,0	34 189	1,9	-16,4
Unbekannt	**1 729**	**0,1**	**1 877**	**0,1**	**-7,9**
Gesamt	1 441 341		1 769 203		-18,5
Schadstoffklasse S5 nach STVZO					
Inland	**9 836 083**	**59,2**	**11 120 151**	**62,4**	**-11,5**
Ausland	**6 769 858**	**40,7**	**6 686 634**	**37,5**	**1,2**
- EU	6 258 283	37,7	6 199 223	34,8	1,0
- Nicht EU	511 576	3,1	487 411	2,7	5,0
Unbekannt	**8 198**	**0,0**	**8 179**	**0,0**	**0,2**
Gesamt	16 614 139		17 814 963		-6,7
Schadstoffklasse EEV Klasse 1 nach STVZO					
Inland	**3 014 913**	**63,1**	**3 326 050**	**70,8**	**-9,4**
Ausland	**1 763 507**	**36,9**	**1 371 309**	**29,2**	**28,6**
- EU	1 743 405	36,5	1 356 431	28,9	28,5
- Nicht EU	20 101	0,4	14 878	0,3	35,1
Unbekannt	**1 748**	**0,0**	**1 829**	**0,0**	**-4,4**
Gesamt	4 780 168		4 699 189		1,7
Schadstoffklasse S6 nach STVZO [2]					
Inland	**2 635 978**	**55,1**	**348 402**	**7,4**	
Ausland	**907 322**	**19,0**	**76 927**	**1,6**	
- EU	888 888	18,6	74 473	1,6	
- Nicht EU	18 434	0,4	2 454	0,1	
Unbekannt	**3 002**	**0,1**	**134**	**0,0**	
Gesamt	3 546 303		425 463		

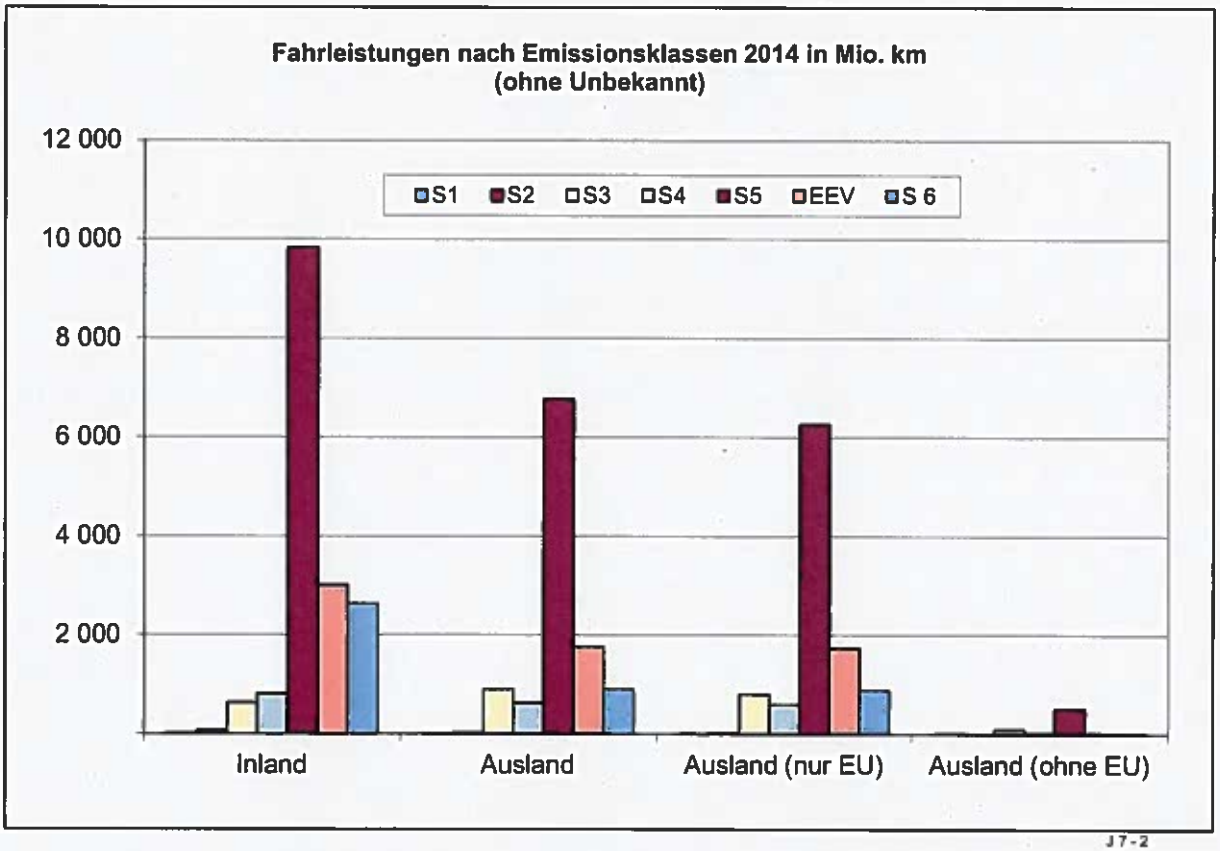
[1] Der Begriff Mautfahrzeug ist in den Methodischen Erläuterungen definiert.
[2] Die Schadstoffklasse S6 wurde erst ab Oktober 2013 ausgewiesen.

Mautstatistik

J 7 Fahrleistungen der Mautfahrzeuge nach Herkunft und Emissionsklasse



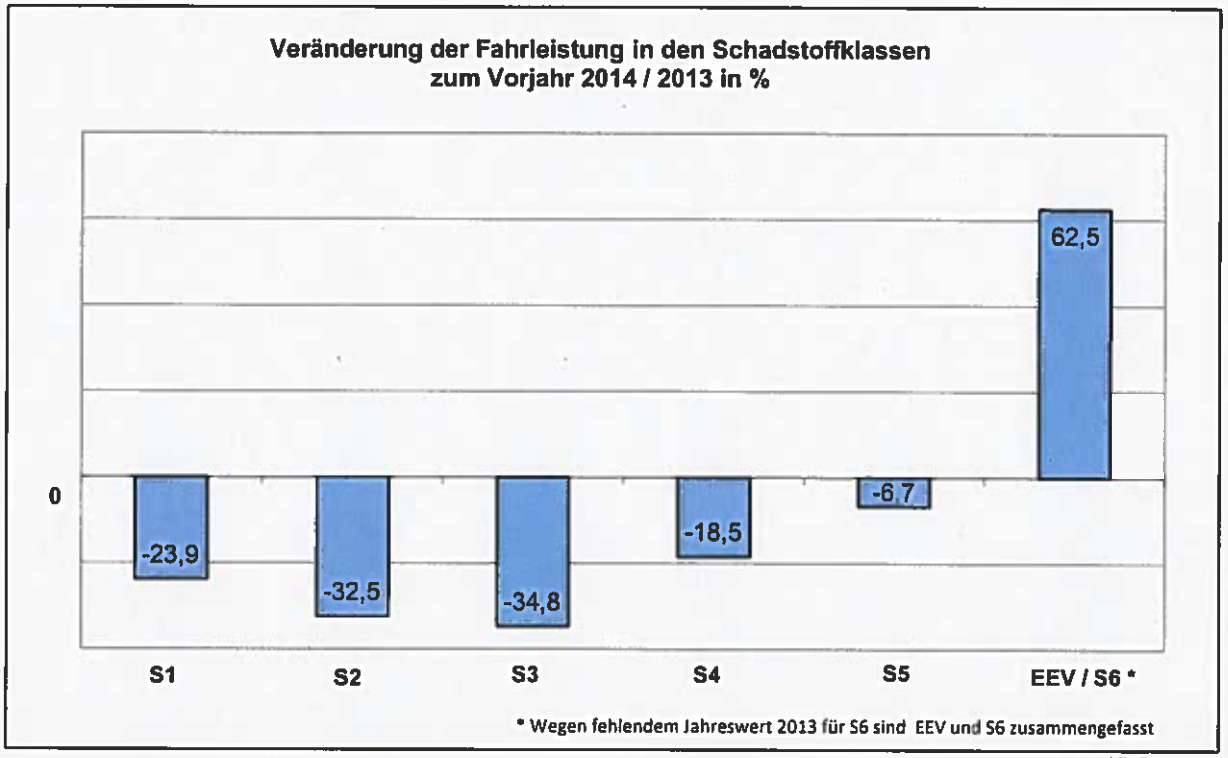
J 7 - 1



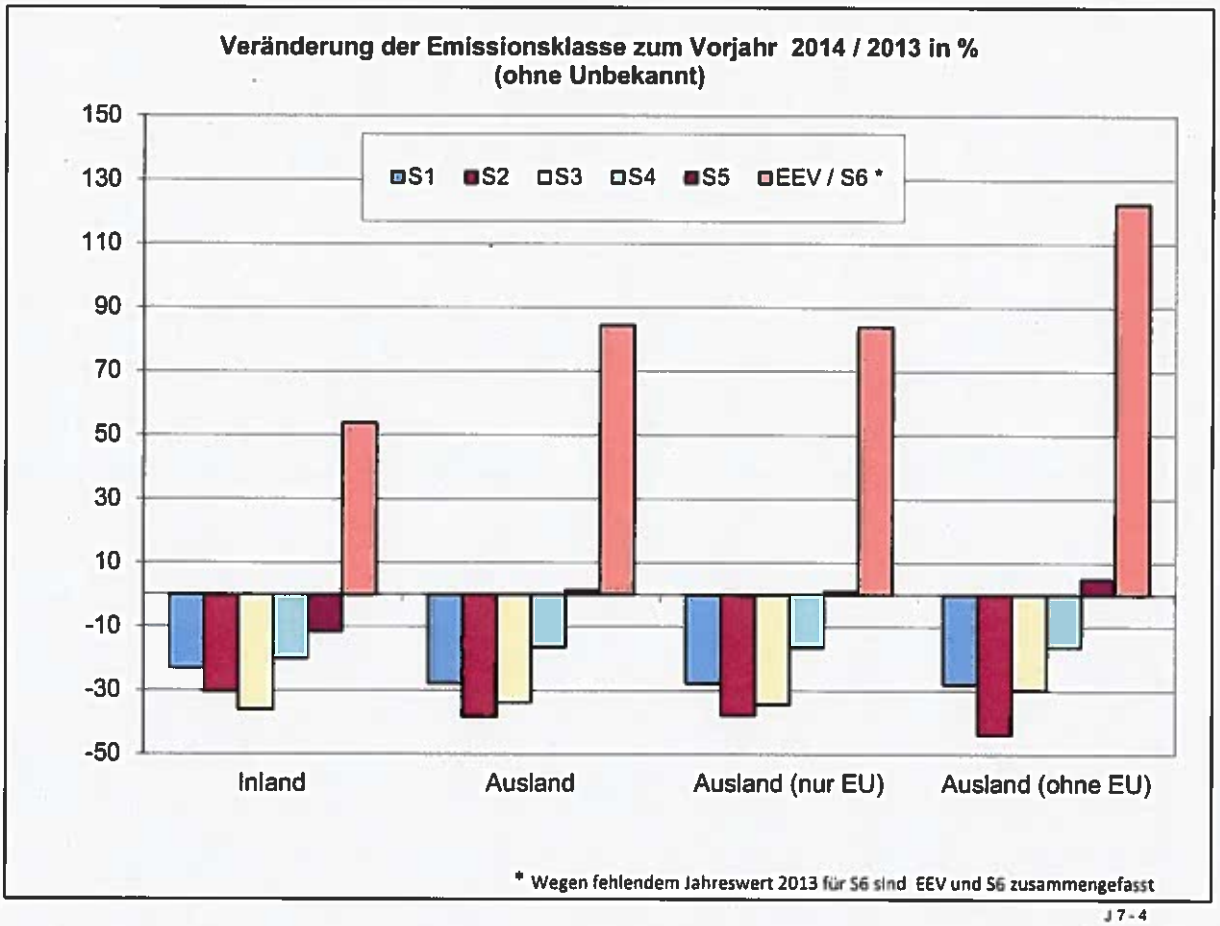
J 7 - 2

Mautstatistik

J 7 Fahrleistungen der Mautfahrzeuge nach Herkunft und Emissionsklasse



J 7 - 3



J 7 - 4

Mautstatistik

J 8 Fahrleistungen nach Emissionsklasse und Achsklasse

Nationalität	2014							
	Schadstoffklasse S1		Schadstoffklasse S2		Schadstoffklasse S3 oder S2 kombiniert mit PMK 1/2/3/4 1)		Schadstoffklasse S4 oder S3 kombiniert mit PMK 2/3/4 1)	
	Achsklasse		Achsklasse		Achsklasse		Achsklasse	
	<=3	>3	<=3	>3	<=3	>3	<=3	>3
	[km]	[km]	[km]	[km]	[km]	[km]	[km]	[km]
Inland	**9 515 569**	**8 605 378**	**31 536 558**	**42 747 016**	**141 862 913**	**487 270 576**	**147 416 870**	**665 131 999**
Ausland	**1 040 572**	**2 409 582**	**3 455 298**	**17 897 983**	**23 122 841**	**878 008 455**	**21 840 970**	**605 222 422**
- EU	971 141	1 829 287	3 353 212	15 993 187	21 769 697	782 181 908	21 386 906	577 078 830
Belgien	38 244	25 691	150 061	415 184	991 357	9 652 142	440 426	8 112 776
Bulgarien	6 150	60 957	28 418	875 401	678 957	44 436 635	648 539	27 014 453
Dänemark	33 783	26 873	99 430	180 658	316 076	2 181 205	413 482	7 574 323
Estland	5 552	957	14 206	94 932	21 861	6 432 859	68 642	7 903 312
Finnland	17 390	25 991	20 240	15 539	107 643	1 948 081	76 850	2 684 747
Frankreich	92 393	80 677	205 056	296 316	996 921	4 901 309	833 192	6 879 134
Griechenland	2 408	148 414	27 517	1 559 816	56 907	12 850 617	10 553	1 843 253
Großbritannien	35 173	35 376	168 146	231 006	688 460	2 604 334	591 130	2 834 576
Irland	4 673	8 448	2 327	35 472	40 898	3 559 252	29 937	2 343 517
Italien	36 764	13 794	280 758	310 651	1 562 741	16 796 915	513 578	5 209 255
Kroatien 2)	2 248	724	6 144	80 997	188 142	4 957 539	80 291	2 574 578
Lettland	10 241	77 624	11 881	206 290	135 418	12 478 103	42 795	6 861 036
Litauen	32 879	249 110	67 230	591 736	358 894	55 643 876	199 680	31 552 551
Luxemburg	3 369	10 811	67 831	64 601	241 840	3 425 615	185 507	3 846 832
Malta	0	0	779	261	1 248	94 857	0	9 640
Niederlande	216 579	380 861	928 739	1 996 494	3 787 042	52 812 873	2 862 692	51 878 458
Österreich	83 275	52 639	219 046	429 355	2 135 868	12 859 418	1 239 819	9 868 683
Polen	226 593	503 825	444 380	5 331 234	3 529 369	262 061 433	5 304 638	219 302 973
Portugal	8 489	33 880	16 928	561 045	128 553	11 556 495	66 304	11 798 963
Rumänien	2 447	8 570	35 023	469 715	838 029	86 129 954	527 020	39 653 094
Schweden	14 128	3 762	43 093	34 622	322 876	4 065 598	166 499	2 693 412
Slowakei	3 481	987	49 364	95 055	479 913	29 023 829	1 054 127	19 439 474
Slowenien	471	2 247	20 831	6 854	568 864	9 926 584	666 756	13 176 461
Spanien	20 929	50 452	95 168	862 060	515 187	26 836 046	237 363	21 855 345
Tschechien	16 863	13 797	199 981	583 726	1 632 943	73 756 004	2 917 957	50 453 372
Ungarn	56 619	11 101	150 616	230 348	1 437 272	29 561 181	2 207 545	18 685 853
Zypern	0	1 720	21	433 819	6 418	1 629 153	1 584	1 028 759
- Nicht EU	69 432	580 295	102 086	1 904 797	1 353 144	95 826 547	454 064	28 143 592
Unbekannt	**171 743**	**73 601**	**315 916**	**207 508**	**811 646**	**928 899**	**742 839**	**985 718**
Gesamt	10 727 884	11 088 561	35 307 772	60 852 507	165 797 399	1 366 207 929	170 000 679	1 271 340 139

1) PMK = Partikelminderungsklasse.
2) Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU.

Mautstatistik

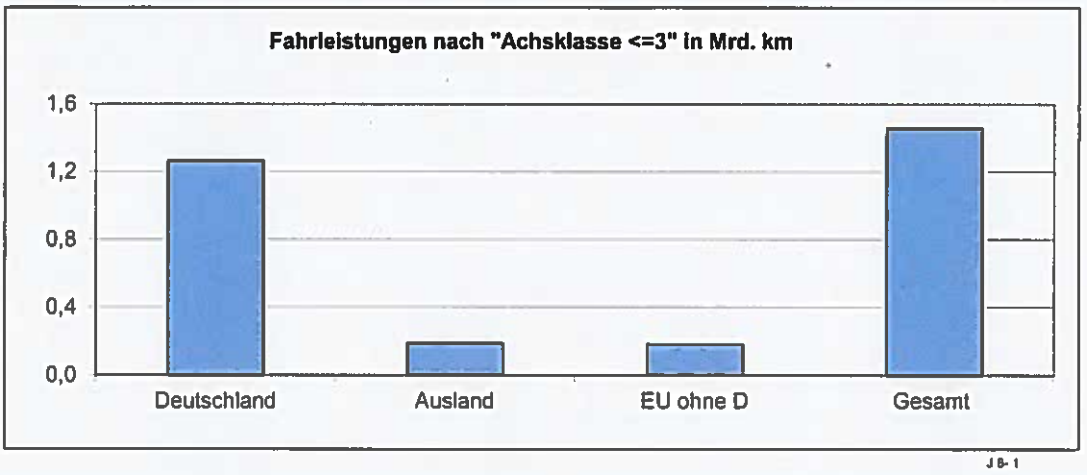
J 8 Fahrleistungen nach Emissionsklasse und Achsklasse

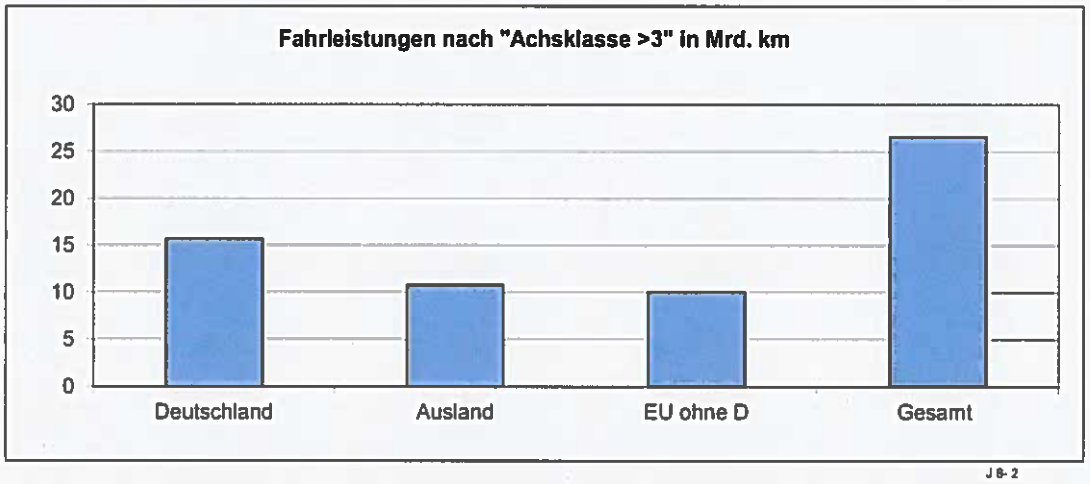
Nationalität	2014							
	Schadstoffklasse S5		Schadstoffklasse EEV		Schadstoffklasse S6		Gesamt	
	Achsklasse		Achsklasse		Achsklasse		Achsklasse	
	<=3	>3	<=3	>3	<=3	>3	<=3	>3
	[km]	[km]	[km]	[km]	[km]	[km]	[km]	[km]
Inland	**692 182 787**	**9 143 900 299**	**133 378 735**	**2 881 533 871**	**109 822 166**	**2 526 156 298**	**1 265 715 597**	**15 755 345 437**
Ausland	**92 542 361**	**6 677 316 033**	**20 407 449**	**1 743 099 428**	**25 366 485**	**881 955 515**	**187 775 977**	**10 805 909 418**
- EU	89 419 499	6 168 863 273	20 313 837	1 723 091 599	25 086 228	863 801 754	182 300 520	10 132 839 837
Belgien	1 955 619	98 515 792	70 824	4 517 974	333 987	11 171 837	3 980 518	132 411 397
Bulgarien	1 721 451	233 121 070	131 577	22 999 338	78 969	9 263 691	3 294 060	337 771 545
Dänemark	1 065 326	48 376 395	99 521	8 901 328	251 945	12 288 066	2 279 563	79 528 847
Estland	136 059	42 573 299	6 637	1 562 336	17 406	3 107 138	270 363	61 674 833
Finnland	177 038	15 101 426	10 236	536 009	17 701	2 228 556	427 097	22 540 348
Frankreich	1 353 490	43 418 122	130 070	6 808 700	85 416	3 709 460	3 696 539	66 093 718
Griechenland	36 696	8 223 572	496	290 818	464	178 569	135 041	25 095 060
Großbritannien	1 367 706	20 295 241	20 902	685 047	45 581	2 501 250	2 917 099	29 186 829
Irland	79 583	8 065 211	8 436	5 217	2 242	432 584	168 095	14 449 702
Italien	4 768 367	112 790 588	530 852	28 913 298	447 848	18 856 137	8 140 907	182 890 638
Kroatien [1]	466 389	54 979 047	220 642	16 949 368	79 151	4 752 750	1 043 007	84 295 002
Lettland	337 036	98 868 032	5 687	2 212 838	21 494	4 883 303	564 552	125 587 226
Litauen	1 093 762	318 462 151	33 469	5 982 074	433 335	19 986 477	2 219 248	432 467 974
Luxemburg	963 519	61 146 810	16 633	9 032 999	79 054	7 954 846	1 557 753	85 482 512
Malta	18 850	1 076 032	703	67 292	1 962	85 456	23 541	1 333 538
Niederlande	15 004 137	641 070 194	2 349 981	93 115 290	2 723 080	146 798 292	27 872 248	988 052 462
Österreich	6 117 453	89 547 112	4 469 751	171 662 399	3 222 683	45 933 714	17 487 895	330 353 320
Polen	28 427 312	2 467 365 563	1 152 059	252 668 211	7 591 812	249 351 577	46 676 164	3 456 584 817
Portugal	243 141	50 515 159	3 663	2 635 775	46 748	4 600 859	513 825	81 702 175
Rumänien	4 109 878	401 445 752	521 424	125 674 555	1 175 925	48 715 634	7 209 745	702 097 273
Schweden	397 252	24 940 163	21 703	2 192 628	144 627	5 280 913	1 110 176	39 211 099
Slowakei	2 102 440	239 444 259	1 820 687	213 209 611	1 169 800	48 609 861	6 679 814	549 823 076
Slowenien	1 841 982	126 667 074	1 037 417	112 898 141	702 537	28 904 646	4 838 859	291 582 007
Spanien	591 186	125 965 399	51 177	15 494 883	95 870	10 481 104	1 606 881	201 545 290
Tschechien	9 460 047	576 759 758	4 419 261	319 428 248	4 775 459	123 979 205	23 422 510	1 144 974 110
Ungarn	5 569 577	254 825 460	3 180 031	302 140 932	1 541 135	49 742 787	14 142 795	655 197 663
Zypern	14 203	5 304 591	0	2 506 291	0	3 045	22 227	10 907 378
- Nicht EU	3 122 863	508 452 759	93 611	20 007 829	280 258	18 153 761	5 475 458	673 069 581
Unbekannt	**2 204 308**	**5 993 689**	**771 660**	**976 642**	**682 262**	**2 320 031**	**5 700 374**	**11 486 087**
Gesamt	786 929 456	15 827 210 021	154 557 844	4 625 609 940	135 870 913	3 410 431 845	1 459 191 948	26 572 740 941

[1] Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU.

Mautstatistik

J 8 Fahrleistungen nach Emissionsklasse und Achsklasse





Mautstatistik

J 9 Mautfahrten nach Emissionsklasse und Achsklasse [1)]

Nationalität	2014							
	Schadstoffklasse S1		Schadstoffklasse S2		Schadstoffklasse S3 oder S2 kombiniert mit PMK 1/2/3/4 1)		Schadstoffklasse S4 oder S3 kombiniert mit PMK 2/3/4 1)	
	Achsklasse		Achsklasse		Achsklasse		Achsklasse	
	<=3	>3	<=3	>3	<=3	>3	<=3	>3
	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]
Inland	**483 611**	**328 476**	**1 609 542**	**1 682 723**	**6 291 793**	**13 739 517**	**6 004 250**	**15 200 856**
Ausland	**6 742**	**24 448**	**36 950**	**165 861**	**197 072**	**5 691 105**	**185 262**	**4 165 671**
- EU	6 495	21 885	36 401	156 771	188 750	5 231 037	182 646	4 018 232
Belgien	235	322	1 180	5 135	9 803	114 329	4 706	92 522
Bulgarien	28	350	120	5 042	4 619	284 026	3 658	187 709
Dänemark	129	319	585	1 169	2 530	21 182	2 663	72 039
Estland	13	4	59	583	183	42 570	517	51 400
Finnland	70	155	70	50	683	12 828	417	19 740
Frankreich	879	3 044	1 364	5 760	10 287	88 338	7 697	135 022
Griechenland	14	967	209	10 292	288	67 943	57	9 024
Großbritannien	127	187	1 076	1 638	2 874	17 696	2 603	16 927
Irland	20	36	7	327	172	20 884	168	13 245
Italien	168	38	1 166	1 682	11 111	93 489	3 401	28 463
Kroatien [3)]	6	2	17	348	853	25 391	557	10 292
Lettland	49	682	104	1 687	1 360	83 823	595	46 132
Litauen	107	1 588	283	4 405	2 860	316 164	1 237	199 366
Luxemburg	102	622	1 468	1 518	4 526	63 666	5 524	63 670
Malta			1	1	3	624		56
Niederlande	2 499	6 332	19 154	27 677	50 566	672 672	46 458	620 790
Österreich	839	544	3 189	6 310	31 979	144 516	17 687	118 729
Polen	756	5 680	2 140	55 054	17 818	1 438 878	31 939	1 150 755
Portugal	20	334	114	4 924	1 087	95 517	569	98 556
Rumänien	11	45	143	4 750	3 970	482 539	2 503	256 260
Schweden	43	22	90	90	1 482	19 574	858	16 227
Slowakei	12	10	210	1 189	2 940	169 363	5 229	130 196
Slowenien	3	5	69	35	3 226	56 898	5 026	72 730
Spanien	79	476	396	7 765	2 577	212 758	1 508	171 280
Tschechien	77	71	2 438	6 617	12 456	510 844	20 397	327 400
Ungarn	209	47	748	1 616	8 443	165 793	16 647	104 591
Zypern		3	1	1 107	54	8 732	25	5 111
- Nicht EU	247	2 563	549	9 090	8 322	460 068	2 616	147 439
Unbekannt	**22 769**	**6 771**	**42 394**	**22 262**	**110 943**	**78 950**	**101 940**	**71 267**
Gesamt	513 122	359 695	1 688 886	1 870 846	6 599 808	19 509 572	6 291 452	19 437 794

1) Der Begriff Mautfahrt ist in den Methodischen Erläuterungen definiert.
2) PMK = Partikelminderungsklasse.
3) Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU.

Mautstatistik

J 9 Mautfahrten nach Emissionsklasse und Achsklasse [1]

Nationalität	2014							
	Schadstoffklasse S5		Schadstoffklasse EEV		Schadstoffklasse S6		Gesamt	
	Achsklasse		Achsklasse		Achsklasse		Achsklasse	
	<=3	>3	<=3	>3	<=3	>3	<=3	>3
	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]	[Anzahl]
Inland	**23 357 932**	**145 560 894**	**4 298 849**	**37 585 363**	**2 401 726**	**31 949 799**	**44 447 703**	**246 047 628**
Ausland	**782 526**	**42 852 652**	**209 804**	**11 593 035**	**189 347**	**6 160 811**	**1 607 703**	**70 653 583**
- EU	760 619	40 130 321	209 121	11 472 649	186 781	6 023 465	1 570 813	67 054 360
Belgien	22 061	1 008 473	459	39 456	3 063	108 769	41 507	1 369 006
Bulgarien	9 771	1 553 738	787	143 062	436	62 430	19 419	2 236 357
Dänemark	9 222	349 244	509	62 112	1 944	83 548	17 582	589 613
Estland	1 312	281 638	58	10 757	152	21 297	2 294	408 249
Finnland	1 724	110 341	132	4 218	291	14 695	3 387	162 027
Frankreich	13 689	612 451	1 788	102 222	658	52 914	36 562	999 751
Griechenland	175	42 852	4	1 240	5	725	752	133 043
Großbritannien	6 539	126 910	114	4 775	238	12 520	13 571	180 653
Irland	609	47 416	112	30	8	2 134	1 096	84 072
Italien	44 717	714 000	5 766	204 284	5 198	124 131	71 527	1 166 087
Kroatien [2]	2 169	270 373	1 099	95 301	492	25 790	5 193	427 497
Lettland	2 485	528 990	74	15 141	260	35 850	4 927	712 305
Litauen	7 152	1 893 712	276	43 127	2 121	115 187	14 036	2 573 549
Luxemburg	19 607	846 084	280	93 601	1 510	99 144	33 017	1 168 305
Malta	68	7 935	5	428	10	664	87	9 708
Niederlande	216 605	6 703 364	45 758	927 184	42 034	1 481 329	423 074	10 439 348
Österreich	59 478	778 255	70 935	1 481 006	24 586	429 663	208 693	2 959 023
Polen	188 751	12 948 062	7 286	1 406 894	45 726	1 377 054	294 416	18 382 377
Portugal	1 844	402 800	26	19 539	314	34 441	3 974	656 111
Rumänien	25 873	2 548 466	2 917	802 052	7 443	308 267	42 860	4 402 379
Schweden	2 168	170 446	153	11 475	741	38 837	5 535	256 671
Slowakei	11 640	1 534 671	14 142	1 373 031	7 919	305 570	42 092	3 514 030
Slowenien	10 831	699 492	7 998	643 026	4 533	163 670	31 686	1 635 856
Spanien	4 234	972 615	442	133 416	676	76 566	9 912	1 574 876
Tschechien	59 478	3 532 023	26 919	2 049 033	26 672	758 214	148 437	7 184 202
Ungarn	38 044	1 412 315	21 082	1 791 801	9 751	290 045	94 924	3 766 208
Zypern	173	33 655		14 438		11	253	63 057
- Nicht EU	21 907	2 722 331	683	120 386	2 566	137 346	36 890	3 599 223
Unbekannt	**272 086**	**374 737**	**130 174**	**47 104**	**67 756**	**145 506**	**748 062**	**746 597**
Gesamt	24 412 544	188 788 283	4 638 827	49 225 502	2 658 829	38 256 116	46 803 468	317 447 808

[1] Der Begriff Mautfahrt ist in den Methodischen Erläuterungen definiert.
[2] Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU.

Mautstatistik

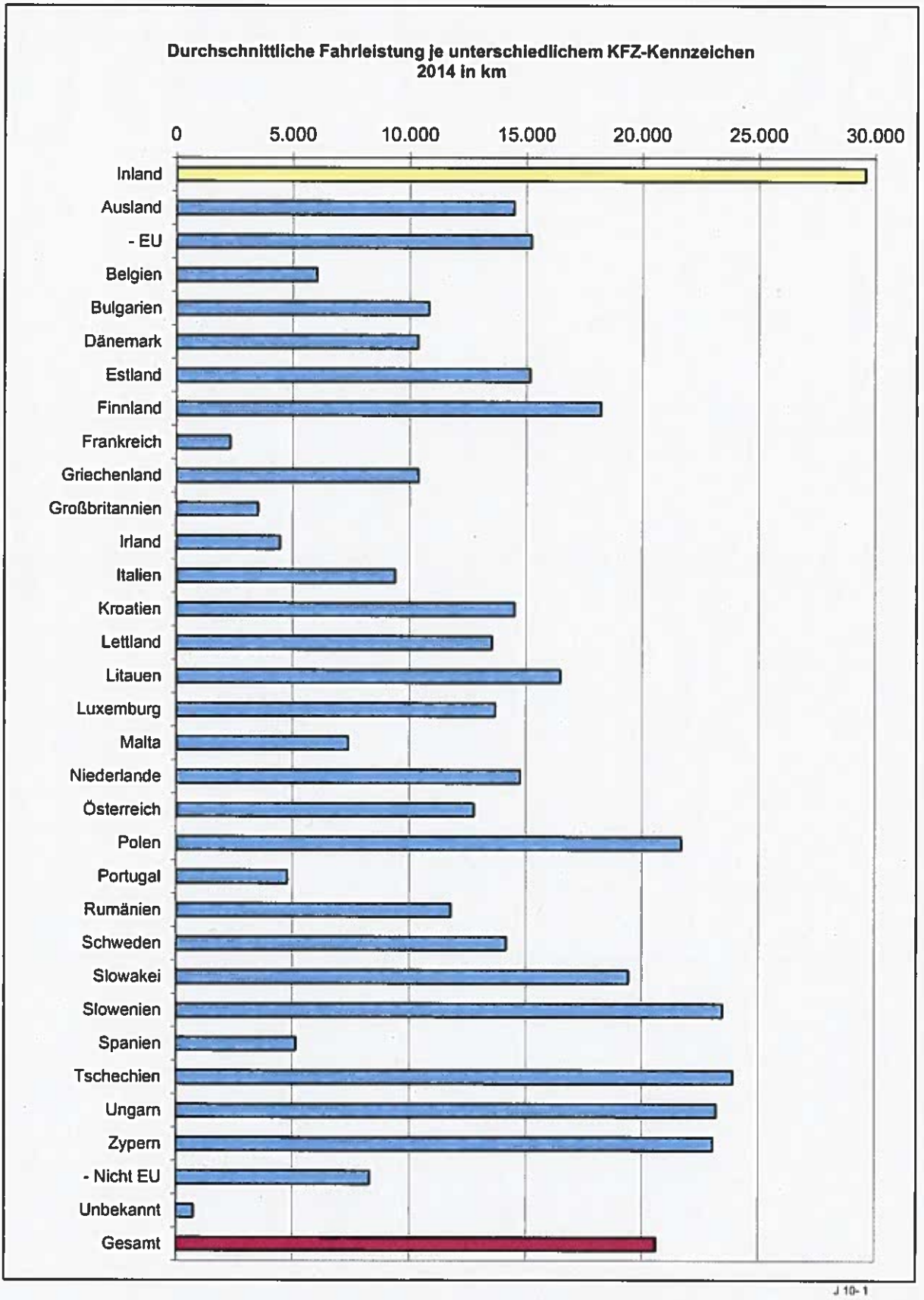
J 10 Durchschnittliche Fahrleistungen / Mautfahrten der Mautfahrzeuge nach Nationalität [1]

Nationalität	2014			2013		
	Mautfahrzeuge	Mittelwert Fahrleistungen pro Fahrzeug	Mittelwert Mautfahrten pro Fahrzeug	Mautfahrzeuge	Mittelwert Fahrleistungen pro Fahrzeug	Mittelwert Mautfahrten pro Fahrzeug
	[Anzahl] [2]	[km]	[Anzahl]	[Anzahl] [2]	[km]	[Anzahl]
Inland	**575 681**	**29.567**	**505**	**582 351**	**29.064**	**486**
Ausland	**759 424**	**14 476**	**95**	**750 495**	**13 709**	**88**
- EU	677 802	15 219	101	667 670	14 388	94
Belgien	22 617	6 031	62	24 339	5 994	60
Bulgarien	31 512	10 823	72	29 531	9 978	61
Dänemark	7 899	10 357	77	7 891	11 126	87
Estland	4 083	15 171	101	4 120	13 817	90
Finnland	1 261	18 214	131	1 244	18 935	129
Frankreich	30 229	2 309	34	33 742	2 221	32
Griechenland	2 431	10 378	55	2 392	10 528	55
Großbritannien	9 177	3 498	21	9 903	3 139	19
Irland	3 281	4 455	26	3 491	4 068	24
Italien	20 354	9 385	61	22 384	9 438	59
Kroatien [3]	5 884	14 503	74	4 776	14 248	69
Lettland	9 329	13 523	77	9 590	12 453	69
Litauen	26 381	16 477	98	26 302	15 467	86
Luxemburg	6 360	13 686	189	6 671	13 812	186
Malta	184	7 375	53	166	7 673	55
Niederlande	68 908	14 743	158	71 103	14 689	153
Österreich	27 267	12 757	116	27 770	13 057	113
Polen	161 455	21 698	116	152 730	20 115	104
Portugal	17 208	4 778	38	17 034	4 624	36
Rumänien	60 171	11 788	74	53 080	11 115	64
Schweden	2 852	14 138	92	3 160	14 532	91
Slowakei	28 658	19 419	124	28 636	18 322	111
Slowenien	12 631	23 468	132	12 055	23 647	127
Spanien	39 506	5 142	40	39 344	5 168	39
Tschechien	48 855	23 916	150	49 187	22 341	136
Ungarn	28 835	23 213	134	26 455	23 978	130
Zypern	474	23 058	134	574	22 794	141
- Nicht EU	81 622	8 313	45	82 825	8 233	44
Unbekannt	**23 354**	**736**	**64**	**21 563**	**717**	**73**
Gesamt	1 358 459	20 635	268	1 354 409	20 104	259

[1] Die Begriffe Mautfahrzeug und Mautfahrten sind in den Methodischen Erläuterungen definiert.
[2] Die Anzahl der Mautfahrzeuge wird durch die Anzahl der unterschiedlichen im Bezugsjahr aufgetretenen KFZ-Kennzeichen bestimmt (s.a. Seite 7 der Vorbemerkungen).
[3] Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU.

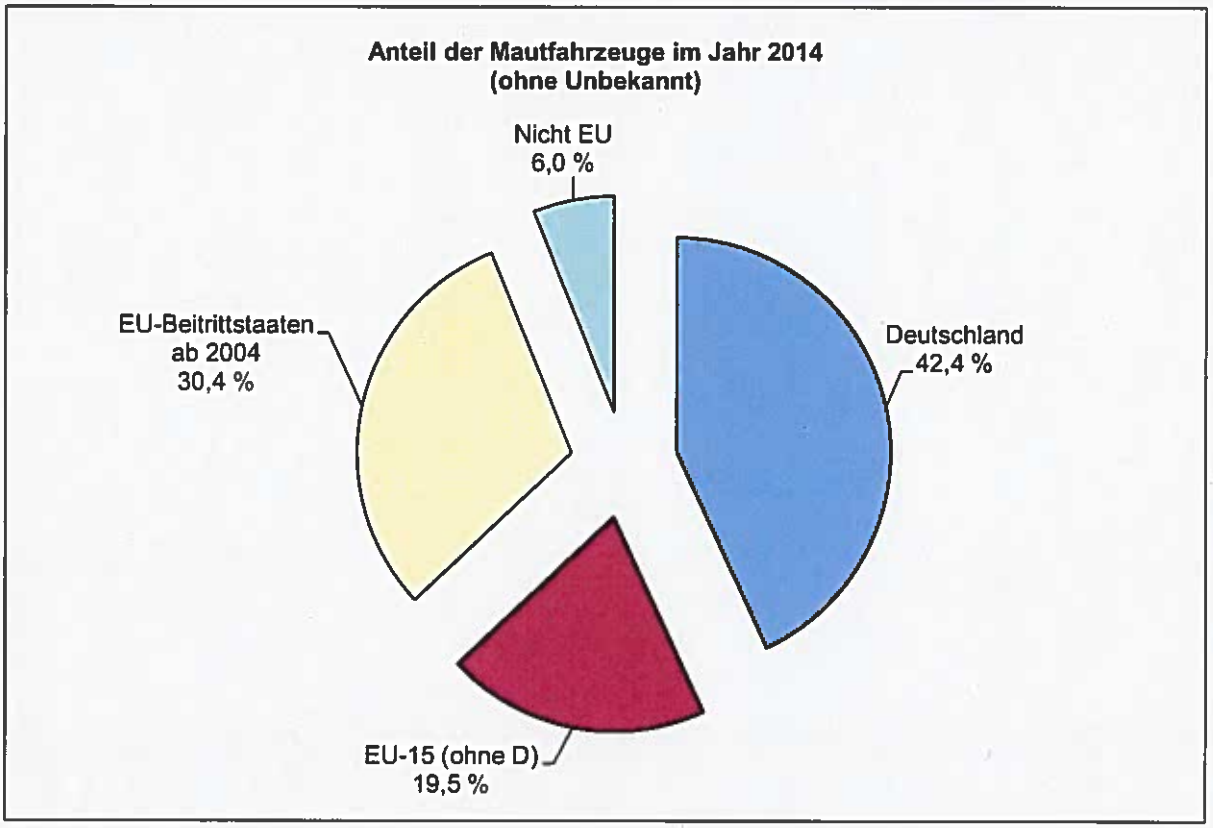
Mautstatistik

J 10 Durchschnittliche Fahrleistungen / Mautfahrten der Mautfahrzeuge nach Nationalität

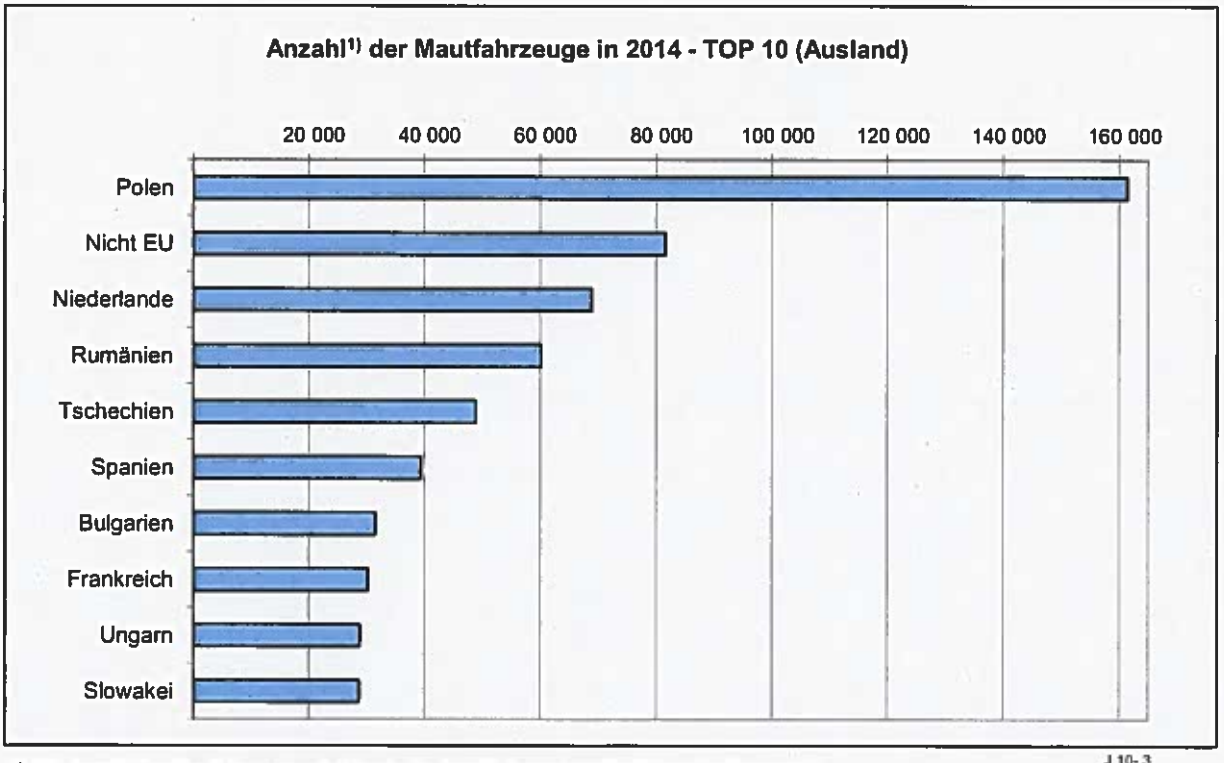


Mautstatistik

J 10 Durchschnittliche Fahrleistungen / Mautfahrten der Mautfahrzeuge nach Nationalität



J 10-2



J 10-3

[1] Die Anzahl der Mautfahrzeuge wird durch die Anzahl der unterschiedlichen im Bezugsjahr aufgetretenen KFZ-Kennzeichen bestimmt (s.a. Vorbemerkungen).

Mautstatistik

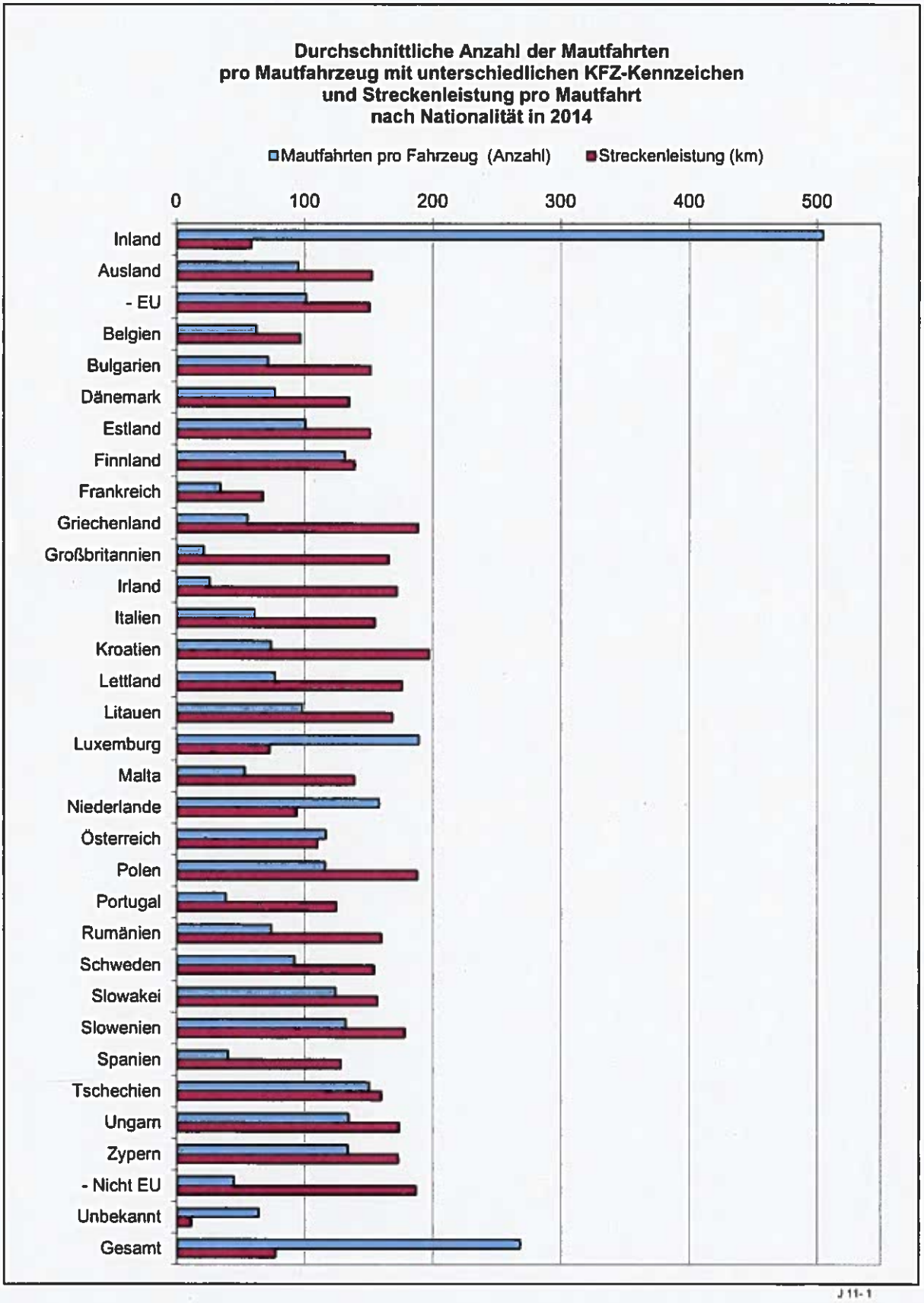
J 11 Durchschnittliche Streckenleistung pro Mautfahrt nach Nationalität [1)]

Nationalität	2014	2013	Veränderung zum Vorjahr
	[km]	[km]	[%]
Inland	**58,6**	**59,8**	**-2,0**
Ausland	152,1	155,6	-2,2
- EU	150,3	153,7	-2,2
Belgien	96,7	99,1	-2,4
Bulgarien	151,2	162,7	-7,1
Dänemark	134,7	128,2	5,1
Estland	150,9	154,1	-2,1
Finnland	138,8	147,1	-5,6
Frankreich	67,3	70,1	-3,9
Griechenland	188,6	190,1	-0,8
Großbritannien	165,3	161,7	2,2
Irland	171,6	170,7	0,6
Italien	154,4	160,7	-4,0
Kroatien [2)]	197,2	208,0	-5,2
Lettland	175,9	181,2	-2,9
Litauen	168,0	179,3	-6,3
Luxemburg	72,5	74,3	-2,4
Malta	138,5	139,9	-0,9
Niederlande	93,5	96,1	-2,6
Österreich	109,8	115,8	-5,2
Polen	187,6	193,1	-2,9
Portugal	124,6	127,8	-2,6
Rumänien	159,6	173,2	-7,9
Schweden	153,8	159,0	-3,3
Slowakei	156,5	164,8	-5,1
Slowenien	177,8	185,7	-4,3
Spanien	128,2	131,7	-2,6
Tschechien	159,3	164,1	-2,9
Ungarn	173,4	184,5	-6,1
Zypern	172,6	161,5	6,9
- Nicht EU	**186,6**	**188,8**	**-1,2**
Unbekannt	**11,5**	**9,8**	**17,6**
Gesamt	77,0	77,6	-0,9

[1)] Der Begriff Mautfahrten ist in den Methodischen Erläuterungen definiert.
[2)] Kroatien ist seit dem 01.07.2013 Mitgliedsstaat der EU.

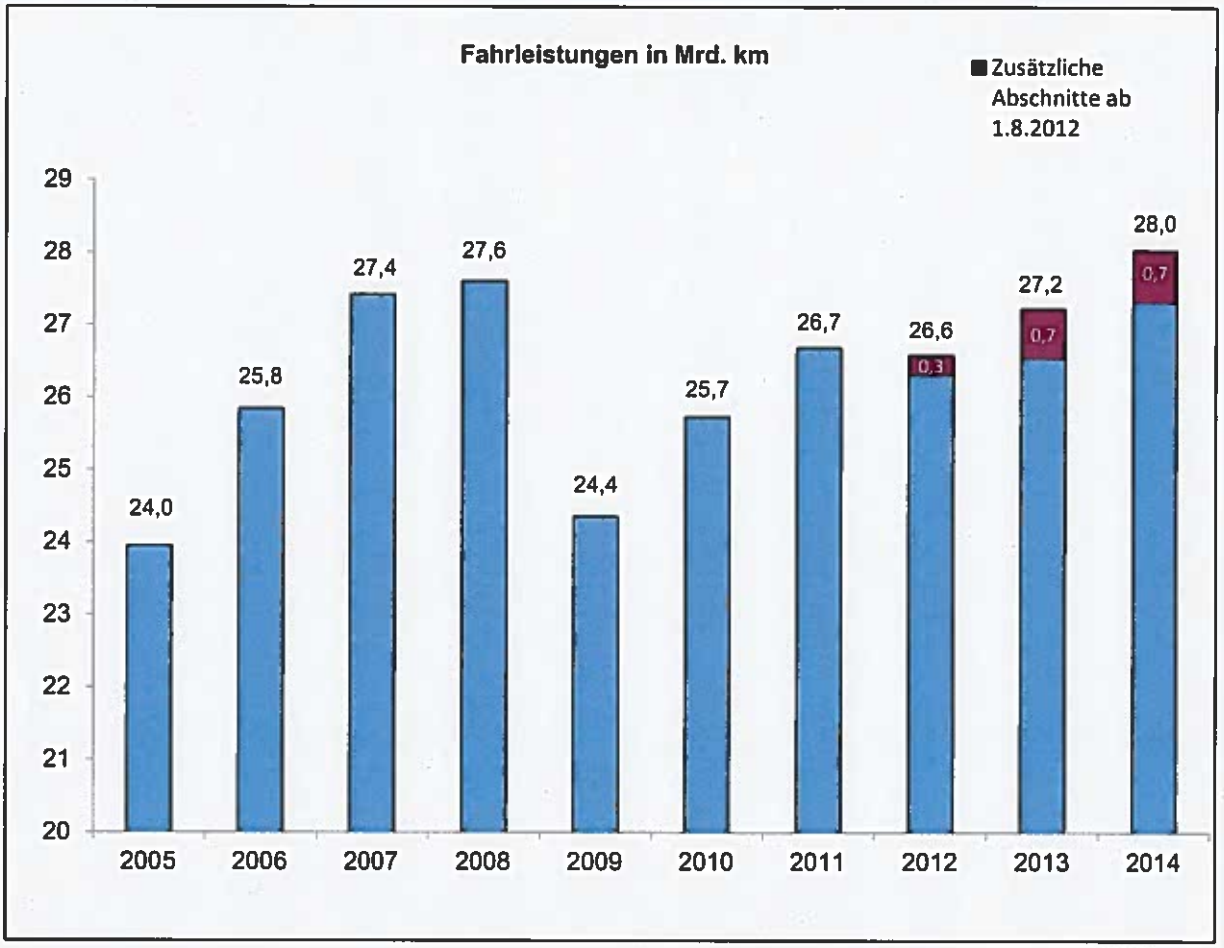
Mautstatistik

J 11 Durchschnittliche Streckenleistung pro Mautfahrt nach Nationalität

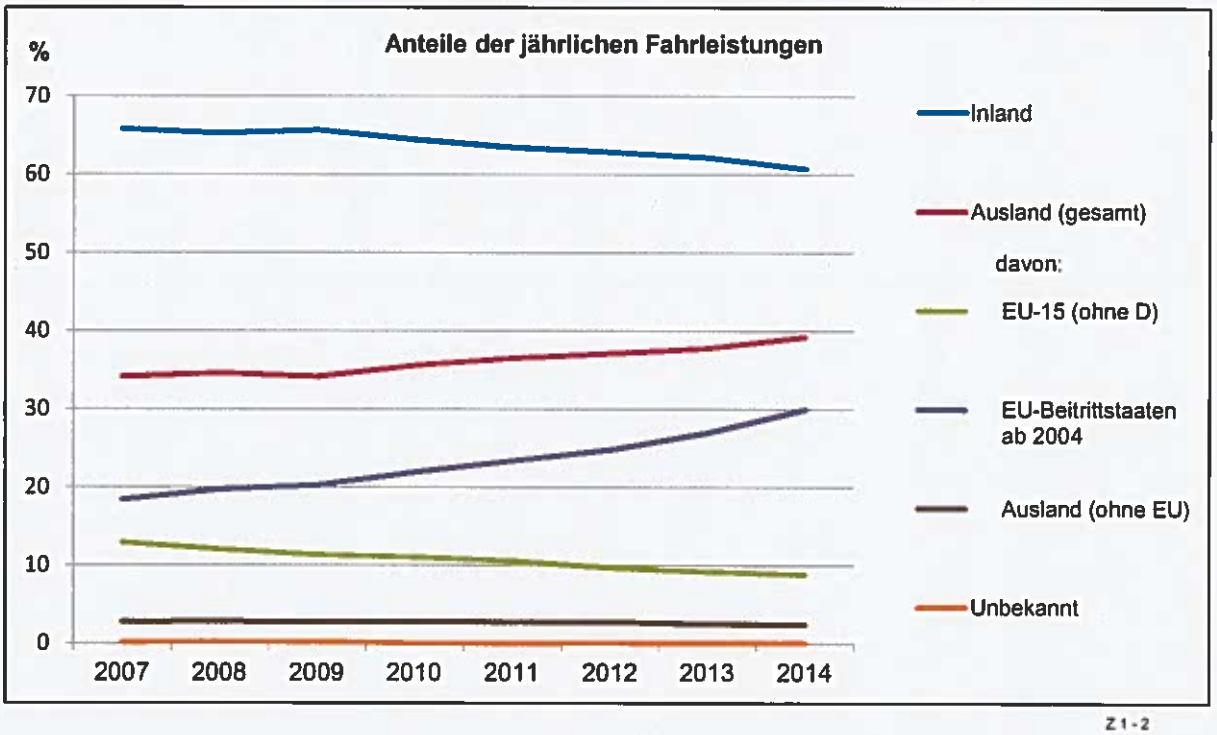


Mautstatistik

Z 1 Fahrleistungen der Mautfahrzeuge nach Nationalität



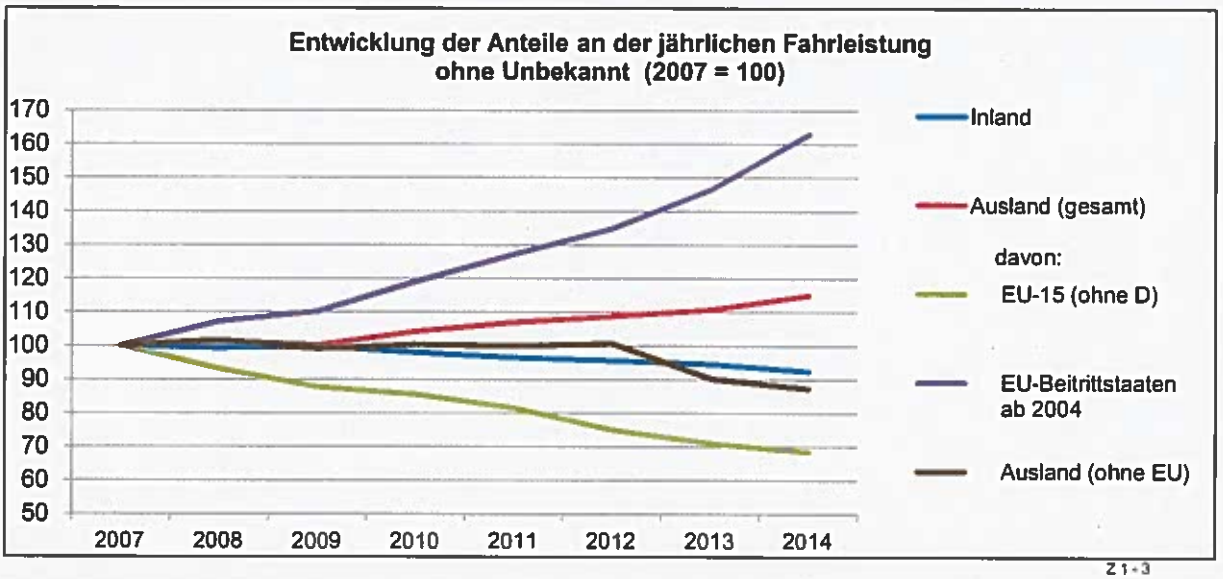
Z 1 - 2



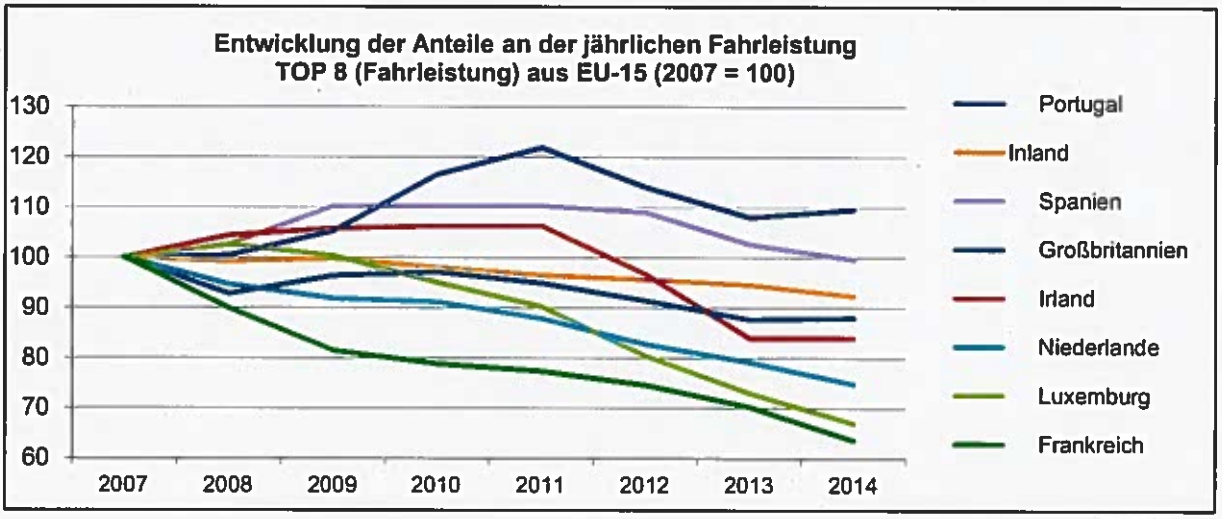
Z 1 - 2

Mautstatistik

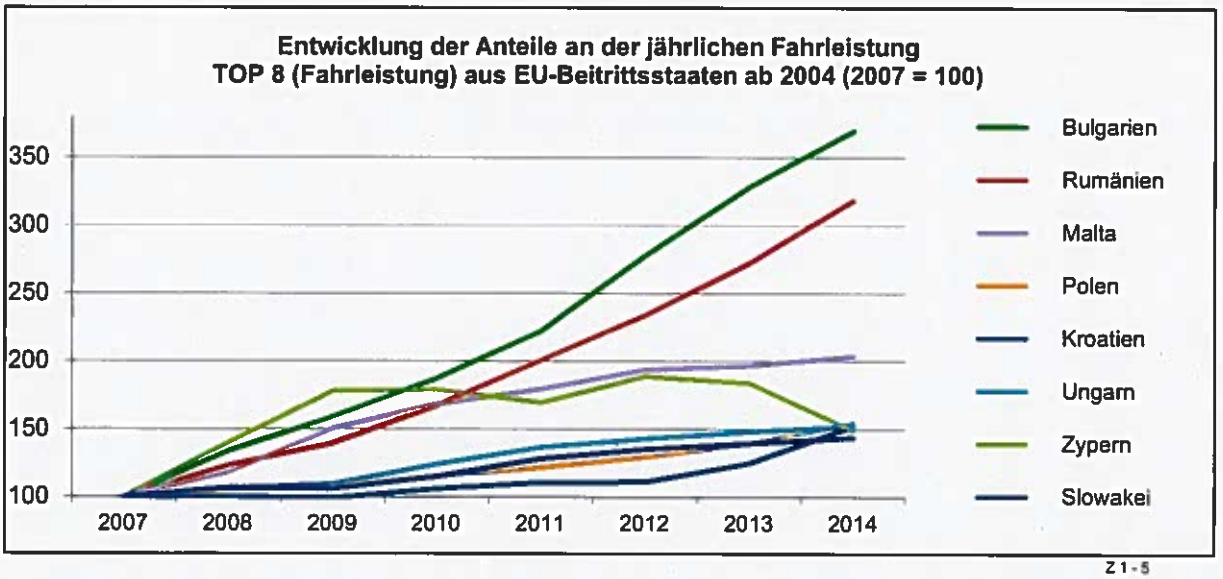
Z 1 Fahrleistungen der Mautfahrzeuge nach Nationalität



Z 1 - 3



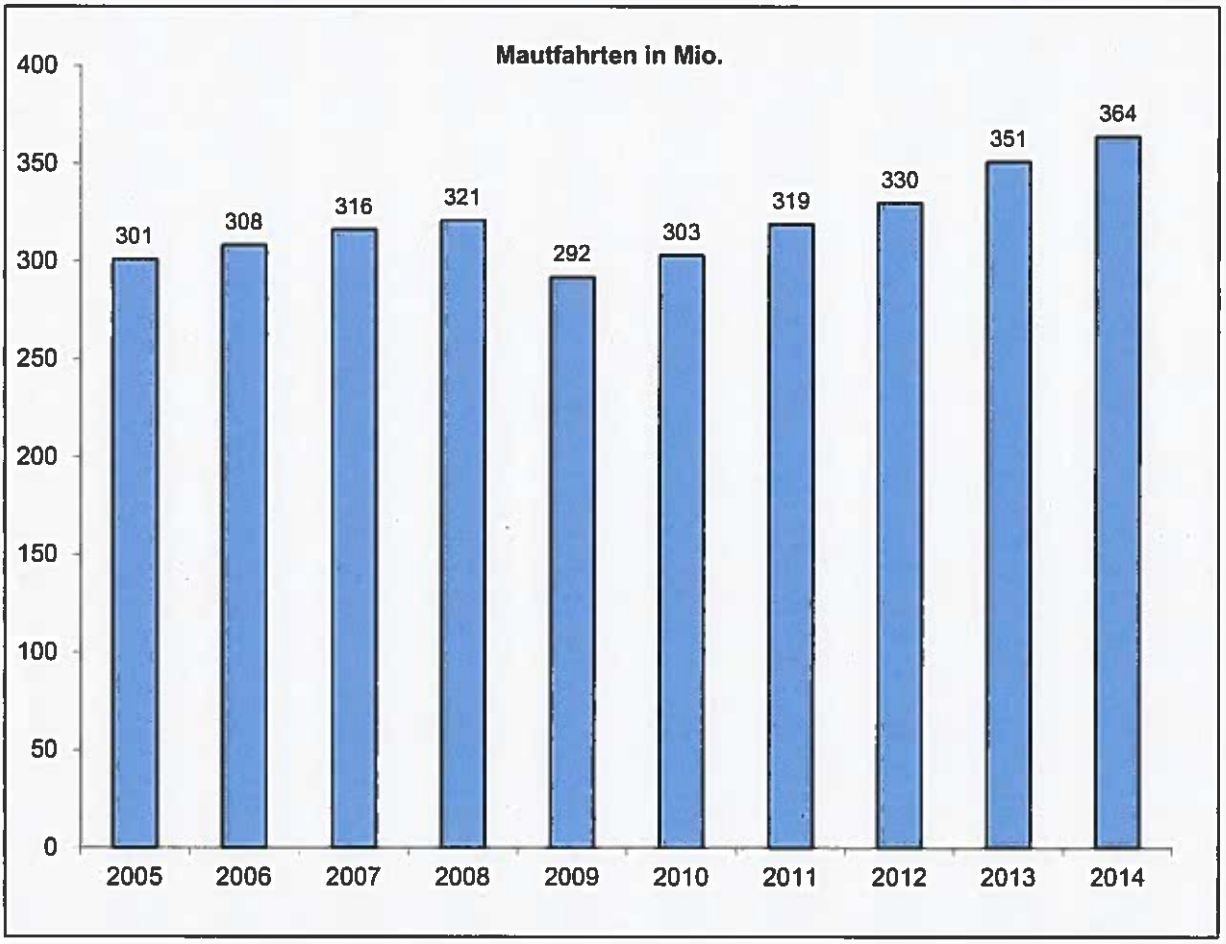
Z 1 - 4



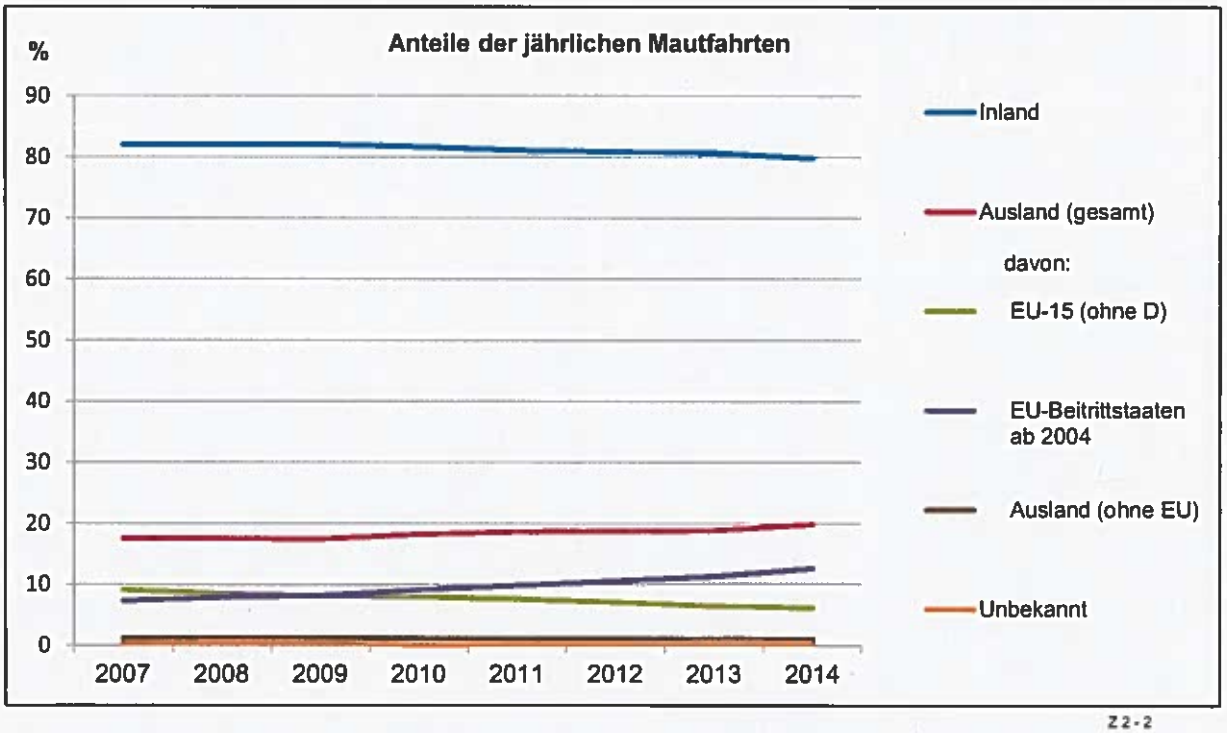
Z 1 - 5

Mautstatistik

Z 2 Mautfahrten der Mautfahrzeuge nach Nationalität



Z 2 - 1

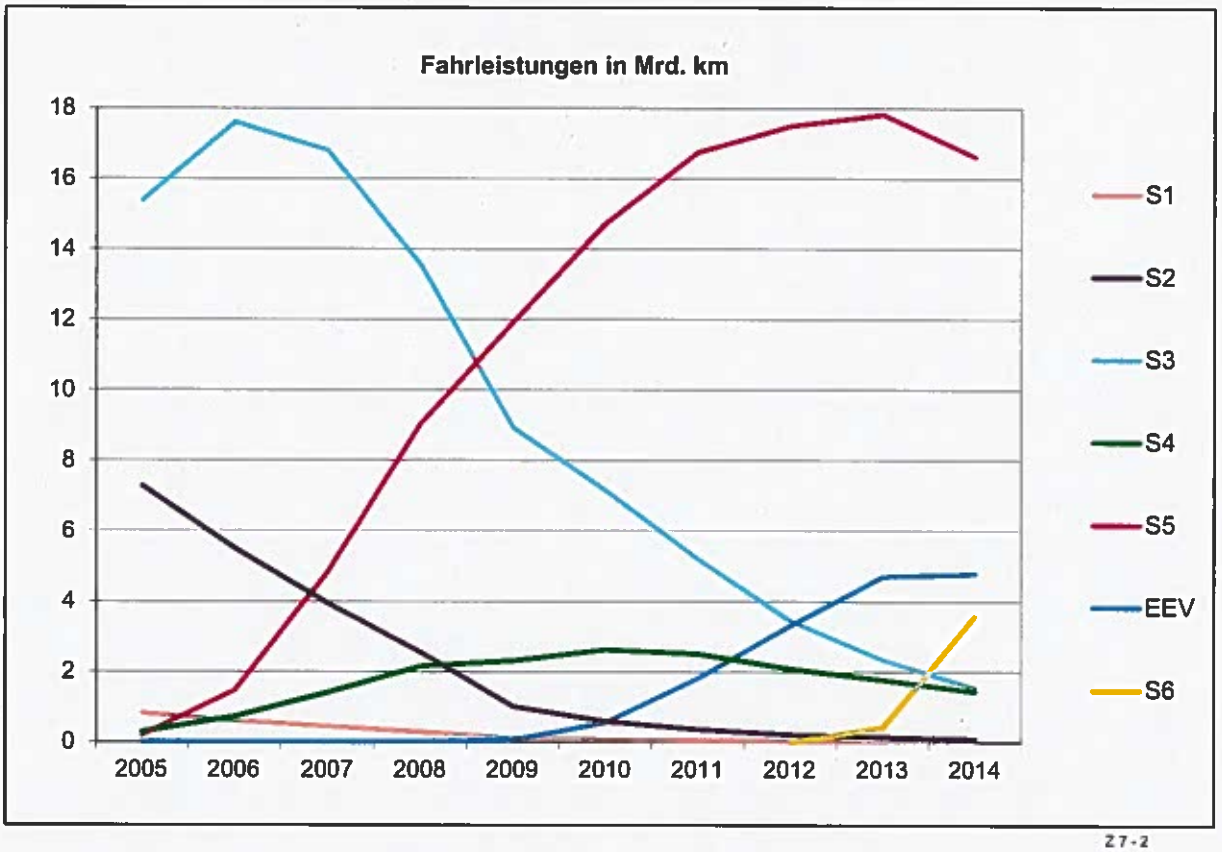


Z 2 - 2

Mautstatistik

Z 7 Fahrleistungen der Mautfahrzeuge nach Herkunft und Emissionsklasse

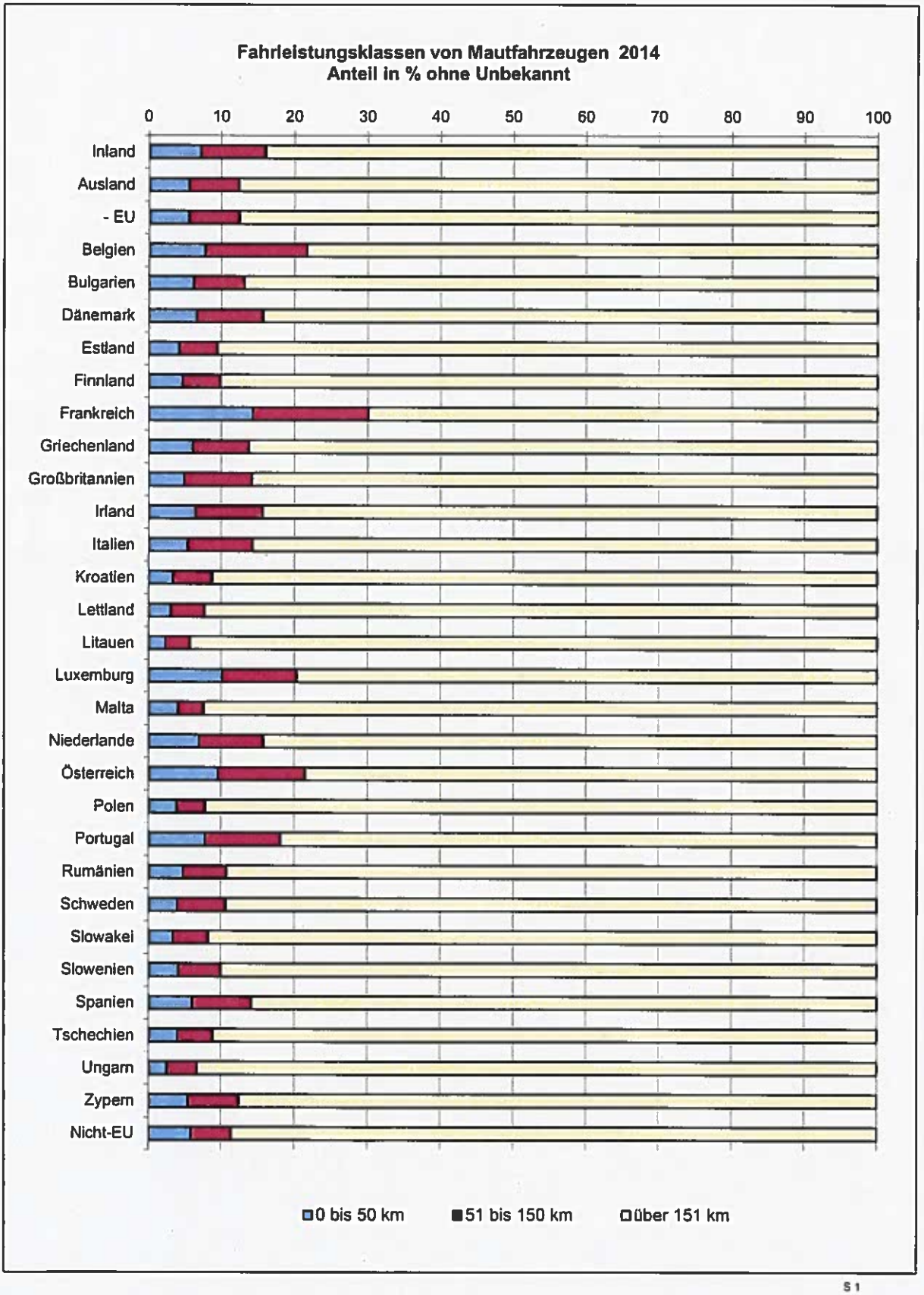
Z7-1



Z7-2

Mautstatistik

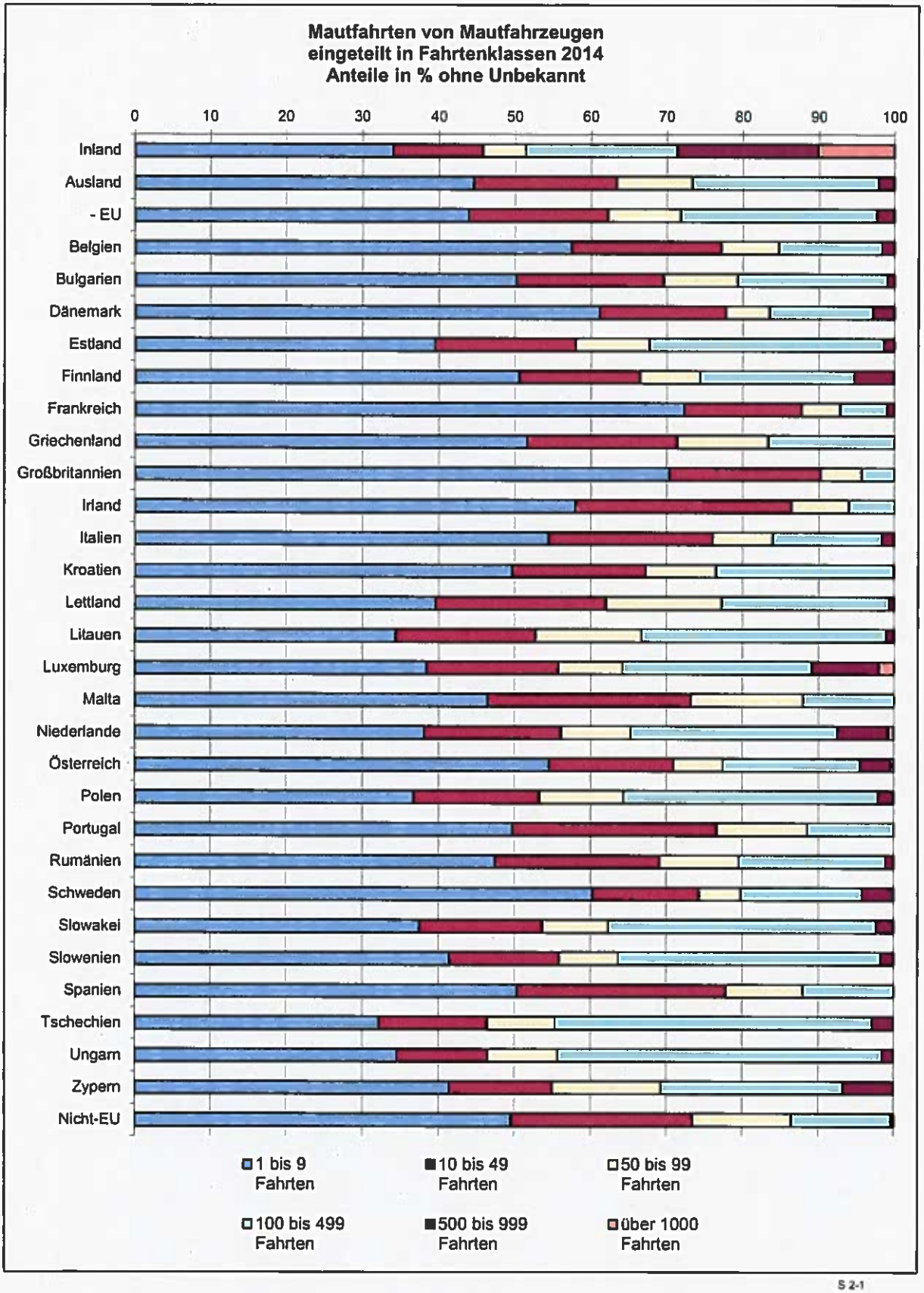
S 1 Fahrleistungsklassen



S 1

Mautstatistik

S 2 Klassen von Mautfahrten



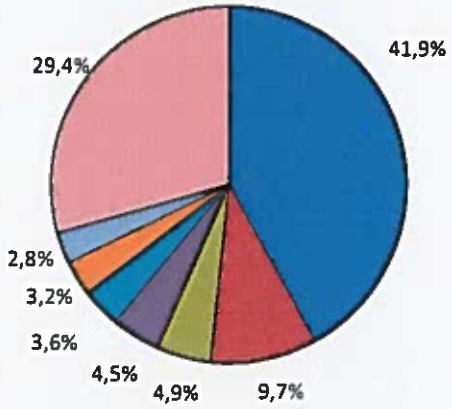
S 2-1

Mautstatistik

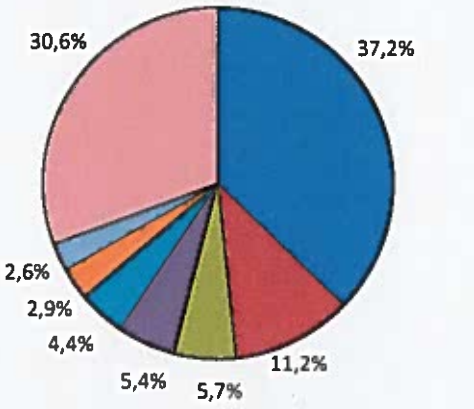
S 2 Klassen von Mautfahrten

**Mautfahrten von Mautfahrzeugen
eingeteilt in Fahrtenklassen 2014
Anteile in % ohne Unbekannt**

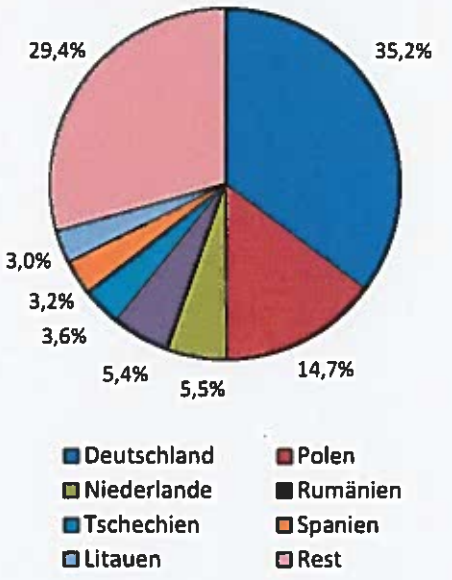
Klasse: 1 bis 9 Fahrten



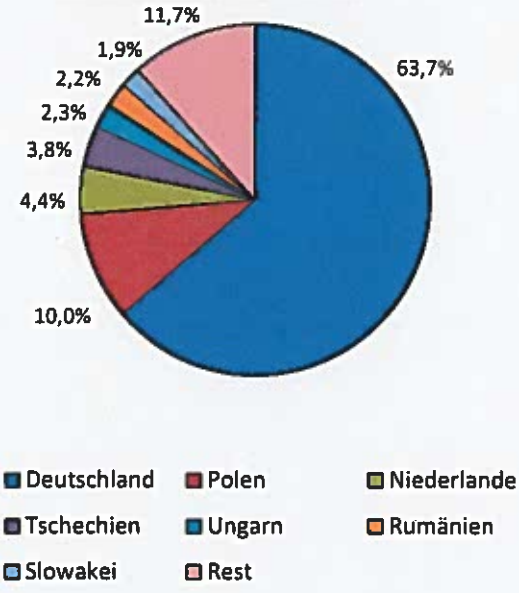
Klasse: 10 bis 49 Fahrten



Klasse: 50 bis 99 Fahrten



Klasse: über 100 Fahrten



S 2-2

Bundesamt
für Güterverkehr

Anhang

Mautstatistik

Methodische Erläuterungen

Inhaltsverzeichnis

Stand: Januar 2014

0. Einführung

Seit Jahresbeginn 2005 wird in Deutschland eine streckenbezogene Gebühr für schwere Lkw auf Autobahnen erfolgreich erhoben. Die Mautpflicht[1] gilt für LKW ab einem zulässigen Gesamtgewicht von 12 Tonnen grundsätzlich auf allen Bundesautobahnen (BAB) einschließlich Rastanlagen sowie auf einigen Abschnitten von vierstreifigen Bundesstraßen und beginnt mit der Auffahrt auf den Straßenabschnitt.

Das Mautsystem bietet als duales System den Nutzern dabei grundsätzlich zwei Möglichkeiten zur Einbuchung: die automatische Einbuchung per Fahrzeuggerät (automatisches Verfahren) und die manuelle Einbuchung am Mautstellen-Terminal oder per Internet (manuelles Verfahren). Das System der automatischen Einbuchung basiert auf einer Kombination der Mobilfunktechnologie (GSM) mit dem Satellitenortungssystem GPS (Global Positioning System). Kernstück der automatischen Einbuchung ist ein Fahrzeuggerät, die so genannte On-Board Unit (OBU), die mit Hilfe von Satellitensignalen die Position und zurückgelegte Strecke des Lkw bestimmt, automatisch die Höhe der Maut errechnet und die Daten per Mobilfunk an die Rechensysteme des Betreibers übermittelt.

Die Möglichkeit zur manuellen Einbuchung am Mautstellen-Terminal oder im Internet eignet sich vor allem für Lkw-Fahrer und Transportunternehmen, die selten auf mautpflichtigen Straßen fahren.

Mit Beginn der Maut hat das zuständige Bundesamt für Güterverkehr mit dem Aufbau eines Informationssystems begonnen, in dem alle erforderlichen Kennzahlen zur Steuerung und Überwachung des Betreibers zentral auswertbar sind. Hierzu gehören die Fahrtendaten aus dem manuellen und automatischen Verfahren. Ausschließlich diese Daten sind die Grundlage für die nachfolgend beschriebenen Tabellen.

Im Hinblick darauf, dass die Daten in der Regel zeitnah zur Verfügung stehen, steht in erster Linie die schnelle Bereitstellung von Tabellen und damit die **Aktualität der Veröffentlichung** im Vordergrund.

[1] Bundesfernstraßenmautgesetz (BFStrMG) *http://www.gesetze-im-internet.de/bfstrmg/index.html*

1. Definitionen

1.1 Mautfahrzeuge

Alle Tabellen beziehen sich auf mautpflichtige Fahrzeuge mit einem zulässigen Gesamtgewicht von mindestens 12 t auf mautpflichtigen Straßen, die über das automatische oder das manuelle Verfahren erfasst wurden. Diese Fahrzeuge sind im Folgenden als **Mautfahrzeuge** beschrieben.
Die Berechnung der Anzahl der Mautfahrzeuge erfolgt durch die Erfassung der KFZ-Kennzeichen. Daher kann innerhalb eines Zeitraumes ein reales Fahrzeug mehrfach als ein Mautfahrzeug erfasst werden, wenn z.B. ein Kennzeichenwechsel durchgeführt wurde.
Abweichend von den mautpflichtigen Fahrzeugen werden auch solche Fahrzeuge mitgezählt, deren Fahrten im Nachhinein erstattet wurden. Andererseits sind Mautpreller nicht enthalten. Dies gilt auch dann, wenn eine Mautgebühr aufgrund von Kontrollen im Nachhinein erhoben wurde.

1.2 Mautfahrt

Eine Fahrt – zu Abgrenzung von anderen Definitionen **Mautfahrt** genannt - in dieser Statistik beginnt vereinfacht mit der Auffahrt auf eine mautpflichtige Straße und endet, wenn eine mautpflichtige Straße wieder verlassen wird.
Im manuellen Verfahren werden innerhalb eines Buchungsvorgangs Start- und Endpunkt sowie ggf. Zwischenziele über Terminal oder das Internet angegeben.
Im automatischen Verfahren können sich während einer „Fahrt“ Tarifmerkmale (Tarifversion, Gebührenklasse wie Achsklasse oder Gewichtsklasse) ändern, oder die mautpflichtige Straße wird kurzzeitig verlassen. Dies führt dann jeweils zu einem Ende der ersten Mautfahrt und somit zu mehreren Mautfahrten und entspricht nicht einer Fahrt im Sinne der Logistik.
Beispiele: Ein Mautfahrzeug fährt von Hamburg nach München und verlässt in Kassel die Autobahn für eine Beladung. Anschließend wird die Fahrt an der gleichen oder einer anderen Auffahrt fortgesetzt. In diesem Fall handelt es sich um zwei Mautfahrten. Ändert sich während der Fahrt die Achsklasse (von > 3 auf <=3), indem z.B. an einer Rastanlage ein Anhänger abgekoppelt und die Fahrt fortgesetzt wird, sind dies ebenfalls zwei Mautfahrten.

1.3 Emissionskennzahl

Die Höhe der Maut richtet sich nach der Schadstoffkategorie, die den Fahrzeugen abhängig von deren Schadstoffklasse zugewiesen wird. Die Zuordnung der z.Zt. definierten Schadstoffklassen S1 – S6 und EEV zu den z.Zt. geltenden Kategorien A, B, C und D ist nicht konstant. Änderungen der Zuordnung und neue Kategorien sind möglich. Die Kategorien sind deshalb für die Bildung einer **Emissionskennzahl** nicht geeignet. Die Kennzahl muss vielmehr direkt aus den Schadstoffklassen berechnet werden.

Den Schadstoffklassen können gem. Anlage XIV zu § 48 StVZO die Grenzwerte der Richtlinie 88/77/EWG in der jeweils dort angegebenen Fassung zugeordnet werden. Damit ist es möglich, jeder Schadstoffklasse eine höchstzulässige Schadstoffmenge in g/kWh zuzuordnen (vgl. Tabelle unten). Mit dieser höchstzulässigen Schadstoffmenge wird eine durchschnittliche Emissionskennzahl für einen Autobahnabschnitt nach folgender Formel berechnet:

$$E_{BAB} = \frac{\sum_{i=1}^{n} (S_i \times L_i)}{\sum_{i=1}^{n} L_i} [g / kWh]$$

Mit E_{BAB} = Durchschnittliche Emissionskennzahl für den gewählten Abschnitt [g/kWh] (Wertebereich z.Zt. 2,04 ...15,53)
S_i = gesamte zulässige Schadstoffmenge der Schadstoffklasse i [g/kWh] Vgl. Tabelle unten
L_i = Insgesamt im gewählten Abschnitt gefahrene km mit Fahrzeugen der Schadstoffklasse i [km]
i = 1..n Index der Schadstoffklassen (z.Zt. n = 7)

Berechnung der gesamten zulässigen Schadstoffmenge S_i für die Schadstoffklasse i (jeweils g/kWh)

	CO	HC	NO_X	Partikel	Summe = S_i	i
Klasse S1 [1)]	4,9	1,23	9,0	0,4	15,53	1
Klasse S2 [1)]	4,0	1,1	7,0	0,15	12,25	2
Klasse S3 [2)]	2,1	0,66	5,0	0,10	7,86	3
Klasse S4 [2)]	1,5	0,46	3,5	0,02	5,48	4
Klasse S5 [2)]	1,5	0,46	2,0	0,02	3,98	5
KlasseEEV1 [2)]	1,5	0,25	2,0	0,02	3,77	6
Klasse S6 [3)]	1,5	0,13	0,4	0,01	2,04	7

1) Richtlinie 88/77/EWG in der Fassung der Richtlinie 91/542/EWG
2) Richtlinie 88/77/EWG in den Fassungen der Richtlinien 1999/96/EWG und 2001/27/EWG. Die Werte sind in den beiden Fassungen identisch
3) Verordnung (EG) 595/2009

2. Datenbasis

Die Fahrtendaten und DSRC-Kontrolldaten (an Mautkontrollbrücken ausgelesene OBU-Daten) werden von der Betreibergesellschaft in Form von Rohdaten zur Verfügung gestellt und im Zentralen Informationssystem (**ZIS**, DataWarehouse) des BAG aufbereitet.

Basis für die Auswertungen sind die vom ZIS zur Verfügung gestellten sogenannten Datenwürfel (**Cubes**) oder Reports. Auf dieser Grundlage sind Auswertungen nach zahlreichen Kriterien möglich. Im Wesentlichen sind dies:

Cube 9 (Differenzierung der Mautfahrten):

Kriterium	Beschreibung
Datum (Jahr, Monat, Tag)	Eine Mautfahrt wird im automatischen Verfahren mit dem Fahrtende und im manuellen Verfahren mit dem angegebenen Fahrtbeginn zeitlich zugeordnet.
Nationalität (ab 1.1.2007)	Im manuellen Verfahren wird das Zulassungsland des Zugfahrzeuges während der Einbuchung angegeben. Die Zuordnung von Nationalitäten im automatischen Verfahren erfolgt im ZIS über DSRC-Kontrolldaten. Im DSRC-Kontrolldatensatz ist - im Gegensatz zu den Fahrtendaten - das Zulassungsland enthalten. Aufgrund der begrenzten Anzahl von Mautkontrollbrücken ist diese Zuordnung bis auf etwa 0,4 % vollständig. In Tabellen mit dem Kriterium Zulassungsland wird daher eine Ausprägung „unbekannt" ausgewiesen.
Emissionsklasse (S1, S2, S3, S4, S5, EEV, S6)	Die Emissionsklassen ergeben sich aus den Richtlinien 88/77/EWG in der Fassung der Richtlinie 91/542/EWG und 88/77/EWG in den Fassungen der Richtlinien 1999/96/EWG und 2001/27/EWG sowie der Verordnung EG 595/2009.
Achsklasse (<=3 Achsen, > 3 Achsen)	Die Gesamtachszahl ergibt sich aus der Achszahl des Fahrzeugs oder der Fahrzeugkombination.
Einbuchungsquelle (OBU, Internet, Terminal)	

Cube 15 (Abschnittsbezogene Fahrleistungen der Mautfahrzeuge):

Kriterium	Beschreibung
Mautabschnitt	Ein Mautabschnitt ist eine mautpflichtige Strecke zwischen zwei aufeinander folgenden Knotenpunkten. Ein Knotenpunkt kann eine Auf- und/oder Abfahrtstelle sowie Anfangs- bzw. Endpunkt einer Bundesautobahn (BAB) bzw. einer Bundesstraße, ein Autobahndreieck, ein Autobahnkreuz oder eine Bundesgrenze sein. Grundlage ist die von der Bundesanstalt für Straßenwesen veröffentlichte Mauttabelle (http://www.mauttabelle.de/). Fahrleistungen werden gesondert nach den Fahrtrichtungen ausgewiesen.
Datum (Jahr, Monat, Tag)	s. Cube 9
Nationalität (ab 1.1.2007)	s. Cube 9
Emissionsklasse (S1, S2, S3, S4, S5, EEV, S6)	s. Cube 9
Achsklasse (<=3 Achsen, > 3 Achsen)	s. Cube 9
Einbuchungsquelle (OBU, Internet, Terminal)	s. Cube 9

Cube 16 (Anzahl Mautfahrzeuge – gezählt nach unterschiedlichen KFZ-Kennzeichen - im System):

Kriterium	Beschreibung
Datum (Jahr, Monat)	Eine Berechnung der Mautfahrzeuge mit unterschiedlichen KFZ-Kennzeichen innerhalb eines bestimmten Zeitraumes kann nur auf Monatsebene / Jahresebene durchgeführt werden. Eine kumulierte Auswertung kann nicht dargestellt werden, da ein Kennzeichen in verschiedenen Monaten aufgetreten sein kann und damit mehrmals gezählt wird.
Nationalität (ab 1.1.2007)	s. Cube 9
Einbuchungsquelle (OBU, Internet, Terminal)	s. Cube 9

Das ZIS unterliegt Ergänzungen und Anpassungen, die sich aufgrund des Betriebes und fachlichen Anforderungen ergeben und im Einzelfall minimale Auswirkungen auf die Auswertungen haben können. Hierauf soll in diesem Abschnitt hingewiesen werden.

- Stornierte Fahrten (nur im manuellen Verfahren möglich) sowie die mautpflichtigen Bundesstraßen werden mit Änderung des Auswertungssystems seit Januar 2008 berücksichtigt.
- Mit den Auswertungen ab Januar 2009 werden sogenannte Nullbuchungen nicht mehr berücksichtigt. Durch eine Neubewirtschaftung des ZIS gilt dies sowohl für den aktuellen als auch für den Vorjahresmonat. Für Prüfzwecke der BAG-Kontrollfahrzeuge als auch für temporär mautbefreite Fahrzeuge können Nullbuchungen entstehen.

3. Auswertezyklus

Die Datenlieferung aus dem Mautsystem erfolgt kontinuierlich. Systembedingt können Daten aus dem automatischen Verfahren vereinzelt auch noch Monate später in die den Auswertungen zugrundeliegende Datenbasis einfließen.
Beispiel: Ein Fahrzeug bewegt sich nicht im mautpflichtigen Streckennetz. In der OBU befinden sich aber noch erhobene Streckendaten, die nicht an die zentralen Systeme des Mautsystems versandt wurden. Erst nach dem Einschalten der OBU bzw. der Erfüllung eines der Versand-Kriterien „Einfahrt in das mautpflichtige Streckennetz" oder „Kredit- bzw. Zeitlimit erreicht", werden Daten in das Mautsystem abgegeben.
Auswertungen haben ergeben, dass nach etwa 10 Tagen des Folgemonats die Mautdaten nahezu vollständig vorliegen. Danach fließen lediglich noch Mautdaten im Promillebereich in den Gesamtdatenbestand ein. Die Aussagefähigkeit der dargestellten Tabellen wird hierdurch nicht eingeschränkt.

Die Auswertungen erfolgen in der Regel zu folgenden Stichtagen:

- Bei monatlich erscheinenden Tabellen 15 Werktage nach dem jeweils monatsletzten Tag. Mit diesem Stichtag erfolgt die Auswertung sowohl für den aktuellen Monat als auch für den vergleichenden Vorjahresmonat.
- Bei jährlichen erscheinenden Tabellen 15 Werktage nach dem jeweils vorausgehenden 31. Dezember. Mit diesem Stichtag erfolgt die Auswertung für das aktuelle Jahr als auch für das vergleichende Vorjahr.

Auswertungen zum aktuellen Berichtszeitraum, die zu einem späteren Stichtag durchgeführt werden, können daher geringfügige Abweichungen aufweisen.

4. Erläuterungen zu den Tabellen

Die Veröffentlichung umfasst **monatliche** mit **M** und **jährliche** mit **J** bezeichnete Tabellen. In beiden Tabellentypen erfolgt ein Vorjahresmonats- bzw. Vorjahresvergleich.

In einem mit [ ] gekennzeichneten Tabellenfeld liegt kein Wert zugrunde. Zum Beispiel liegen bei einer im Januar 2008 veröffentlichten Jahrestabelle für das Jahr 2007 mit dem Kriterium Nationalität (das erst ab dem 1.1.2007 im ZIS enthalten ist) keine Zahlen des Vorjahreszeitraums 2006 vor.

Die Tabellen M 1 bzw. M 2 und J 1 bzw. J 2 liefern Übersichten über die Fahrleistungen bzw. Mautfahrten der Mautfahrzeuge auf mautpflichtigen Straßen aufgegliedert nach dem Zulassungsstaat des Mautfahrzeuges. Zusätzlich erfolgt eine Untergliederung nach Inland / Ausland und hierbei wiederum nach EU und Nicht EU Staaten. Die Ausprägung „Unbekannt" beinhaltet die im ZIS nicht einer Nationalität zugeordneten Fahrtendaten (vgl. auch Punkt 2).

Um die unterschiedlichen Kalenderverläufe (siehe auch Hinweisseite in den monatlichen Tabellen) für das aktuelle und das vorhergehende Jahr zu berücksichtigen, wurde ausschließlich für die Tabelle M 1 mit Januar 2009 eine Tabelle M 1a eingeführt. In ihr sind neben den tatsächlichen auch die unter Berücksichtigung der Kalenderverläufe ermittelten Veränderungswerte zum Vorjahresmonat bzw. zur Jahressumme dargestellt. Die Ermittlung erfolgt hierbei nach folgender Methodik. Für den aktuellen Monat als auch für den Vorjahresmonat werden jeweils für Werktage, Samstage und Sonntage (einschl. bundeseinheitliche Feiertage) getrennt die entsprechenden Fahrleistungen berechnet. In Abhängigkeit der jeweiligen Anzahl der Tage erfolgt die getrennte Berechnung einer (bereinigten) Fahrleistung für den aktuellen Monat. Der Vergleich des sich daraus ergebenden Gesamtwertes mit dem Wert des Vorjahresmonats ergibt den in M 1a zusätzlich ausgewiesenen Veränderungswert. Die Berechnung erfolgt gesondert nach Nationalitäten.

Die Tabellen M 3, M 4, M 5 und J 3 , J 4, J 5 stellen die Anzahl der ein- und ausfahrenden Mautfahrzeuge an den Grenzübergängen dar.
Aufgrund der mautfreien Abschnitte nach Frankreich (A6: Goldene Bremm-Bundesgrenze sowie A5: Ottmarsheim Bundesgrenze) und in die Schweiz (A5: Weil am Rhein-Bundesgrenze) ist der Verkehr in und aus diesen Ländern nur eingeschränkt darstellbar.

Die Berücksichtigung des Merkmals Emissionsklassen liefern die Tabellen M 6, M 7 sowie J 6, J 7.
Den Tabellen M 6 und J 6 liegen die unter Punkt 1.3 definierten Emissions-kennzahlen zugrunde. Die Tabellen stellen anhand der zurückgelegten mautpflichtigen Kilometer die durchschnittliche Emissionskennzahl je Nationalität dar. In Tabelle J 6 enthält die Spalte „Anteil in [%]" zum Vergleich den Anteil an der gesamten Fahrleistung, die auch in Tabelle J 1 ausgewiesen ist.
In den Tabellen M 7 und J 7 sind die Fahrleistungen nach Herkunft (Inland / Ausland sowie EU ohne Inland und Nicht EU), untergliedert nach den einzelnen Emissionsklassen, ausgewiesen.

Seit Januar 2010 werden folgende weitere Tabellen in der Auswertung dargestellt : Die Tabelle M 8 bzw. J 8 stellt die Fahrleistungen nach Emissionsklasse und Achsklasse dar, die Tabelle M 9 bzw. J 9 stellt die Mautfahrten nach Emissionsklasse und Achsklasse dar. Diese Auswertungen beziehen sich nur auf den aktuellen Monat bzw. auf das aktuelle Jahr, ein Vergleich zum Vorjahresmonat bzw. zum Vorjahr findet nicht statt.

Der Tabelle M 10 sowie J 10 liegt die Anzahl der eingebuchten unterschiedlichen KFZ-Kennzeichen von Mautfahrzeugen innerhalb eines bestimmten Zeitraumes im System zugrunde. Hierbei ist nur eine monatliche bzw. jährliche Auswertung möglich, da in einem kumulierten Wert ein Kennzeichen mehrmals vorkommen kann. In der jährlichen (unter Umständen auch in der monatlichen) Auswertung können reale Fahrzeuge mehrfach auftreten, wenn z.B. innerhalb dieses Zeitraumes ein Kennzeichenwechsel vorgenommen wurde. Der Mittelwert der Fahrleistungen wird

anhand der Fahrleistungen aus M 1 (J 1) , der Mittelwert der Mautfahrten mit den Mautfahrten aus M 2 (J 2) berechnet.
In der Tabelle M 11 und J 11, welche die durchschnittliche Streckenleistung pro Mautfahrt ausweist, werden die Fahrleistungen aus M 1 bzw. J 1 den Mautfahrten aus M 2 bzw. J 2 gegenübergestellt.

5. Tabellenübersicht

J 1 / M 1	Fahrleistungen der Mautfahrzeuge nach Nationalität
J 2 / M 2	Mautfahrten der Mautfahrzeuge nach Nationalität
J 3 / M 3	Anzahl der ein- und ausfahrenden Mautfahrzeuge an den Grenzübergängen
J 4 / M 4	Anzahl der einfahrenden Mautfahrzeuge an den Grenzübergängen
J 5 / M 5	Anzahl der ausfahrenden Mautfahrzeuge an den Grenzübergängen
J 6 / M 6	Emissionskennzahl der Mautfahrzeuge nach Nationalität
J 7 / M 7	Fahrleistungen der Mautfahrzeuge nach Herkunft und Emissionsklasse
J 8 / M 8	Fahrleistungen nach Emissionsklasse und Achsklasse
J 9 / M 9	Mautfahrten nach Emissionsklasse und Achsklasse
J 10 / M 10	Durchschnittliche Fahrleistungen / Mautfahrten der Mautfahrzeuge mit unterschiedlichen KFZ-Kennzeichen nach Nationalität
J 11 / M 11	Durchschnittliche Streckenleistung pro Mautfahrt nach Nationalität

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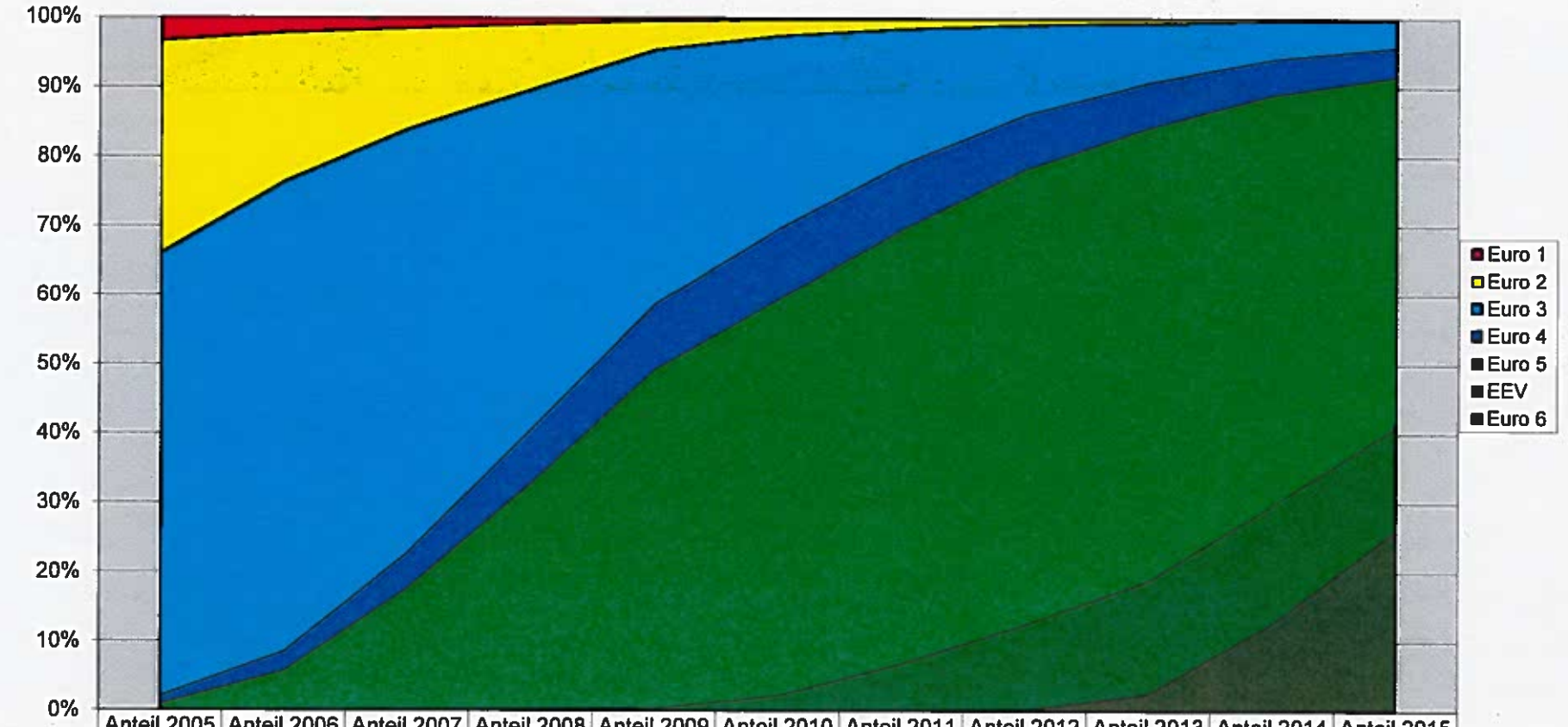
Stand: Februar 2015

Übersicht Lkw-Maut: Entwicklung der Fahrleistungsanteile nach Schadstoffklassen



	Anteil 2005	Anteil 2006	Anteil 2007	Anteil 2008	Anteil 2009	Anteil 2010	Anteil 2011	Anteil 2012	Anteil 2013	Anteil 2014	Anteil 2015
Euro 1	3,44%	2,30%	1,61%	1,04%	0,49%	0,30%	0,20%	0,14%	0,11%	0,08%	0,06%
Euro 2	30,39%	21,25%	14,37%	9,28%	4,14%	2,28%	1,35%	0,82%	0,52%	0,34%	0,25%
Euro 3	64,11%	67,98%	61,25%	49,09%	36,67%	27,82%	19,51%	12,96%	8,63%	5,46%	3,90%
Euro 4	1,22%	2,79%	5,10%	7,80%	9,47%	10,21%	9,40%	7,85%	6,50%	5,14%	4,22%
Euro 5	0,80%	5,65%	17,63%	32,74%	48,98%	57,23%	62,76%	65,78%	65,43%	59,27%	50,61%
EEV	0,04%	0,03%	0,03%	0,05%	0,25%	2,16%	6,79%	12,32%	16,32%	17,02%	14,87%
Euro 6	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,13%	2,50%	12,68%	26,08%

1 rQuestionnaire

1)	Please provide all relevant national legal principles and rules for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) in your country.

The legal framework applicable to HGV with MPW over 3,5 tons mainly cover the following items:

- 1-Driving times, breaks and rest periods for drivers in application of Regulation EC/561/2006 of march 15th 2006.
- 2-For international traffic, dimensions and maximum weight in application of Directive 93/53/EC of july 25th 1996.
- 3-For national traffic a Decree of december 4th 2012, applicable from january 1st 2013, authorizes HGV 4 or more axles to run with a gross weight between 40 and 44 tons on the national territory. This authorization is regulated by a set of technical requirements that shall be observed, in particular strict limitations for the axles load of the tractor unit and trailer.
- 4-Traffic ban applicable to HGV over 7,5 tons, all year long and on the entire national road network:
  - Saturday 22:00 until Sunday 22:00;
  - The day prior public holidays from 22:00 to 22:00 the next day.
- Some derogations are possible for transport of specific goods.
- 5-Speed limitations:
- 90 km/h on motorway/highway
- 90 or 80 km/h on main roads.

2)	Please attach a map (e.g. as pdf-document) showing where tolls and user charges are collected in your country.

See map herewith (annex 1)

3a)	Does your Member State apply tolls and/or user charges on roads not included in the trans-European road network?
	[X] Yes No
3b)	If yes to 3a), please provide information on the roads and/or the road network concerned.

Some Motorways are not included in the Transeuropean road, network because of more local interest, but they have been delegated and tolls are applied.

One of the main benefits of this survey should be to identify and compare the current toll rates and/or levels of user charges for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW).

Therefore please indicate the current toll rates and/or user charges for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) applied in your country.

Please indicate also, if toll rates and/or user charges are subject to the value added tax (VAT) in your country and if yes, if the VAT is included in the listed rates.

Levels of toll are not common to all motorways but, as each motorway has been built in the framework of a concession, linked to the own parameters of this concession (costs of the construction, traffic, ...). The general principle was to balance costs (construction, maintenance, financing, ...) and incomes (tolls), avoiding subsidizing the projects (as far as possible ...).

All levels of tolls presented herewith, if not otherwise specified, are given for the heaviest vehicles (cat 4+ of the above table) ; in the Alps, they vary from 0,30 €/km to 0,52 €/km for the motorways .

Tolls include VAT (presently 20%).

See Tolls on the different alpine motorways annex 2a.

Moreover, two French-Italian tunnels have specific tolls; See annex 2b

..

5) In order to be able to compare toll rates and/or user charges for the different categories of vehicles, please indicate the toll rates and user charges for for vehicles weighing more than 3.5 tonnes maximum permissible laden weight (MPW) with more than 4 axles, EURO III, V and VI.

See above

6a)	Does your country vary toll rates according to EURO emission classes as set out in Annex 0 of 2006/38/EC and/or the time of day, type of day or season?
	[X] Yes No.
6b)	If yes to 6a), please provide information about how this differentiation is implemented in your country.
	1- Modulation are applied on the two french-iatalien tunnels. See annex 2b 2- On delegated network modulation are presently applied only on two recent delegated motorways, A63 and A150, in west of France. For most of the part of the already delegated network, and in accordance with the European directive, the French law stipulates the inclusion of modulation according to Euro classes at the renewal of the present concession contracts, which did not yet occur.

6c)	Are the impacts of the differentiation of infrastructure charges according to EURO classes on air pollution being monitored?
	Yes No [X]
6d)	If yes to 6c), please specify how they are being/will be monitored, and whether you are able to provide us with link to related documents.

Click here to enter text.

7a)	Toll rates may in exceptional cases be subject to a mark-up for the financing of specific projects of high European interest. If your country does not already apply this exception, does it have any plans to do so?
	[X] Yes [ ] No France does not apply this mark-up yet but plans to do so within the framework of the implementation of the railway project Lyon - Turin. The agreement signed in January 2012 by France and Italy, for the achievement of this project includes in particular an appendix related to the modal shift, which provides for the progressive implementation of the tariff provision of the directive 1999/62/CE on the main franco-italian roads axis crossing the Alps (the tunnels of Mont Blanc and Frejus and the axis of Vintimille). Pursuant to this directive, the corresponding revenue will be assigned to the financing of the new railway line Lyon-Turin. A report on this issue was requested by the government to two members of Parliament and was submitted July 13th 2015.
7b)	If yes to 7a), please provide information, on how this exception will be applied in your country (respective project, planned timetable for implementation and level of toll rates for each vehicle category).
	This has to be analyzed within the framework of the Franco-Italian intergovernmental commission.

8a)	Article 7a para 5 deals with the problem of shifting, especially of HGV traffic, from tolled high-ranked roads (motorways and/or expressways) to parallel road infrastructure. Does in your country have such problems caused by avoiding road charges and/or tolls for HGV´s and using not high ranked roads?
	[X] Yes [ ] No
8b)	If yes to 8a), how does your country manage these problems, are there examples for road tolls and/or charges on parallel roads to the high ranked networks? Are there traffic bans for HGV on parallel routes to the high ranked network, to help that no traffic is diverted?
	A minor part of HGV use free parallel roads when it is easy to do so, which is not the case in the Alpine area.

9)	Please provide information on the development of traffic by vehicle categories on the tolled/charged road network and, if available, the development of the shares of EURO classes of HGV´s on this network since getting into force of the EU-Directive 2006/38/EC.

The share of HGV traffic was:

2015

NoEURO 6%

EURO 0 3%

EURO1 4%

EURO2 12%

EURO3 21%

EURO4 20%

EURO5 29%

EURO6 5%

For France see Annex 3a herewith.

For Mont-Blanc and Frejus tunnels see Annex 3b herewith.

10)	Are you able to provide information about whether infrastructure charging has had an impact on freight traffic on the interurban road network (e.g. traffic performance, degree of loading or empty runs)?

☒ Yes ☐ No ☐ Don't know/No view

On the tolled motorway network, it had an impact which is now stabilized (loaded 76% empty 24%) since 1997.

11)	Is revenue from infrastructure charging earmarked for reinvestment in the transport sector in your Member State?
	All of it [X] Some of it None of it Don't know
12)	Please provide details about your country's policy (and practice) in terms of earmarking infrastructure charging revenue.
	Current revenues, on delegated networks are mainly used for network management.

13a)	One of the main strategic objectives of the transport protocol of the Alpine Convention is shifting cargo from road to rail. Did the implementation of the EU-Directive 1999/62/EC as amended by 2006/38/EC or of similar measures contribute to achieve the objectives of a, b and c of Article 14 of the Transport Protocol.
	Yes No [X] Don't know/No view
13b)	If yes to 13a), please provide a short summary of these positive effects.
	The road-network tariffing system, defined in the concession contracts for a long time, has been regularly updated to follow inflation but its structure has not been modified. No significant modal shift effect was therefore yet observed. Futhermore a very long period of work in the main railway tunnel between France and Italy (Fréjus tunnel), and the disturbances it caused, resulted in a decrease, hopefully temporary, of the railway share in the total traffic between France and Italy. The progressive renewal of long-term concession contracts will be monitored.

14a)	Are there any plans in your country to implement additional measures in the field of tolls and/or user charges?
	[X] **Yes** No Don't know/No view
14b)	If yes to 14a), please provide information which measures are planned and the schedule for their implementation.
	France intends to apply a mark-up on the concerned road network within the framework of the implementation of the railway project Lyon - Turin. The agreement signed in January 2012 by France and Italy, for the achievement of this project includes in particular an appendix related to the modal shift, which provides for the progressive implementation of the tariff provision of the directive 1999/62/CE on the main franco-italian roads axis crossing the Alps (the tunnels of Mont Blanc and Frejus and the axis of Vintimille). Pursuant to this directive, the corresponding revenue will be assigned to the financing of the new railway line Lyon-Turin. A report on this issue was requested by the government to two members of Parliament and was submitted July 13th 2015.

15a)	Is your country planning to implement the relevant provisions of the latest Eurovignette Directive 2011/76/EU for better reflecting the external costs of traffic-based air and noise pollution?
	☒ Yes ☐ No ☐ Don't know/No view
15b	If yes to 15a), please provide information, which measures are planned and the schedule for their implementation.
	France was in favour of the revision of the directive in order to implement road pricing reflecting the external costs. The conditions and possibility for such implementation are currently under examination.

16)	Do you have any additional comments?
	Click here to enter text.

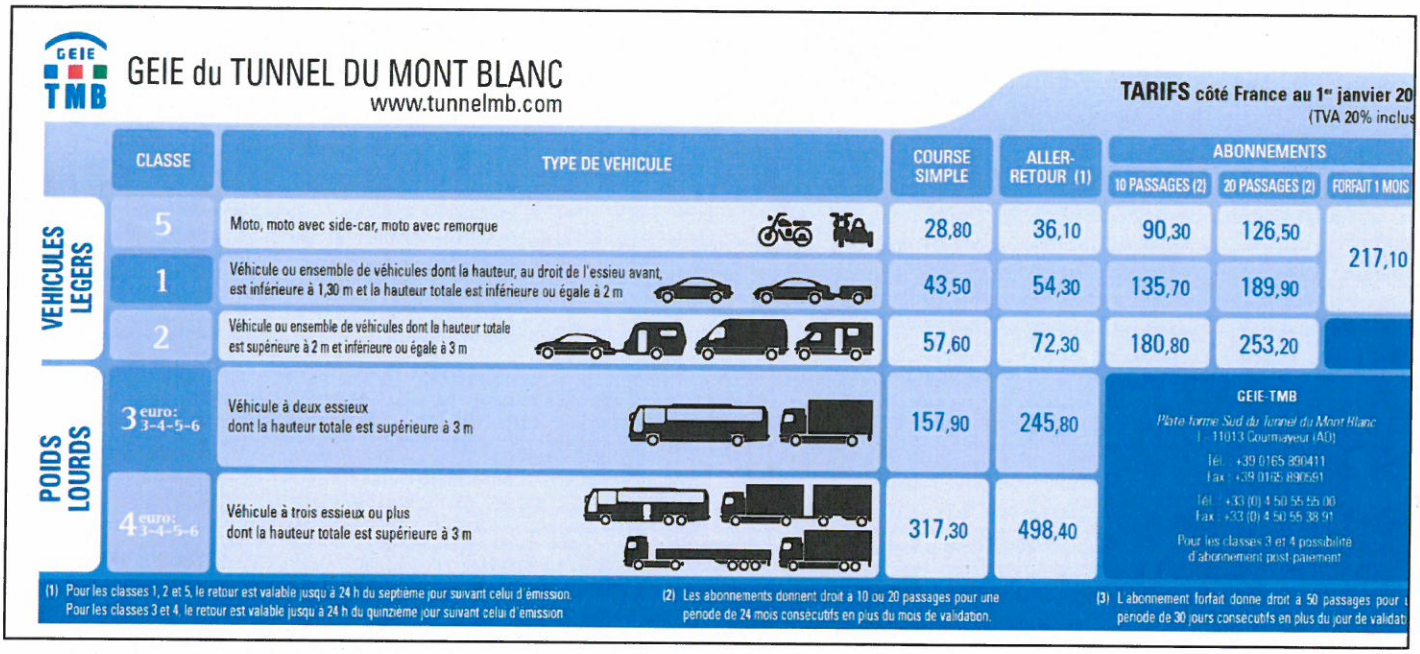
Thank you for your time and support.

Green	Delegated Network (Concession with Tolls)
Blue-	Non delegated Network (free)

Annexe 2a
enquête article 15 protocole transport de la Convention alpine

Voie		Section			Tarification actuelle au 1er février 2016		
N° européen	Numéro national	De …	A …	distance	Type (1)	Tarif (2)	Tarif/km (2)
				… km	Oui /non	€	€ par km
E21 - E62	A 40	Bellegarde	Le Fayet	95,5	oui concession	38,40 €	0,40 €
E25	A40 puis RN 205	Le Fayet	entrée tunnel MB	24,5	Non	0 €	0 €
E712	A 41	St Julien en Genevois	Chambery-Nord	68,9	oui concession	35,90 €	0,52 €
E70	A410 et A43	Villy le Pelloux	Chambery-Nord	51,0	oui concession	15,90 €	0,31 €
E 70	RN201	Chambery nord	La Ravoire	5	Non	0 €	0 €
E 70	A43	La Ravoire	Freney	91,6	oui concession	46,70 €	0,51 €
E 70	A43	Freney	Entrée Tunnel Fréjus	5	Non	0 €	0 €
	A430	Aiton	Gilly-sur-Isère	16,0	oui concession	5,20 €	0,33 €
E712	A41	Montmélian	Meylan	35,5	oui concession	13,10 €	0,37 €
E712	RN87	Meylan	Echirolles	10,5	Non	0 €	0 €
E711	A48	Rives	Saint-Egrève	23,4	oui concession	8,60 €	0,37 €
E711/E712	A480	Saint-Egrève	Claix	14	non	0 €	0 €
E712	A51	Claix	Monestier-de-Clermont	19,0	oui concession	9,40 €	0,49 €
	RN85	Pont-de-Claix	La Saulce	109	Non	0 €	0 €
	RN85	Vizille	Gap	86	Non	0 €	0 €
	RN85	Gap	La Saulce	15	Non	0 €	0 €
	A51	La Saulce	Saint-Paul-lez-Durance	96,5	oui concession	29,20 €	0,30 €
	A49	Voreppe	La Baume-d'Hostun	47,0	oui concession	16,60 €	0,35 €
	A8	Gorbio	Castellar (frontière)	10	non-concession non tarifée	0 €	0 €
E64	RD6204	Breil-sur-Roya (frontière)	Tende (frontière)	40	Non	0 €	0 €

Annexe 2b



GEIE du TUNNEL DU MONT BLANC
www.tunnelmb.com

TARIFS côté France au 1er janvier 20
(TVA 20% inclus

	CLASSE	TYPE DE VEHICULE	COURSE SIMPLE	ALLER-RETOUR (1)	ABONNEMENTS 10 PASSAGES (2)	ABONNEMENTS 20 PASSAGES (2)	ABONNEMENTS FORFAIT 1 MOIS
VEHICULES LEGERS	5	Moto, moto avec side-car, moto avec remorque	28,80	36,10	90,30	126,50	217,10
VEHICULES LEGERS	1	Véhicule ou ensemble de véhicules dont la hauteur, au droit de l'essieu avant, est inférieure à 1,30 m et la hauteur totale est inférieure ou égale à 2 m	43,50	54,30	135,70	189,90	
VEHICULES LEGERS	2	Véhicule ou ensemble de véhicules dont la hauteur totale est supérieure à 2 m et inférieure ou égale à 3 m	57,60	72,30	180,80	253,20	
POIDS LOURDS	3 euro: 3-4-5-6	Véhicule à deux essieux dont la hauteur totale est supérieure à 3 m	157,90	245,80			
POIDS LOURDS	4 euro: 3-4-5-6	Véhicule à trois essieux ou plus dont la hauteur totale est supérieure à 3 m	317,30	498,40			

GEIE-TMB
Plate forme Sud du Tunnel du Mont Blanc
F - 11013 Courmayeur (AO)
Tél. : +39 0165 890411
Fax : +39 0165 890591
Tél. : +33 (0) 4 50 55 55 00
Fax : +33 (0) 4 50 55 38 91
Pour les classes 3 et 4 possibilité d'abonnement post-paiement

(1) Pour les classes 1, 2 et 5, le retour est valable jusqu'à 24 h du septième jour suivant celui d'émission. Pour les classes 3 et 4, le retour est valable jusqu'à 24 h du quinzième jour suivant celui d'émission

(2) Les abonnements donnent droit à 10 ou 20 passages pour une période de 24 mois consécutifs en plus du mois de validation.

(3) L'abonnement forfait donne droit à 50 passages pour u période de 30 jours consécutifs en plus du jour de validati

Tunnel du Fréjus-Tarifs 2015

Poids lourds

En italique : tarifs sens Italie => France

Convois exceptionnels Escortes matières dangereuses

Tarifs TTC en €uros

Classe	Sous classification Euro-polluant	Course Simple		Aller-Retour *Validité 15 jours*	
		France	Italie	France	Italie
3 Véhicule à deux essieux dont la hauteur totale est supérieure à 3m.	Euro 3-4-5-6	**157,90**	***160,50***	**245,70**	***249,80***
	Euro 1-2	**167,10**	***169,80***	**260,00**	***264,30***
4 Véhicule à trois essieux ou plus dont la hauteur totale est supérieure à 3m.	Euro 3-4-5-6	**317,30**	***322,50***	**498,30**	***506,60***
	Euro 1-2	**335,70**	***341,30***	**527,30**	***536,10***
Exceptionnels classe **B**	Euro 3-4-5-6	**440,50**	***447,80***		
	Euro 1-2	**466,10**	***473,80***		
Exceptionnels classe **C**	Euro 3-4-5-6	**874,30**	***888,80***		
	Euro 1-2	**925,10**	***940,00***		
Escortes matières dangereuses	Euro 3-4-5-6	**127,80**	***129,90***		
	Euro 1-2	**135,20**	***137,40***		
Escorte spécifique **F** *MD de classe 1, classification 1.3C et 1.3G (-5t) et de classe 2* **Transit entre 23h00 et 5h00**	MD de classification 1 (1.3C & 1.3G) et de classification 2	**590,20**	***600,00***		

PL en Euro 1 interdits à compter du 1er mai 2015

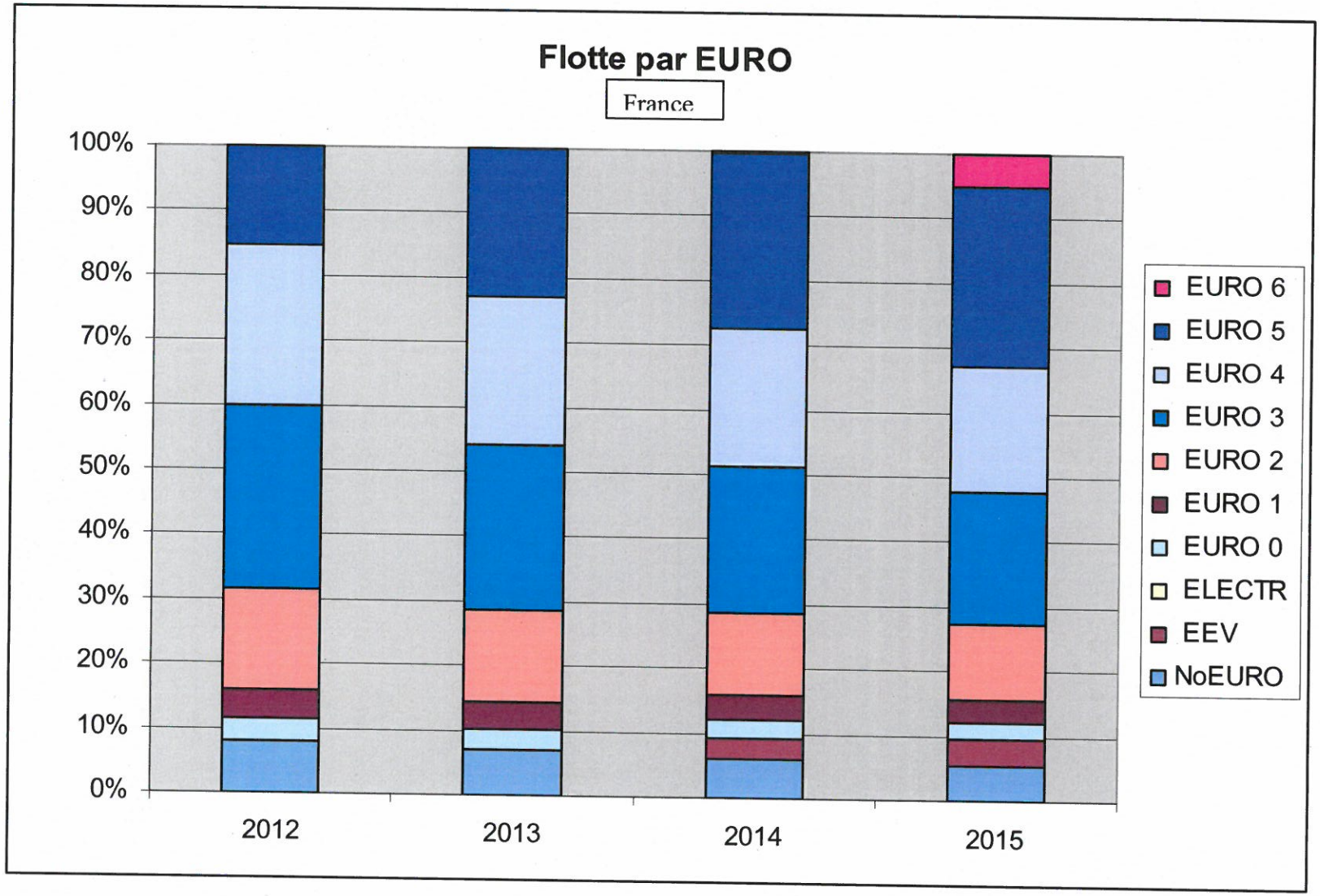
Transit des matières dangereuses : arrêté préfectoral disponible au www.tunneldufrejus.com.

Transports exceptionnels : conditions particulières (renseignements auprès du Cesam)

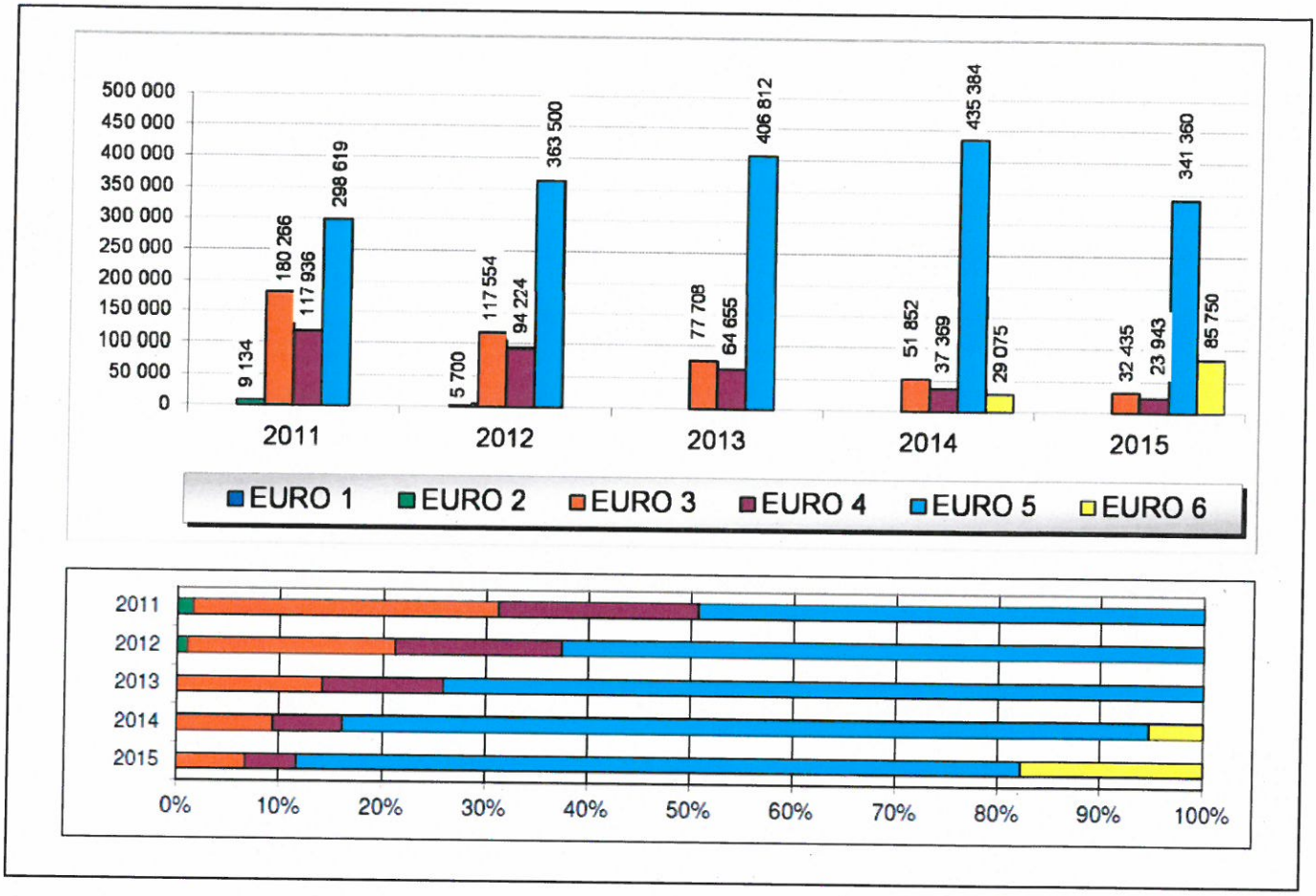
Classe B : largeur comprise entre 2,81m et 3,50m

Classe C : largeur comprise entre 3,51m et 6m, ou longueur supérieure à 25m

Annexe 3a


Flotte par EURO
France
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2012
2013
2014
2015
EURO 6
EURO 5
EURO 4
EURO 3
EURO 2
EURO 1
EURO 0
ELECTR
EEV
NoEURO

Tunnel du Mont-Blanc



Tunnel du Fréjus

Tipologia Typologie	Euro 0		Euro 1		Euro 2		Euro 3		Euro 4		Euro 5		Euro 6	
	Transiti 2014 Transits 2014	Diff. % 14/13	Transiti 2014 Transits 2014	Diff. % 14/13	Transiti 2014 Transits 2014	Diff. % 14/13	Transiti 2014 Transits 2014	Diff. % 14/13	Transiti 2014 Transits 2014	Diff. % 14/13	Transiti 2014 Transits 2014	Diff. % 14/13	Transiti 2014 Transits 2014	Diff. % 14/13
BUS	1	0,0%	25	-37,50%	274	-42,56%	1.695	-11,58%	1.328	-73,17%	13.666	41,08%	270	---
PL	0	0,0%	311	-43,35%	4.770	-37,82%	87.980	-26,04%	51.886	-46,27%	493.628	12,59%	27.952	---
PL + BUS	1	0,0%	336	-42,95%	5.044	-38,10%	89.675	-25,81%	53.214	-47,59%	507.294	13,20%	28.222	---
Peso – Poids % 2014	0,0%		0,05%		0,74%		13,11%		7,78%		74,19%		4,13%	
Peso – Poids % 2013	0,0%		0,09%		1,20%		17,77%		14,93%		65,89%		0,12%	

NB:
La classificazione Euro 6 è iniziata il 1° agosto 2013.
Precedentemente erano classificati con gli Euro 5

NB:
L'enregistrement des Euros 6 a commence le 1er aout 2013.
Auparavant ils étaient intégrés avec les Euros 5

Annex 2

Cerema

Direction technique
Infrastructures de transport et matériaux

Case followed by:

Mar. M'BALLA
DTITM
CSTM/DEOST Department
French Ministry for Environment
tel. +331 60 52 32 63

CSTM
110 rue de Paris
77487 SOURDUN
France

SOURDUN, 13 May 2016

Concerning: Memo External Environmental Costs

In the context of the Alpine Convention in the field of transport gathering the countries of the Alpine range (Germany, Austria, France, Italy, Slovenia, Switzerland), the French Ministry for Environment (DGITM/SAGS/MAP) commissioned from Cerema/DTecITM a bibliographical review on traffic-related external environmental costs (private cars, vans, HGVs, two-wheelers, buses/coaches). This review analysed the various calculation methods identified in a corpus of studies, in order to estimate the impact of traffic on external environmental costs. It also assessed the data used in the various studies. It cross-compared the values used in these studies, and checked them against the Eurovignette III Directive. The analysis also focused on mountainous areas and on how these had been factored in. Indeed, mountainous zones are more sensitive to traffic-related environmental impacts than are lowland areas. The topography of mountainous areas makes them less ventilated than lowlands and intensifies road traffic related resonance effects.

SUMMARY

This note, produced on behalf of the Mission des Alpes, addresses the question of external environmental costs incurred by heavy goods vehicles (HGVs). These external environmental costs are the impacts related to the use of transport and which are not accounted for in the costs paid by the agents who carry out or commission such transportation. Examples of the above are noise, atmospheric pollution or indeed climate change. These costs endured by society have a price (development costs for noise-limiting schemes, medical care related to pollution, action against GHG emissions, etc.). The current economic climate does not allow society to take on the entirety of these costs. Consequently, the Eurovignette III European Directive enables Member States to surtax vehicles in order to take into account the environmental impacts on noise and air pollution. This approach is based on the polluter-payer principle.

The aim of this review is to present the calculation methods encountered in a series of studies for estimating the impact of traffic on external environmental costs. A second objective is to identify the data used to estimate the impact of traffic on external environmental costs. Within this framework, 15 studies conducted between 2003 and 2015 have been analysed.

This review also compares the basic values arising from the 15 bibliographical references: by cross-referencing them and with the values recommended by the Eurovignette III Directive for atmospheric pollution and noise pollution.

The question of sensitive mountain zones is subject to particular focus. Their topography makes mountainous zones less aerated than lowlands and accentuates the resonance effects related to road traffic noise, making them more sensitive than lowlands.

1) Comparison of methods and data sources used for calculating the external environmental costs:

- Air pollution:

Out of the 15 documents analysed, 14 address the issue of atmospheric pollution. Particulate Matter – PM - (10 and 2.5) is the element incriminated in all the studies dealing with the issue of atmospheric pollution. Its dangerousness is linked to the particle size. The smaller the particles are (PM 2.5) the deeper they get inside the respiratory system. Some can contain toxic products such as metals or polycyclic aromatic hydrocarbons (PAH), which are considered to be carcinogenic. This is the reason why the cost per tonne of volatile particulate matter emitted is far more significant than for the other pollutants.

The most commonly encountered calculation method used to estimate the effects of atmospheric pollution emitted by road traffic is the IPA (Impact

Pathway Approach). Out of the 14 studies analysed, 11 employed it. The IPA method requires the use of 3 types of data: the transport demand (in vkm per year), the specific emission coefficients (in g per vkm) and the damaging factor per pollutant (in euros per tonne).

The database most often used to evaluate the transport demand is EUROSTAT. Other studies use transport models to which they add their own traffic data. Emission coefficients are obtained using traffic models. COPERT and TREMOVE are the most commonly used. The most used damaging factors per pollutant are mainly from HEATCO.

- Noise:

Out of the 15 documents analysed, 13 address the issue of noise. The majority of effects taken into account in the calculation of external costs due to noise are the cost of discomfort and effects on health. Out of the 13 studies analysed, 9 uses IPA method. This method requires the use of 3 types of data: data on exposure to noise, data on costs per person exposed and the breakdown of total external costs by vehicle category using weighing factors as a basis.

The data on exposure to noise is governed by European Directive 2002/49/EC. It makes noise maps compulsory for conurbations of more than 100,000 inhabitants or along roads bearing traffic of more than 3 million vehicles per year. As regards the data on costs per person exposed and the breakdown of total external costs by vehicle category using weighting factors, the majority of studies use HEATCO as a basis. Some of these studies implement correction factors to take account of their specific nature (For France: CGSP 2013 or La Transalpine 2008).

- Other external costs:

The Eurovignette III European Directive does not provide mean values imposed on HGVs for other external costs. Within the scope of the 15 studies, 9 provide further information on other external costs. It appears that the upstream downstream effects, accidents and climate change are analysed by most of the studies. Their impacts on the total of external costs vary considerably from one study to another. This is most likely to be linked to the introduction of factors and coefficients taking into account the scope studied, the development of engine power or the value of a year of human life. Other factors such as the calculation method and the databases used could explain such differences.

2) Comparison of basic values between the Eurovignette III Directive and the other studies:

- Air pollution:

To improve the comparison, the cost data per Euro standard presented in the European Directive has been averaged in accordance with the composition of the HGV fleet on the roads in France in 2015. On average, with Eurovignette III, an HGV driving along an urban road may be taxed at a rate of €0.04 per kilometre, as opposed to €0.03 per kilometre if it uses an inter-city road.

Only the CGSP 2013, Delft Infras 2011 and ALE 2012 studies (based on the results of Delft Infras 2011) provide values enabling a comparison with Eurovignette III. The aggregated values of the Eurovignette III Directive are generally lower than the values put forward by the other studies for an identical urban fabric. When compared with other studies, without applying the factor of 2 to mountainous zones, the Eurovignette III Directive underestimates the impacts of atmospheric pollution.

- Noise:

On average, with Eurovignette III, an HGV driving along an urban road in the daytime may be taxed at a rate of €0.011 per kilometre (€0,02 per kilometre during night-time whatever type if urban fabric. According to Eurovignette III, the noise impact due to the use of vehicles is approximately two times higher at night than during the day regardless of urban zoning. Only the CGSP 2013, Delft Infras 2011 and ALE 2012 studies (based on the results of Delft Infras 2011) provide values enabling comparison with Eurovignette III.

The costs of noise pollution according to the Eurovignette III Directive are much lower for urban areas than the values put forward by the studies that address the issue of noise cost in urban areas. The cost of noise pollution in the Eurovignette III Directive is much lower for rural areas then the values proposed by the studies that address the issue of noise cost in rural areas.

3) Comparison of basic values between the Eurovignette III Directive and the studies on mountainous zones:

- Air pollution:

METLTM 2003, GRACE 2006, La Transalpine 2008 and InterAlp 2013 are the studies that specifically assess mountainous zones or which use specific data for mountainous zones. To take account of external costs in mountainous zones, the Eurovignette III Directive recommends the use of a factor of 2 on the basic data. The GRACE 2006 study uses a factor of 5.15.

Applying a factor of 5.15 to the Eurovignette basic values makes it possible to approximate the values arising from the METLTM 2003 study. La Transalpine indicates much lower values.

- Noise:

METLTM 2003, GRACE 2006 and La Transalpine 2008 are the studies that specifically assess noise in mountainous zones. To take account of external costs in mountainous zones, the Eurovignette III Directive recommends applying a factor of 2 to the basic data. The GRACE 2006 study uses a factor of 5.15.

On comparing the Eurovignette III application of the “factor of 2”, its results converge with the two other studies on mountainous zones (METLTM 2003 and La Transalpine 2008). The values of Eurovignette III with a “factor of 5.1” are higher than the results of the studies addressing mountainous zones for urban areas.

Conclusion:

The result of this analysis shows that the basic values of the Eurovignette III European Directive are lower than those of the studies analysed within the scope of this paper.

According to the studies addressing mountainous zones, the use of a factor of 2 appears to be insufficient to take account of their sensitivity to air pollution. The application of a factor of 5.15 for air pollution to Eurovignette III provides values that are close to those in the studies on mountainous zones.

Concerning noise pollution, the factor of 2 proposed by the Directive is fairly close to the results of the studies addressing mountainous zones.

I - WHAT IS AN EXTERNAL COST?

External costs are effects related to the use of transport that are not taken into account in the costs paid by the agents using transportation. These effects are, for example, noise, congestion, pollution, accidents, etc. These costs are borne by society (care in the case of accidents, insurance, medical costs linked to pollution, etc.).

1) External environmental costs:

External environmental costs can be distinguished from overall external costs. **External environmental costs are the secondary effects** (noise, air pollution, health, climate change, biodiversity, etc.) **that solely have an impact on the environment**.

2) External costs included in this study:

In this study, two major external environmental costs are singled out: air pollution and noise.

It is more difficult to quantify some of the other environmental impacts, such as impacts on biodiversity, nature and landscapes, water and soils, etc.

II - BIBLIOGRAPHICAL ANALYSIS: HOW EXTERNAL COSTS ARE CALCULATED

This chapter focuses on the analysis of the methods used to calculate external environmental costs based on the bibliographical analysis of the 15 studies referenced in the annex.

1) Air pollution:

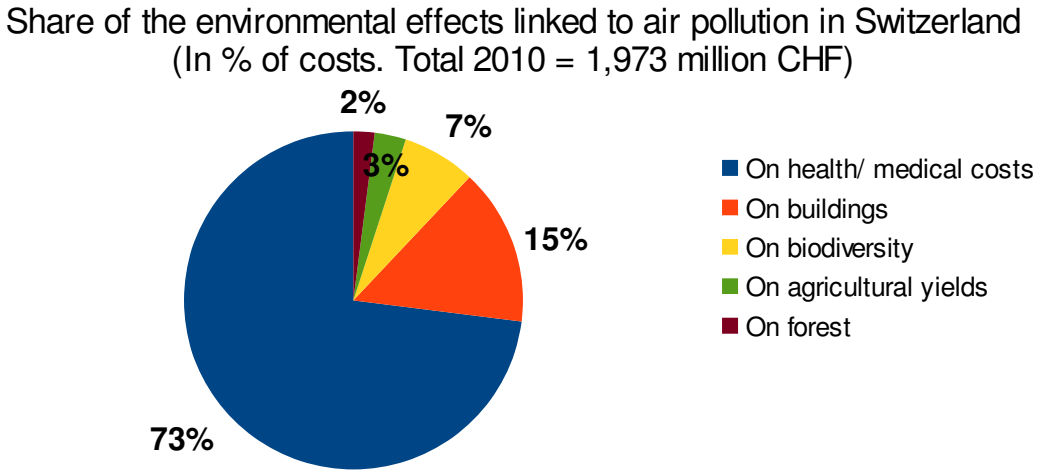
This section describes the methods used to calculate external costs related to air pollution, as observed in the bibliographical analysis. Out of the 15 documents analysed, 14 address the issue of air pollution. This section focuses first on the environmental effects factored in by the different methods to calculate air pollution. Thereafter, analysis is made of the pollutants taken into consideration and their impacts on health. The last part will address the method employed and the data sources used to calculate air pollution.

a) The effects taken into consideration:

In the analysis of the 14 studies, the majority of effects taken into consideration in the calculation of external costs are the health/medical effects (all the studies), the effects on buildings (8 studies), the effects on biodiversity (6 studies) and the effects on agricultural yields (5 studies).

To a lesser extent, 3 studies (ARE 2014, Ecoplan 2014 and Ricardo-AEA 2014) take into consideration the effects on forests and on wildlife.

Illustration 1: Share of the environmental effects linked to air pollution in Switzerland drawn from ARE (2014)



A Swiss study (ARE 2014) monetised the effects of air pollution on different impacts for all transport modes. The share of costs concerning health/medical fees linked to air pollution is considerable.

It is therefore understandable why all the studies we analysed take that into consideration. The other costs account for part of it but to a lesser extent (less than 15 %).

b) Pollutants taken into consideration:

Particulate matter (PM 10 and 2.5) is the element incriminated in atmospheric pollution by all the studies.

Eleven studies incorporate nitrogen oxide (NOx) for measurement of atmospheric pollution, 8 integrate sulphur dioxide (SO2) and 8 include Non-Methane Volatile Organic Compounds (NMVOC).

To a lesser extent, the other elements taken into consideration are ozone (O3), ammonia (NH3), carbon monoxide (CO), carbon dioxide (CO2) and tetrahydrocannabinol (THC). Most of the documents assign the impacts below to the pollutants in the following way:

Elements	Name	Effects
PM 10 and 2.5	Particulate matter	On health and buildings
NOx	Nitrogen oxide	On forests, agriculture and biodiversity
SO2	Sulphur dioxide	On agriculture and biodiversity
NMVOC	Non-Methane Volatile Organic Compounds	On agriculture and biodiversity
O3	Ozone	Combination of NOx + NMVOC. Effects on agriculture and biodiversity
NH3	Ammonia	On biodiversity and acidification of soils
CO	Carbon monoxide	On health and biodiversity
THC	Tetrahydrocannabinol	No data

Table 1: Effects of different atmospheric pollutants

The impact of each pollutant on the environment was monetised by some of the studies, per country. These results are summarised in graphical form below.

Illustration 2: Cost of atmospheric pollution in € per tonne of pollutant emitted in rural areas - drawn from the Ricardo-AEA study (2014)

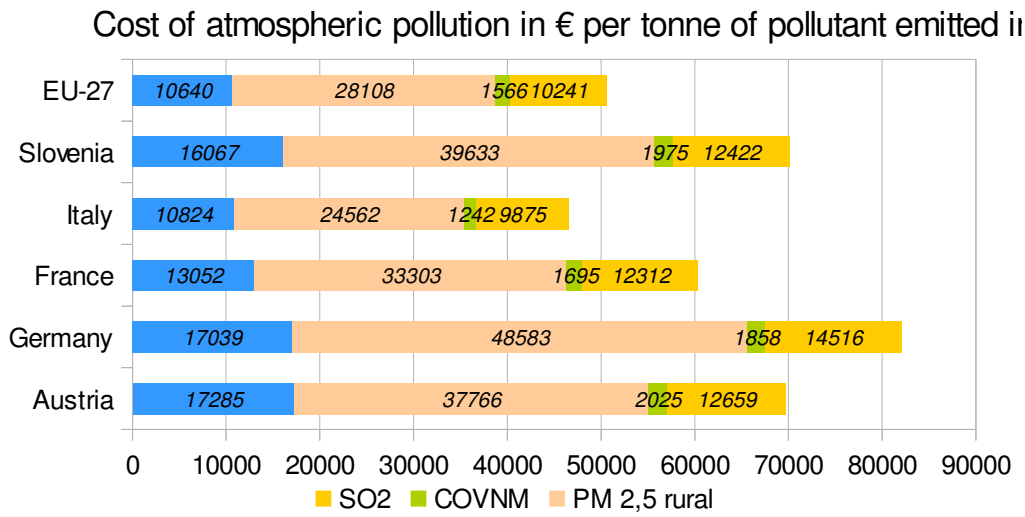
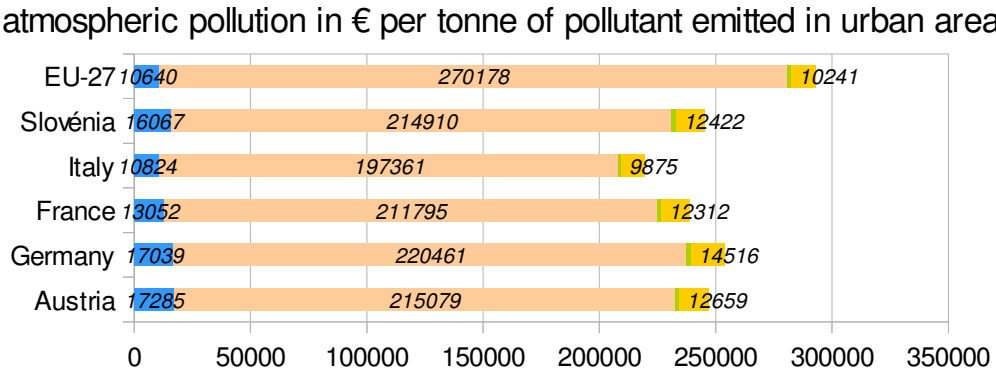


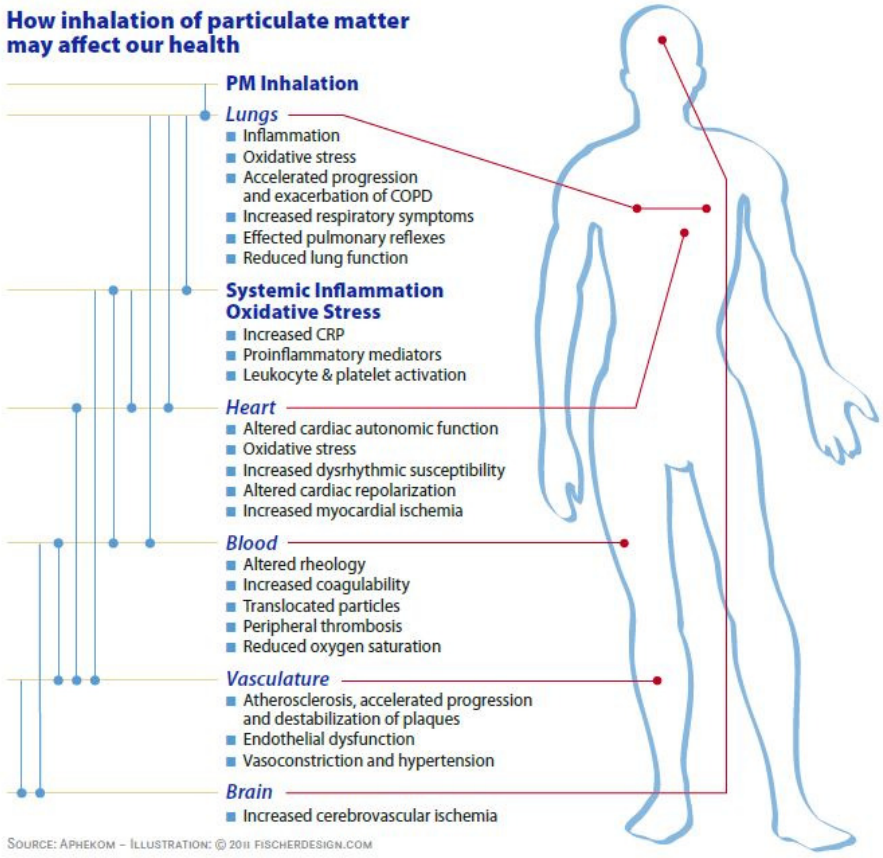
Illustration 3: Cost of atmospheric pollution in € per tonne of pollutant emitted in urban areas - drawn from the Ricardo-AEA study (2014)



Remarks on the graphs: *We only selected the countries among the 27 EU Member States that are signed up to the Alpine convention. In urban areas, the cost of a tonne of emitted pollutants is higher than in rural areas. Even if there are considerable disparities between the countries concerning rural areas, disparities lessen in urban areas.*

These graphs make it possible to grasp the significance of particulate matter's impact on the environment. As can be seen in illustration 1, **human beings are the primary beings vulnerable to**

particulate matter. The particulate matter penetrates deeply into the lungs and transports carcinogenic compounds. The smaller the particles (PM 2.5), the deeper they penetrate. The diagram below describes and pinpoints the impacts of particulate matter in human beings.



Source: Based on Pope and Dockery, 2006, cf. Aphekom project.

Illustration 4: Based on the EEA study (2010)

This is why the cost per tonne of particulate matter emitted is much higher than for any of the other pollutants.

c) Methods and data sources used to calculate air pollution:

IPA (Impact Pathway Approach) is the most commonly used calculation method for the assessment of the impacts of air pollution generated by road transport. Out of 14 studies analysed, 11 use this method. IPA is a "bottom-up"[1] method inspired by the ExternE study (2005). The IPA method calls for the use of 3 types of data:

- - Assessment of transport demand (in vkm per yr);
- - Specific emission coefficients (in g per vkm);
- - Damage factors by pollutants (in € per tonne).

Only two out of all the studies analysed, use the top-down method:[2] Reports InterAlp 2013, INFRAS 2004 and METLTM 2003.

- **Assessment of transport demand**

To assess transport demand in view of calculating air pollution impacts, the most commonly used tools are EUROSTAT, ALPINFO, SECTEN and TREMOVE. Each of their specificities is described below:

Name	Description
EUROSTAT	Soon after it was created, the EU developed a Statistical Office in 1953, thus providing the EU with statistics on Europe. EUROSTAT offers an important range of statistical data (9 main themes including transport), mainly for public authorities. In the wider family of transport data, this indicator is defined as the share, expressed as a percentage, of each transport mode out of the total number of transportation systems inside the EU, measured as ton-kilometre (). This indicator includes road, railway, inland waterways and oil pipeline transportation.
ALPINFO	Database managed by the Swiss Federal Transport Office with contributions from Austria, France and Switzerland. ALPINFO lists all road and railway traffic at the main Alps crossings.

Table 2: Traffic database

Name	Description
TREMOVE	The EU's DG Environment developed this transport model within the framework of European Programme CAFE (Clean Air For Europe). This tool is used for the implementation of policies aimed at reducing air pollution and climate change impacts generated by transport systems. This model encompasses both passenger and freight transport systems in 31 countries, and covers years 1995 to 2030.

Table 3: Traffic model

1 Bottom-up: Upward approach – based on vehicle emissions (fleets of vehicles; engine power; etc.), assesses impact on health of exposed individuals.

2 Top-down: Downward approach – breaks down total cost of pollution between the various vehicles (engine capacities, car categories, etc.) at macro (or national) level.

Nom	Description
SECTEN	Inventory conducted by CITEPA for the Ministry for Environment. The **SECTEN** report (Economic SECTors and ENergy) is updated each year and includes 6 to 8 main sectors (including transport), in which emissions of over 50 compounds are monitored.

Table 4: Inventory for pollution assessment

- **Emission coefficients (data related to incriminated elements)**

HBFEA, COPERT and TREMOVE are the databases used to obtain the emission coefficients that served as a basis to calculate the effects of air pollution. The specificities of this data are described below:

Name	Description
COPERT	Tool used to calculate air pollutant emissions and greenhouse gas emissions generated by road transport. Built with the participation of the European Environment Agency (EEA), COPERT was developed in preparation for road transport emissions inventory in the EEA Member States. It can however be used for all relevant scientific research and academic applications.
HBFEA	Database stemming from "The Handbook Emission Factors for Road Transport (HBEFA)", which provides emission factors for all categories of vehicles (LPVs, HGVs, LCVs, bus, motorcycles), motorizations (diesel, gasoline), loading weight and road cross-section.
TREMOVE	The EU's DG Environment developed this transport model within the framework of European Programme CAFE (Clean Air For Europe). This tool is used to implement the policies aimed at reducing air pollution and climate change impacts generated by transport systems. This model encompasses both passenger transport systems and freight in 31 countries, and covers years 1995 to 2030.

Table 5: Databases of emission coefficients

- **Damage factors per pollutant (monetarisation of emissions)**

Several studies served as a source for databases used to monetise the impacts of pollutant emissions. These studies are: NEEDS, HEATCO, CAFE CBA, ALPINFO and TRENDS. CGSP (2013), in particular, is based on HEATCO data. The specificities of this data are presented below:

NEEDS	The aim of this report is to assess the costs and benefits of future energy policies and systems in each country and at EU level. This implied advanced research results for: - Life cycle analysis (LCA) of energy technologies; - Monetary assessment of externalities related to energy generation, transport, transformation and use; - Integration of LCA and information externalities in the definition of policies and development of scenarios.
CAFE CBA	This report is part of the Clean Air for Europe – CAFE – programme, which aims at developing an integrated and long-term strategy to fight against air pollution and protect human health and the environment against the impacts of this pollution. The existing community measures and proposals aimed at improving air quality define target values for air quality, as well as national threshold values to fight cross-border air pollution. They also provide integrated pollution reduction programmes in concrete areas, as well as specific measures for the limitation of emissions or improvement of products quality.
HEATCO	European project based on the assessment of transport projects in Europe by analysing current practices in EU countries and Switzerland. It suggests guidelines for the assessment of inter-European transport projects, focusing on specific elements such as evaluation techniques for non-market values (risks, impacts of non-monetised values, updating…), evaluation of traffic and congestion, time value, accidents and environmental costs (air pollution, noise, global warming, maintenance costs and infrastructure operation).
ALPINFO	Database managed by the Swiss Federal Transport Office with contributions from Austria, France and Switzerland. ALPINFO lists all road and railway traffic at the main Alps crossings.

Table 6: Monetisation of emissions

In some cases, the data is used to take account of certain impacts in a specific way. **Some studies use multiplying factors to factor in the density of the impacted population** (Delft Infras 2011, CGSP 2013, Ricardo-AEA 2014, TransAlpine 2008 and GRACE 2006). Other studies, such as EEA 2013, ARE 2014 and Ecoplan 2014, provide no value per vehicle -.

2) Noise:

Based on the bibliographical analysis, the objective of this section is to analyse the methods used to calculate external costs related to noise. This section will focus first on the environmental effects factored in by the different methods to calculate noise, and second, on the methods and data sources used for calculation. Thirteen of the studies analysed tackle the noise issue.

a) Effects taken into account:

In the analysis of those 13 studies, the majority of effects integrated in external costs calculation generated by noise were related to disturbance costs (10 studies) and health consequences (11 studies).

Housing value depreciation due to noise is only included in 3 studies (ARE 2014, ECOPLAN 2014 and METLTM 2003). To some extent, they can be considered as also reflecting the cost of disturbances and health consequences, since people take them into account in their choice of a location to settle. The ARE 2014 and ECOPLAN 2014 studies monetise the effect of noise on people (physical and psychological illnesses) based on epidemiological studies[3]. The EEA 2010 survey only tackles the impact of noise pollution on health. The impact of noise was not monetised.

Out of the 13 studies analysed, 6 provide information on the marginal cost of noise, including 4 providing values for this marginal cost of noise depending on which population is impacted and on the time of day.

b) Methods and data sources used to calculate air pollution:

The most commonly used calculation method to assess the effect of noise generated by road traffic stems from the IPA (Impact Pathway Approach). 9 out of 13 studies analysed use it. The IPA is a bottom-up method inspired by the ExternE study (2005). The IPA method calls for the use of three types of data:

- Noise exposure data;

- Data related to the cost per exposed person and distribution of total external costs between the various categories of vehicles, based on weighting factors.

3 We were not able to analyse those epidemiological studies.

- **Noise exposure data**

The assessment of the number of people impacted by noise is important data to understand the number of people impacted at their place of residence. **This assessment is conducted based on strategic noise maps, in compliance with the requirements of the European Directive 2002/49/EC applying to all Member States.**

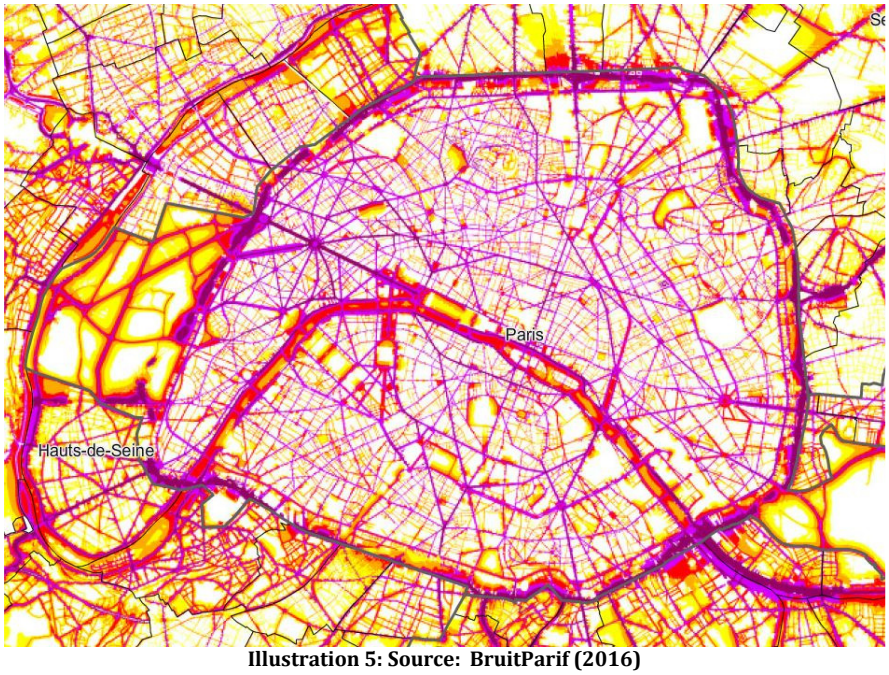


Illustration 5: Source: BruitParif (2016)

This map applies to conurbations of over 100,000 inhabitants or to roads with traffic levels exceeding 3 million vehicles per year. Given the compulsory character of the Directive, all studies analysed recommend its implementation, except the Swiss studies (ARE 2014 and ECOPLAN 2014), and one study, METLTM 2003, which uses a top-down method.

This map has its limits: it does not cover all territories (conurbations of less than 100,000 inhabitants and roads travelled by less than 3 million AADT). A threshold at 45dB was chosen by scientific researchers to take account of noise pollution.

All these limitations led certain studies to use a different method to calculate the cost of noise. Two studies use an alternative method rather than the method in the European Directive:

The UBA 2015 report, noise calculations were computed using LIMA, mapping software from Germany. This programme uses the V-BUS sound pollution calculation method. This method allocates a sound absorption level to buildings governed by population density.

Name	Description
LIMA	Noise calculation software to calculate noise levels and their impacts on the environment. It creates, calculates and displays maps showing the effects of noise. It integrates the European Directive as well as other methods (V-BUS, etc.).
V-BUS	VBUS is a preliminary noise calculation method for noise generated by road traffic. It is a German method used for acoustic calculations and the development of strategic noise maps. The Lden noise index (24h weighting, average value) and Lnight one were calculated based on a step size of 10 m x 10 m with a sensor located at 4m above ground.

Table 7: German method serving as an alternative to the European Directive's strategic maps

When no noise map is available and traffic levels are known, the CGSP 2013 report offers a similar method to take account of noise disturbances. Various samples, that had been used to develop strategic maps, were measured to obtain these values.

- **Data related to the cost per person exposed and distribution of total external costs between the various categories of vehicles based on weighting factors**

Out of 13 studies analysed, 8 studies provide information on this data and 3 studies (Delft Infras 2011, ALE 2012 and CGSP 2013) used data drawn from the HEATCO 2006 study.

3) Other costs (excluding noise and air pollution):

This section aims to analyse other external costs for which the Eurovignette III European Directive does not provide average values for HGVs. This section focuses first on other external costs (excluding noise and air pollution) included in other studies. Second, this section presents a comparison between the different studies based on the share of each impact in the total sum of external costs. 9 studies are analysed in this section.

a) External costs factored in

As far as other external costs are concerned, the Eurovignette III European Directive provides no average values enforceable on HGVs. However, out of 15 studies, 9 provide us with extra information regarding other external costs. These studies are[4]:

Illustration 6: Other environmental costs factored in

	Nature & landscape	Water & soil	Upstream Downstream	Accidents	Urban	Biodiversity	Climate change	Mountain areas	Congestion
ARE (2014)	X	X	X	X	X		(**)		
ALE (2012)			X	X			(**)		
CGSP (2013)			X	(X)			(**)		(X)
Delft-Infras (2012)	X	X	X	X	X	X	X		
ECOPLAN (2014)	X	X	X	X	X		X		
GRACE (2006)			(°)	(°)			(°)	X	(°)
INFRAS (2004)	X		X	X	X		(**)		(*)
RICARDO AEA (2014)			(°)	(°)			(°)		(°)

For each environmental cost, analytical methods vary from one study to the other, as well as unitary values (million €, CHF or in € per 100 HGV.km). **It appears that most studies analyse the upstream and downstream[5], accidents, and climate change impacts.**

The CGSP 2013 study considers that accidents and congestion are not to be included in external environmental costs, whereas the other studies incorporate them.

The issue of climate change is tackled in different ways depending on the study. Indeed, they allocate a varying value to each tonne of CO2 emitted and their scenarios (high and low levels) are based on these values. This CO2 value also has an impact on the results showing upstream-downstream effects.

4 (*) Congestion costs calculated by measuring the loss of surplus due to inefficient infrastructure use - (**) Cost of avoidance of each tonne of GHG emitted, according to different scenarios (high and low levels). High-level scenario selected for studies - (°) case studies where externalities are analysed independently - (X) Not integrated as external environmental costs.

5 ups and-downstream effects: composed of three externalities: those related to the generation of energy and its delivery, those related to the production of vehicles and those related to the life cycle of the infrastructure

So as to measure the share of environmental costs in the total of all external costs, we have analysed the share of each cost in the total sum. Some studies, because of their specificities, present costs that we will not be able to subsequently analyse. For instance, GRACE 2006 and Ricardo-AEA 2014 process each external cost independently for each specific location (or specific values).

b) Share of each impact out of the total sum of external costs:

Concerning HGVs, we analysed the share of each environmental impact out of the total cost, whenever the data was available. Two analyses thus were conducted:

- Share of each external cost out of the total cost, expressed in million € (or CHF);
- Share of each external cost in € per 100 HGV.km.

- **Share of each external cost out of the total cost in euros per tonne.km:**[6]

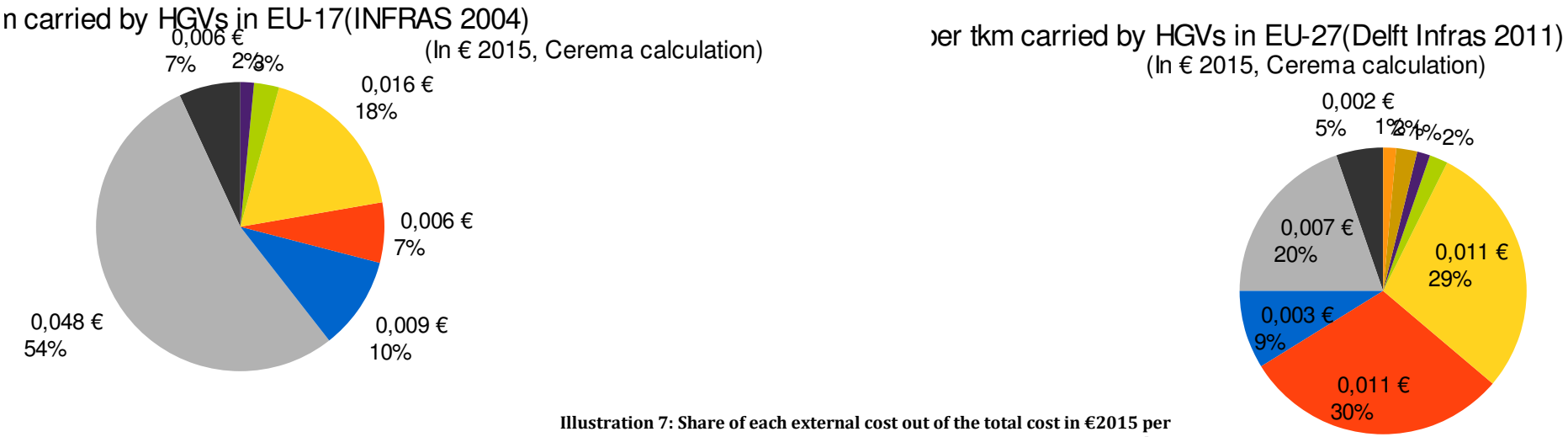
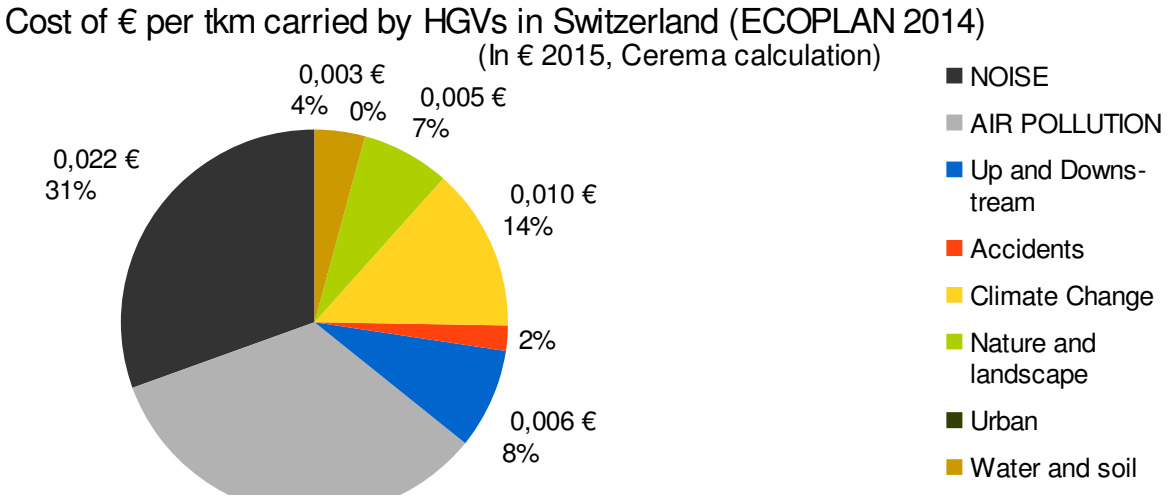


Illustration 7: Share of each external cost out of the total cost in €2015 per tonne.km



Updating monetary values in 2015 euros. For EU INFRAS 2004, updating 2000 euros in 2015 euros (Inflation at €1.243). For Delft Infras 2011 updating of 2008 euros in 2015 euros (Inflation at 1.09). For ECOPLAN, switching from CHF 2010 to 2010 euros with 1 CHF2010 = €0.72. Updating of 2010 euros in 2015 euros (Inflation at €1.07).

Expect for the upstream-downstream effects and climate change impacts, the 3 graphs show values that are quite different. This most likely has to do with calculation methods. Differences between INFRAS 2004 and Delft Infras 2011 are quite substantial. Several potential explanations of these differences between Infras 2004 and Delft Infras 2011 are presented below:

- **Scope of countries covered:** this has an impact on the various cost values (revenues, cost of healthcare, lower GDP per inhabitant).

The scope of both studies (moving from 17 States in 2004 to 27 States in 2011), by including Eastern European countries, most of which have lower average cost values compared to Western Europe. These lower costs give rise to lower calculation factors and coefficients, to take account of revenue levels, healthcare costs and generally lower GDP per inhabitant compared to Western Europe.

- Development of motorization: cleaner in 2008 than in 2000

The Euro standard policy reduces the emissions of HGV engines, which is factored in Delft Infras 2011 and shows “cleaner” HGVs than those on the roads in 2000.

- Avoidance of death value changes: higher in 2008.

- Accident assessment method: takes account of the risk of damage in the event of an HGV accident.

As for accidents, a new calculation method was developed in Delft Infras 2011. It takes into account the cost of accidents (…) as well as the potential damage that could be caused by heavier vehicles (HGVs) on other road users. The risk of fatalities and injuries due to an HGV accident is higher than with cars. This is reflected in a factor, which is higher for HGVs compared to cars. Therefore, the impact of HGV accidents in Delft Infras 2011 is higher than in the other studies.

- **Share of each external cost in € per 100 HGV.km**

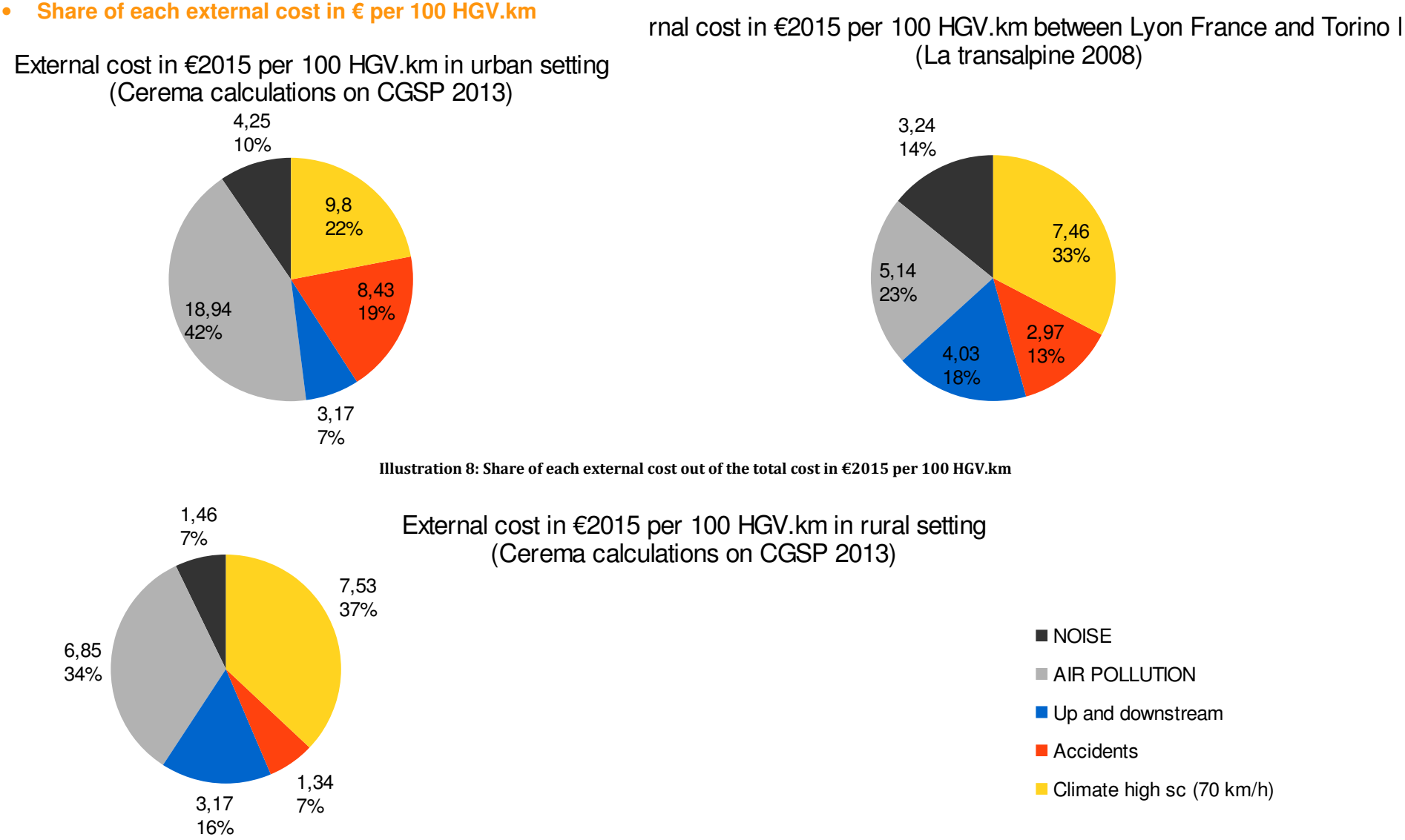


Illustration 8: Share of each external cost out of the total cost in €2015 per 100 HGV.km

Values provided by CGSP 2013 integrate noise, air pollution and upstream-downstream effects in external costs. As far as accident rate values are concerned, we listed all accidents involving an HGV in 2014, applied monetary values for each type of accident (material damage, light injuries, injuries with hospitalisation, fatalities), and analysed this in view of the number of HGVs circulating in France in 2014. As far as climate change is concerned, we selected the high-value scenarios for CO2 (100 € per tCO2) and calculated emissions for an HGV running at 35 kph in urban areas and 70 kph outside urban areas. These are indicative values to illustrate orders of magnitude.

The study entitled “La Transalpine” focuses on a Lyon - Torino journey. Several impacts are integrated. So as to compare it with CGSP 2013, we selected the following impacts: noise, air pollution, upstream-downstream effects, accident rates and climate.

CGSP 2013 values in rural areas are lower than those in urban areas, except for upstream-downstream effects. The calculation method used in CGSP 2013 provides a single value for upstream-downstream effects, irrespective of population densities (rural, urban areas), whereas all other indicators do, depending on the urban context. This is the reason why the share of upstream-downstream effects rises when moving from urban to rural areas.

The values provided by “La Transalpine” appear much lower than the values of CGSP 2013. This has to do mainly with the values related to climate change. CGSP 2013 selects the high-level scenarios to account for climate change. The value of each ton of CO2 is €100, which tends to increase the share of climate change in the total cost.

Overall, the results are mixed and changes in the scope of studies, engine types and human life value may probably not fully explain this variability. Other factors such as the calculation method and the databases employed might explain such differences.

With regard to other external costs for which Eurovignette III does not show cost values, accidents, climate change and upstream-downstream effects represent quite a significant percentage of external costs.

None of the studies account for accidents in their external costs. In fact, some studies define external environmental costs as being just those costs that have an impact on the environment. Indeed, accidents would not be included because they have a direct impact on equipment, the resources implemented to treat accidents (minor and serious injuries; human life value) and only accident victims.

Despite the weighting allocated to climate change, the latter is an external cost with a global impact beyond the scope of a section of road or a community. A tonne of CO_2 emitted in a mountainous area has just as much of an effect on global warming as if it had been emitted in another area.

In terms of upstream-downstream effects, we have identified 3 externalities: those related to energy production and its transportation, those related to vehicle production and those related to infrastructure life cycle. The majority of studies only take into account some of the effects related to energy transportation and distribution.

Hence, for mountainous areas, the other external costs to be analysed are related rather more to those that have a direct local impact: nature and landscape, urban, biodiversity and water and soil.

III MONETISATION OF EXTERNAL COSTS

In Chapter II, the top-down (Impact Pathway Approach) calculation methods and data sources used are almost identical. However, it is difficult to make comparisons between values taken from different bibliographical sources. There are great disparities due to the use of specific data, particularly for traffic and speed, as well as specific coefficients to take account of population density and topographical features.

This Chapter III tackle comparing the base values taken from 15 studies analysed with the Eurovignette III Directive values. This comparison will start with addressing air pollution and follow on with noise pollution.

1) Air pollution:

In this section, the Eurovignette III European Directive values for air pollution will be compared with the values from the other studies included in the bibliographical analysis. Out of the 14 studies addressing the issue of air pollution, few values could be used for this comparison. Only the results of the GRACE (2006), CGSP (2013), Delft Infras 2011 and ALE 2012 (based on Delft Infras 2011) studies could be compared with the European Directive.

This section will first address the objective and method used for the comparison. Then we shall analyse the results of the comparison between Eurovignette III and the other studies for an urban and a rural fabric.

a) Objective and method:

The objective of this analysis is to compare the values taken from Eurovignette III with the 14 studies analysed. To improve the comparison, the data for costs by European standard in the European Directive have been averaged according to the HGV fleet on French roads in 2015.

We thus obtain the average cost for HGVs according to Eurovignette III from the HGV fleet on French roads in 2015.

Density	Urban	Inter-urban
€ per 100 HGV.km	44.2	34.2

Table 8: Eurovignette III Directive aggregated according to French HGV fleet in 2015

On average, using Eurovignette III, an HGV travelling on an urban road may be taxed at a level of €0.04 per kilometre, as against €0.03 per kilometre if travelling on an interurban road.

Only the values available (i.e. from studies that provide euro per vehicle values) will be compared with Eurovignette values, i.e. the following studies:

CGSP 2013, Delft Infras 2011 and ALE 2012 (based on the results of the Delft Infras 2011 study).

The other studies (Ecoplan Infras 2014, ARE 2014 and a GRACE 2006 case study) either provide values for a given year (million CHF in 2014 for ARE 2014 and Ecoplan Infras 2014 and million € for InterAlp 2013), or include other costs under air pollution (climate change for the GRACE 2006 case study). INFRAS 2004 was not been used, because it was updated by the Delft Infras 2011 study.

Other studies provide us with a range of values by HGV tonnage (Ricardo-AEA 2014 and UBA 2015) or only provide values in euros per tonnes of pollutants emitted (EEA 2013).

For all these studies, the exercise to reduce them to identical unit values (€ per 1,000 HGV.km) within the time allowed appeared too complex to perform. This is the reason why we shall not use them for a comparison with the Eurovignette III Directive.

b) Comparison between Eurovignette III Directive, CGSP 2013, Delft Infras 2011, ALE 2012 and GRACE 2006[7]:

In € per 1000 HGV.km	**URBAN**	**RURAL**
Eurovignette III	44,2	34,2
Delft Infras 2011 (in € 2008)	83,4	64,3
CGSP 2013 (in € 2010)	177	94
GRACE 2006 (Prague in € 2006)	83	
GRACE 2006 (Copenhagen in € 2006)	82	
GRACE 2006 (Berlin in € 2006)	94	

Table 9: Comparison of air pollution between the Eurovignette III European Directive and other studies The aggregated values of the Eurovignette III Directive are lower overall than the values proposed by other studies for an identical urban fabric. Compared with the other studies, by not applying a factor of 2, the Eurovignette III Directive underestimates the impact of air pollution.

In an urban environment, the CGSP 2013 values are 4 times higher than the Directive and the Delft Infras 2011 values are almost twice as high. The case studies taken from GRACE are around 88% higher to twice as high for Berlin.

In a rural environment, the CGSP 2013 values are 3 times higher than the Directive, whilst the Delft Infras 2011 values are almost twice as high as the Eurovignette III Directive.

The CGSP calculation method applies a correction factor of 2.5 to take account of changes in the annual human life value (HLV) between Delft Infras 2011 (€115,000) and the HEATCO and HBEFA reports (€46,000). Other factors are allocated according to the density of population living close to the infrastructure and the urban fabric. This is the reason why the CGSP values are quite high.

2) Noise:

In this section, the Eurovignette III European Directive values for noise will be compared with the values from the other studies included in the bibliographical analysis. Out of the 13 studies addressing the issue of noise pollution, few values could be used for this comparison. Only the results of the CGSP (2013), Delft Infras 2011 and ALE 2012 (based on Delft Infras 2011) studies could be compared with the European Directive.

7

Values taken from Delft Infras for “urban” and “suburban” apply in this report to "urban" and "rural" respectively. Values taken from CGSP for “urban” and “rural” apply in this report to "urban" and "rural" respectively.

This section will first address the objective and method used for the comparison. Then we shall analyse the results of the comparison between Eurovignette III and other studies for an urban and a rural fabric.

a) Objective and method:

The objective of this analysis will be to compare the values taken from Eurovignette III with the 13 studies analysed. The Eurovignette III Directive sets out the maximum cost that can be charged to road users:

€ per 100 HGV.km	Day	Night
Urban	11	20
Inter-urban	2	3

Table 10: Eurovignette III Directive for noise values

On average, applying Eurovignette III, an HGV travelling on an urban road in the daytime may be taxed at a level of €0.011 per kilometre and €0.02 per kilometre if travelling on the same road at night. According to Eurovignette III, noise impacts due to vehicle use are about twice as high at night as during the day, whatever the urban area.

Only the values available (i.e. from studies that provide euro per vehicle values) will be compared with the Eurovignette values, i.e. the following studies:

Quinet 2013 (average values on national and regional roads), Delft Infras 2011 (average HGV values) and ALE 2012 (based on the results of Delft Infras 2011).

The GRACE 2006 and Ricardo-AEA studies only provide us with marginal costs for noise.

The Ecoplan 2014, ARE 2014, InterAlp 2013 and UBA 2015 studies provide values for a given year (million CHF in 2014 for ARE 2014 and Ecoplan Infras 2014 and million € for InterAlp 2013 and UBA 2015). Therefore they are not reduced to identical unit values.

EEA 2010 only gives us noise levels and their effects on human health. INFRAS 2004 was not used, because it was updated by the Delft Infras 2011 study.

This is the reason why we shall not use them for a comparison with the Eurovignette III Directive.

b) Comparison between Eurovignette III Directive, CGSP 2013 (national and regional), Delft Infras 2011 and ALE 2012:

This table summarises the data available in terms of noise pollution cost[8]. We are then going to compare the values for urban and inter-urban.

€ per 1000 HGV.km		Day	Night
Eurovignette III	Urban	**11**	**20**
	Rural	**2**	**3**
Delft Infras 2011 (in € 2008)		19.4	
CGSP 2013 (in € 2010)	Urban	39.7	
	Rural	13.6	

8 In Delft Infras the costs for urban and light rural are in italics because they relate to the cost of a vehicle when traffic is light. It is logical that this cost is higher, because the impact of vehicle in an area where there is little or no traffic is greater than that of the additional vehicle in an area with very high traffic.

Table 11: Comparison of noise pollution between the Eurovignette III European Directive and other studies

Noise pollution costs in the Eurovignette III Directive are much lower for urban areas than the values proposed by studies addressing the question of noise cost in urban areas. The table below gives the difference in noise cost for urban zones between the European Directive and other studies.

Overall, the values taken from Delft Infras 2011 and CGSP 2013 are generally greater than the costs recommended by Eurovignette III.

It is noted that the Eurovignette III European Directive values are lower than those from case studies or those calculated on a national scale.

We conducted the same operation for rural areas. Noise pollution costs in the Eurovignette III Directive are much lower for rural areas than the values proposed by studies addressing the question of noise cost in rural areas. The table above gives the difference in noise cost for rural areas between the European Directive and other studies.

IV MOUNTAINOUS AREAS

Chapter III has enabled us to observe that there are significant differences between Eurovignette III values and the other studies. The application of a factor of 2 to Eurovignette III barely enables us to get close to the base values of the other studies.

The purpose of this Chapter IV is to analyse the results of studies in mountainous areas and to compare them with the recommendations of the Eurovignette III European Directive for mountainous areas. The methods and results of calculations of external environmental costs will therefore be analysed for mountainous areas only, based on 15 bibliographical resources, referenced in the annex.

a) Air pollution in mountainous areas:

In this section, the Eurovignette III values in mountainous areas for air pollution will be compared with the values in the other studies addressing the issue of mountainous areas. Out of the 14 studies addressing the issue of air pollution, only 4 studies address the question of mountainous areas (METLTM 2003, GRACE 2006, La Transalpine 2008 and InterAlp 2013).

This section will first of all set out the methods for calculating external costs in mountainous areas and then compare its results with Eurovignette III for an urban and a rural fabric.

1) Method for calculating external costs in mountainous areas:

Only 4 studies (METLTM 2003, GRACE 2006, La Transalpine 2008 and InterAlp 2013) specifically assess mountainous areas. If we consider Switzerland as a mountainous area, this takes the number of studies to 6. The studies use databases specific to their case study, particularly for mountainous areas (GRACE 2006, MELTM 2003, La Transalpine 2008 and InterAlp 2013), or specific data from their case study (ARE 2014 and Ecoplan Infras 2014).

METLTM 2003 and InterAlp 2013 use a top-down method. GRACE 2006 and La Transalpine 2008 use a bottom-up method.

METLTM 2003 has produced models for population spread around infrastructures and for pollutants dispersing specific to valleys, taking containment effects into account. Slopes have not been taken into account. According to an ADEME study, the slope impact on HGV consumption is estimated at a factor of 1.5 to 2.1 (Boiteux II Report of June 2001).

InterAlp 2013 has taken account of slope incline effect and HGV load impact on consumption. This points to the fact that slopes have a significant effect on consumption. A half-loaded HGV (Euro 5) ad travelling at 50kph consumes 272g of fuel per kilometre for a 0% slope. This vehicle consumes 1015g for a 6% upward slope (i.e. 3.7 times more than on flat ground) and 19.6g (i.e. 13 times less) on a 6% downward slope.

The conclusions for nitrogen oxide are quite similar. A half-loaded HGV (Euro 5) travelling at 50kph emits 3gpkm of NOx. On a 6% upward slope, it emits 9.5gpkm of NOx (i.e. 3.2 times more than on flat ground), and on a downward slope, it tends toward zero emission.

For particulate matter (PM), the conclusions are less clear-cut. A half-loaded HGV (Euro 5) travelling at 50kph emits 0.03gpkm. On a 6% upward slope, it emits 0.05gpkm of PM (i.e. 0.6 times more than on flat ground) and on a downward slope, almost 0.01gpkm (i.e. twice as little as on flat ground).

The GRACE 2006 study concentrating on mountainous areas has used the IPA method. To take better account of mountainous areas, it has typified emissions (due

to altitude and to temperature inversions), concentration (due to topographical and weather conditions) and impacts (population density). No specific points had been identified with regard to infrastructure costs. The GRACE 2006 results come from the collection of knowledge based on different specific research projects in various specificities (MONITRAF-project). The difference coefficient for air pollution between lowland and Alpine areas turns out to be around 5.15 for HGVs.

The external unit costs used in the La Transalpine 2008 study were based on HBFEA 2008 and adapted to the specificities of France-Italy cross-border hauling. These values apply to the HGVs (Euro 5 standard). A factor of 2 for the road was applied to the 2008 HBFEA values that were used. Concerning the impact of traffic congestion, differences were introduced to take account of day and night, peak times or slack periods but the calculation results did not detail them.

2) Comparison between Eurovignette III Directive and GRACE 2006, La Transalpine 2008 and METLTM 2003 studies in mountainous areas for air pollution:

According to the Eurovignette III Directive, *"The table 1 values can be multiplied by a maximum of 2 in mountainous regions, insofar as the slope of the road, altitude and/or temperature inversions allow".* The Directive therefore leaves scope for allocating a factor of 2 to Eurovignette III values in mountainous regions. We have applied this factor to compare it with the two results from mountain studies.

The pricing study of external transport costs in mountainous areas conducted by METLTM in 2003 indicates much higher values than those of Eurovignette III factor of 2 (mountainous areas).

The results taken from the La Transalpine 2008 study are close to Eurovignette III "Factor of 2". This study uses values taken from HBEFA 2008, to which a factor of 2 has been applied to certain impacts and to take account of mountainous areas.

A mountainous area case study conducted in the GRACE 2006 report concludes that, for HGV emissions, a factor of 5.15 must be applied to take account of the impact of the topographical constraints of mountains compared to lowland areas. This factor has been applied to the Directive under the name of "Eurovignette III factor of 5.15".

€ per 1000 HGV.km	Urban mountain roads	Interurban mountain roads
Eurovignette III (in € 2008)	*44.20*	*34.20*
Eurovignette III factor of 2 (in € 2008)	**88.40**	**68.40**
METLM 2003 (in € 2000)	230	200
La Transalpine 2008 (in € 2006)	45.5	
Eurovignette III (factor of 5.15)	227.63	176.13

Table 12: Comparison of air pollution in mountainous areas between the Eurovignette III European Directive and other studies We note that the METLTM 2003 values are 3 times higher than the Eurovignette III (factor of 2) values for inter-urban roads in mountainous areas.

For urban roads in mountainous areas, the METLTM 2003 values are 2.6 times higher than the Eurovignette III (factor of 2) values.

Compared with the La Transalpine 2008 study, the values are lower than Eurovignette III (factor of 2) values.

By applying factor of 5.15 taken from the GRACE 2006 study to the values of the Eurovignette III Directive, the METLTM 2003 values are 14% higher than the Eurovignette III (factor of 5.15) values for inter-urban roads in mountainous areas. For urban roads in mountainous areas, the values of METLTM 2003 and Eurovignette III (factor of 5.15) are almost identical (Eurovignette III (factor of 5.15) being 1% lower).

For the La Transalpine 2008 study, the factor of 5.15 is 5 times higher.

With regard to air pollution, the base values of Eurovignette III are too low for the factor of 2 to allow the sensitivity of mountainous areas to be taken into account.

b) Mountainous areas and noise: *In this section, the Eurovignette III values in mountainous areas for noise will be compared with the values of other studies addressing the issue of noise in mountainous areas. Out of the 13 studies addressing the question of noise pollution, only 3 studies address the issue of mountainous areas (METLTM 2003, GRACE 2006 and La Transalpine 2008).*

This section will start by setting out the methods for calculating external noise cost in mountainous areas and then compare its results with Eurovignette III for an urban and rural fabric.

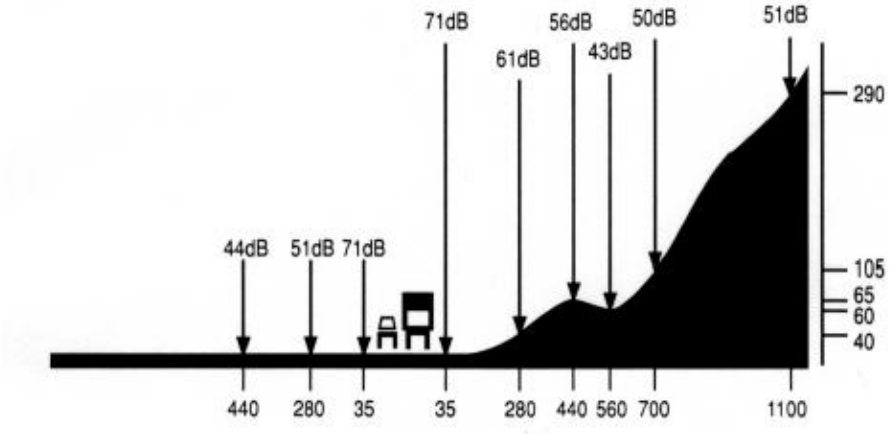
1) Method for calculating external noise costs in mountainous areas:

Only 3 studies (METLTM 2003, GRACE 2006 and La Transalpine 2008) specifically assess noise in mountainous areas. If we consider Switzerland as a country in a mountainous zone, this takes the number of studies to 4. The studies use databases specific to their case study, particularly in the case of mountainous areas (GRACE 2006 and MELTM 2003) or specific data from their case study (ARE 2004, Ecoplan 2014 and INFRAS 2004).

METLTM 2003 studies use the top-down method based on the noise avoidance cost approach; METLTM distributed the amount of known work between the various network sections concerned. Only networks taking traffic of over 50,000 vehicles per day and the urban characteristics of the section were selected. From this calculation comes a cost per kilometre closer to reality. Cost is charged by adopting the following equivalence coefficient: 1 HGV = 10 LPVs.

METLTM 2003 produced models for population spread around infrastructures. In addition, it used the noise-spread model developed by AEE in 1999, which is based on distance from the motorway.

Figure 2: Noise spread in mountainous areas compared to lowland areas



Distance from the motorway in [m]
Source: GRUBER (1994), cit. in BMVIT (1999)

Illustration 9 : from the METLTM study 2003

The values used per type of vehicle stem from the average calculation of damage on the A43 motorway due to noise, i.e. €0.03 per HGV*km.

The GRACE 2006 study measured noise impact by including temperature inversion and resonance effects in mountainous areas. Such effects required greater distance from the road in order to reduce their impact. A number of the Swiss, German and Austrian studies - Scheiring (2000) and Weissen (1996), factored in those impacts.

By factoring in both density of exposed population and increase of the noise impact, the report recommends a factor of 5.1 for HGVs.

The external unit costs used in the La Transalpine 2008 study were based on HBFEA 2008 and adapted to the specificities of France-Italy cross-border hauling. These values apply to the HGVs (Euro 5 standard). A factor of 2 for the road was applied to the 2008 HBFEA values that were used. Concerning the impact of noise, differences were introduced to take account of day and night, peak times or slack periods but the calculation results did not detail them.

2) Comparison between Eurovignette III Directive and mountain-oriented studies - GRACE 2006, La Transalpine 2008, and METLTM 2003 Noise:

According to the Eurovignette III Directive: “Table 2 values can be multiplied by 2 at the most, in mountainous regions, if the slope of the road, altitude and / or temperature inversions justify it.” The Directive therefore allows applying a factor of 2 to Eurovignette III values in mountainous regions. We applied this factor to compare it with the 3 sets of results of the mountain studies.

The study on the pricing of external transport costs in mountainous regions carried out by METLTM in 2003, as well as the Lyon-Torino link done by La Transalpine 2008, and case study in mountainous areas included in the GRACE 2006 report, concluded that a factor of 5.1 should apply to take into account the impact of topographical constraints in mountains versus lowlands. This factor was allocated to the Directive under the designation of “Eurovignette III factor of 5.1”.

€ per 1000 HGV.km		Day	Night
Eurovignette III	*Urban*	*11*	*20*
	Rural	*2*	*3*
Eurovignette III "factor of 2"	Urban	**22**	**40**
	Rural	**4**	**6**
METLTM	Sensitive area (high assumption)	30	
	Sensitive area (low assumption)	30	
La Transalpine	Lyon-Torino	28.7	
Eurovignette III "factor of 5.1"	Urban	56.1	102
	Rural	10.2	15.3

Table 13: Sound pollution in mountainous areas: Comparison between European Eurovignette III Directive and other studies

When comparing Eurovignette III "factor of 2", those results converge with the two other mountain-oriented studies (METLTM 2003 and La Transalpine 2008).

The Eurovignette III "factor of 5.1" values are higher that the results from mountain-oriented studies on urban areas.

V ASSESSMENT

The analysis of the fifteen bibliographical references points to similarities between them, particularly the calculation methods and data sources that were used. The differences mostly concern coefficients allocated to take account of average speed, urban fabric or value per tonne of pollutant emitted.

Our analysis has brought out the fact that the base values from the European Eurovignette III Directive are lower than those in the studies we analysed.

Out of the fifteen bibliographical references, only four took account of mountainous areas. According to these four (METLTM 2003, GRACE 2006, Transalpine 2008 and InterAlp 2013), resorting to a factor of 2 seemed insufficient to account for the additional sensitivity to atmospheric pollution, of mountainous areas.

Project GRACE 2006 recommends applying a multiplication factor, i.e. 5.15 for air pollution and 5.1 for noise. A similar factor is indicated in the METLTM 2003 report for air pollution. For noise pollution, the factor of 2 as per the Directive is fairly close to the results produced by the other studies examining mountainous areas.

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- EEA (2010) → Good practice guide on noise exposure and potential health effects.
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- Ricardo-AEA (2014) → Update of the Handbook on External Costs of Transport
- La transalpine (2008) → Comment réduire la facture des coûts externes?
- AESP (2004) → Analiza eksternih stroskov prometa

Glossary

Upstream-downstream effect:

Composed of 3 externalities: those related to energy generation and its delivery; those related to the production of vehicles; and those related to the life cycle of the infrastructure.

External cost:

External costs are effects related to transport use, not taken into account in the costs paid by those agents using transportation.

External environmental cost:

Secondary effects impacting the environment exclusively.

Particulate Matter (or PM):

Particulate matter (PM) suspended in the air are called aerosol. Their toxicity applies essentially to particulate mater smaller than 10µm in diameter (PM 10 and PM 2.5). Their effect on health depends first on their grain size (the smaller their diameter, the deeper they get inside the respiratory system), and second on their chemical composition. Some could contain toxic products such as metals or polycyclic aromatic hydrocarbons (PAH) considered as carcinogenic. The larger ones are stopped and disposed of by the nose and upper respiratory tract (source: *dictionnaire-environnement.com*).

Non-methane volatile organic compounds (NMVOC)

Non-methane volatile organic compounds (NMVOC) are due mostly to transportation and industrial activities. They are produced in large quantities by road vehicles burning fossil fuel. Beyond this direct impact on health, they are part of the ozone production process in the lower atmosphere (source: *dictionnaire-environnement.com*).

Bottom-up:

Upward approach - based on vehicle emissions (fleets of vehicles; engine power; etc.); assesses impact on health of exposed individuals.

Top-down:

Downward approach – breaks down total cost of pollution between the various vehicles (engine power, car categories, etc.) at macro (or national) level.

Life Cycle Analysis (LCA):

The LCA measures all the resources required to manufacture a product or give access to a service, followed by the quantification, on the environment, of all the potential impacts of this manufacturing. According to ISO, it is the “compilation and evaluation of energy inputs, the uses of raw materials and discharges into the environment, as well as the evaluation of the potential impact on the environment associated to a product, to a process, or to a service, over the total life cycle.” The life cycle of a product, process or service extends from the manufacturing and the processing to the use and final disposal. This method is based on a 4-step approach: the goal and scope definition phase; the inventory analysis phase; the impact assessment phase; and the interpretation phase against the initial objectives. (https://www.iso.org/obp/ui/#iso:std:iso:14044:ed-1:v1:en).

Impact Pathway Approach (IPA):

The physical pathway of a specific pollutant is followed from its emission to the damage it causes to the outside environment (final impacts). This leads to the assessment of the different types of pollution and their related risks.

Two-wheelers:

Motorcycles

Acronyms

PM: Particulates Matter - PM 2.5 and PM 10

NMVOC: Non-Methane Volatile Organic Compounds

CO2: Carbon Dioxide

O3: Ozone

Nox: Nitrogen oxide

SO2: Sulphur dioxide

LCA: Life Cycle Analysis

IPA: Impact Pathway Approach

V-BUS: Vorläufige Berechnungsmethode für den Umgebungslärm an Straßen

HGV: Heavy Goods Vehicle

Cerema: French Centre for Studies and Expertise on Risks, Environment, Mobility and Urban and Country planning

DtecITM: Technical Division for Transportation and Materials Infrastructures at Cerema

LPV: Light Passenger Vehicle

LCV: Light Commercial Vehicle

Two-wheeler: Motorcycle

DGITM: Directorate General for Infrastructures, Transport and the Sea (Direction générale des infrastructures, des transports et de la mer)

SAGS: General Administration and Strategy Department at DGITM

MAP: Mission des Alpes et des Pyrénées

CHF: Swiss Franc

HBFEA: Handbook Emission Factors for Road Transport.

DG: Directorate General

CAFE: Clean Air For Europe

EEA: European Environment Agency

kph: Kilometre per hour

gpkm: gram per kilometre

GHG: Greenhouse Gases

HEATCO : Harmonised European Approaches for Transport Costing and Project Assessment

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Annex 3

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Synthesis document

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




Alpine Convention – Working Group Transport
25.07.2016

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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-Sattelauflieger (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;

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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).

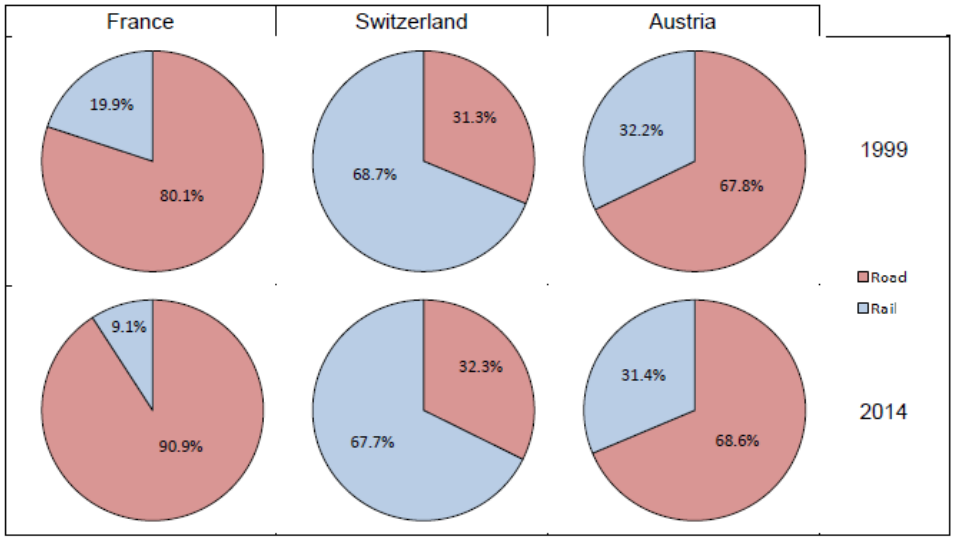


Figure 1: Development of modal split[2]

"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.

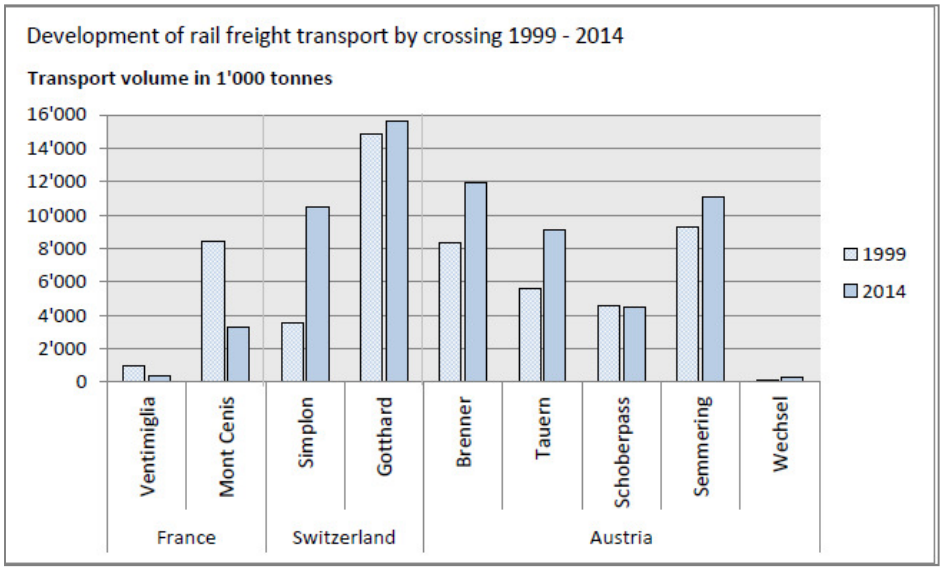


Figure 2: Development of rail freight transport by crossing 1999 - 2014[4]

Evolution of rail freight transport in CT:

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

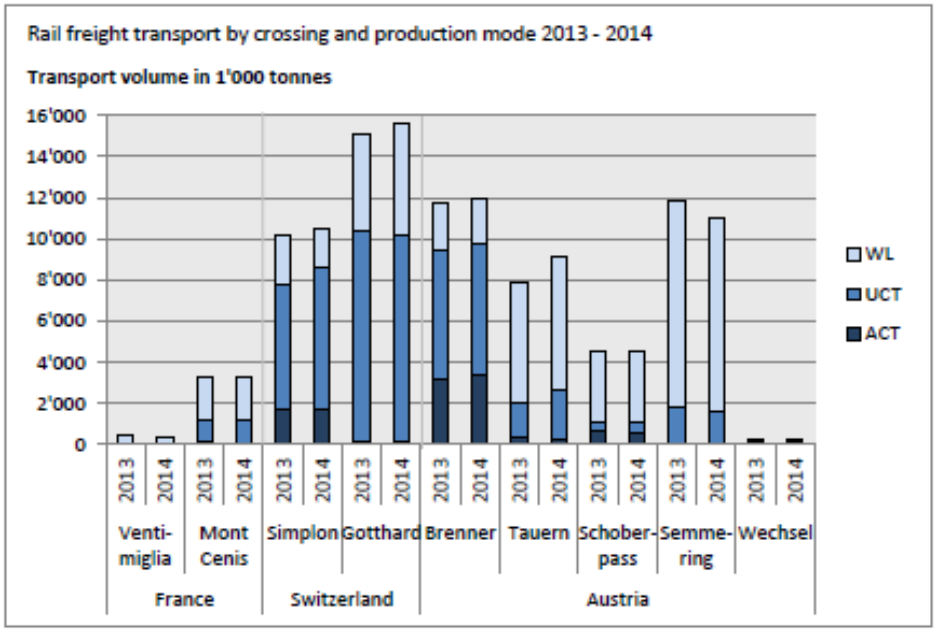


Figure 3: Transalpine rail freight volume, 2013-2014[5]

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 an 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 CT[8]

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.

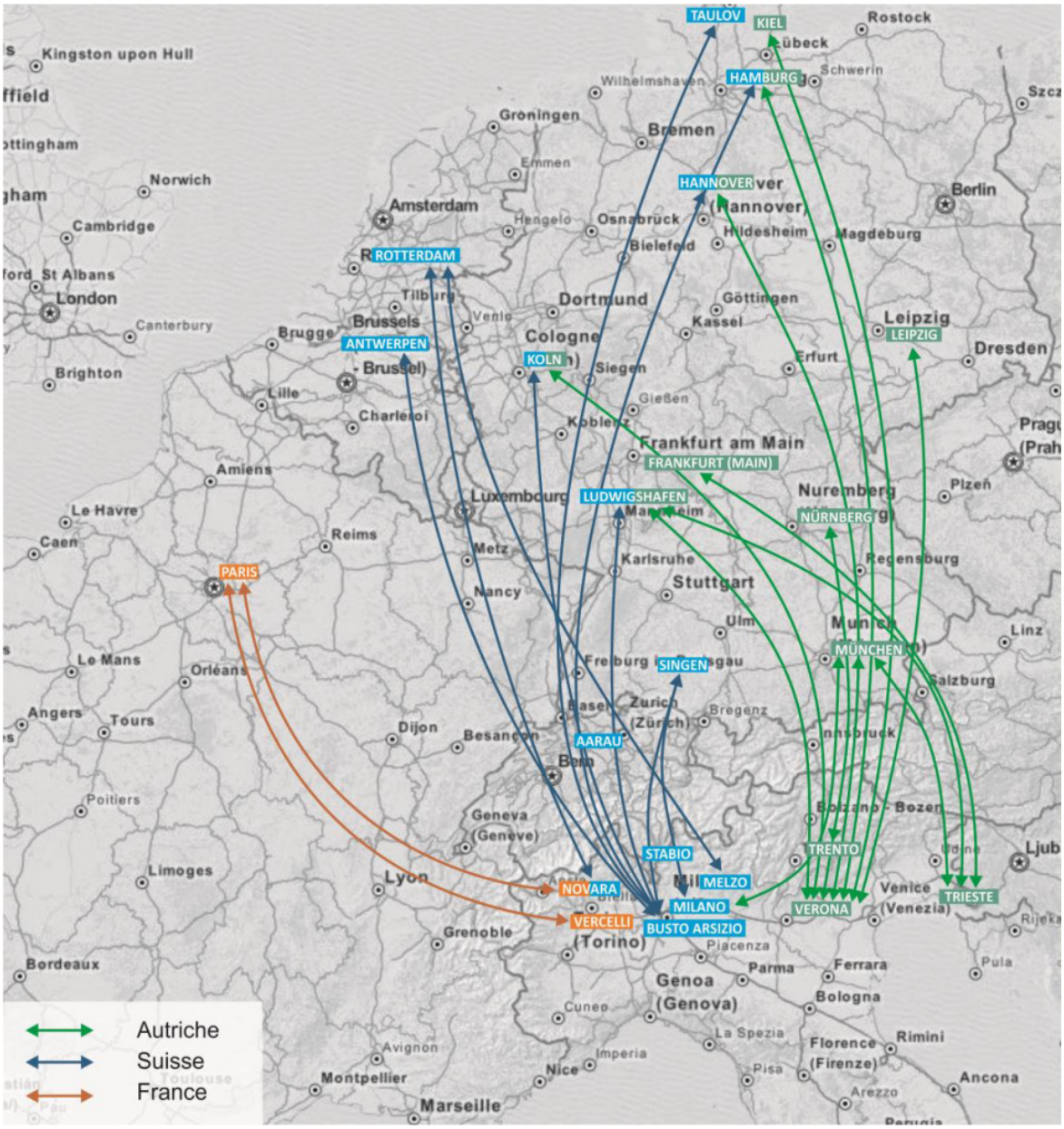


Figure 4: Transalpine relations UCT[9]

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

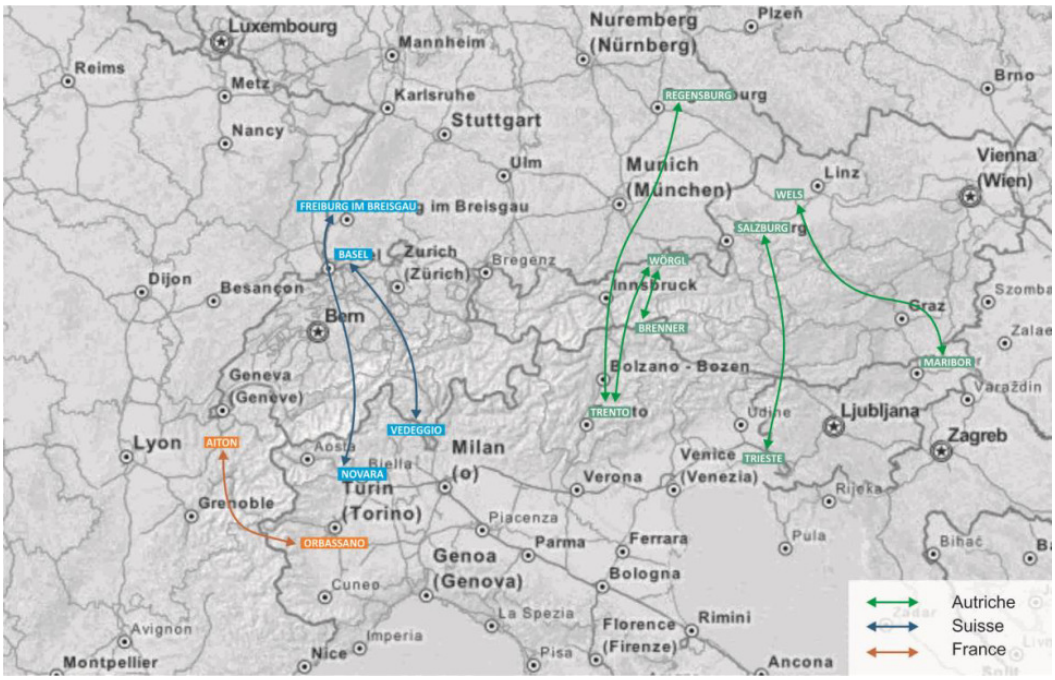


Figure 5: Transalpine relations ACT[10]

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				Strasse		Strasse+	Schiene				Strasse		Strasse+	Schiene				Strasse		Strasse+	Schiene			
	SGF 1000	Mio. t	Schiene Mio. t	Total Mio. t	WL Mio. t	UKV Mio. t	RA Mio. t	SGF 1000	Mio. t	Schiene Mio. t	Total Mio. t	WL Mio. t	UKV Mio. t	RA Mio. t	SGF 1000	Mio. t	Schiene Mio. t	Total Mio. t	WL Mio. t	UKV Mio. t	RA Mio. t	SGF 1000	Mio. t	Schiene Mio. t	Total Mio. t	WL Mio. t	UKV Mio. t	RA 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		1'295	17.3	17.7	0.5	0.5	0.0	
Montgenèvre	119	1.4	1.4					66	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	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					663	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
Gotthard	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																												
Reschen	93	1.2	1.2					125	1.8	1.8					92	1.0	1.0					90	1.0	1.0				
Brenner	1560	25.4	34.1	8.7	2.8	3.3	2.7	2085	33.3	45.0	11.6	3.6	5.8	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
Tarvisio	1270	18.2	23.0	4.8	4.4	0.4		1433	19.9	26.4	6.5	5.5	0.6	0.4	962	15.1	22.2	7.1	4.2	2.6	0.4	969	15.2	22.3	7.0	4.4	2.3	0.3
Felbertauern	65	0.5	0.5					102	1.1	1.1					68	0.8	0.8					32	0.4	0.4				
Tauern	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	967	13.3	21.6	8.4	5.8	2.2	0.4	985	13.5	21.4	7.9	5.9	1.7	0.3
Schoberpass	1030	9.9	15.2	5.3	5.0	0.4	0.0	1425	16.5	22.5	6.0	4.0	1.0	0.9	1341	15.8	20.4	4.6	3.5	0.6	0.6	1353	15.9	20.5	4.6	3.5	0.5	0.6
Semmering	480	3.9	13.8	9.9	9.5	0.4		596	6.6	15.2	8.5	8.0	0.6		426	4.8	15.8	11.0	9.2	1.8		438	5.0	16.9	11.9	10.1	1.8	
Wechsel	1100	8.6	8.7	0.1	0.1	0.0		1038	10.0	10.3	0.3	0.2	0.1		1098	11.8	12.1	0.3	0.1	0.1		1133	12.4	12.7	0.3	0.1	0.1	
Alpenbogen C	9379	110.3	171.9	61.6	39.3	17.1	5.2	10332	134.3	199.8	65.5	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	6224	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	21.8	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	95.9	141.6	45.7	15.9	24.3	5.5	6803	94.2	141.8	47.6	16.0	25.6	6.0
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	2923	44.8	58.3	13.5	7.2	3.7	2.7	3644	55.1	73.2	18.1	9.1	6.3	2.7	3020	45.6	63.9	18.3	6.5	8.4	3.4	2995	45.3	64.0	18.7	6.6	8.7	3.5
Alpenbogen A	4584	60.7	98.5	37.8	18.2	15.9	3.7	4841	69.4	111.4	42.1	15.1	22.4	4.6	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
Frankreich	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
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	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

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	Schiene	Strasse		Strasse+ Schiene	Schiene
	SGF 1000	Mio. t	Mio. t	Mio. t	SGF 1000	Mio. t	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
Gotthard	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
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 Austria[11].
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%
Switzer-land	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%
	Gotthard	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).

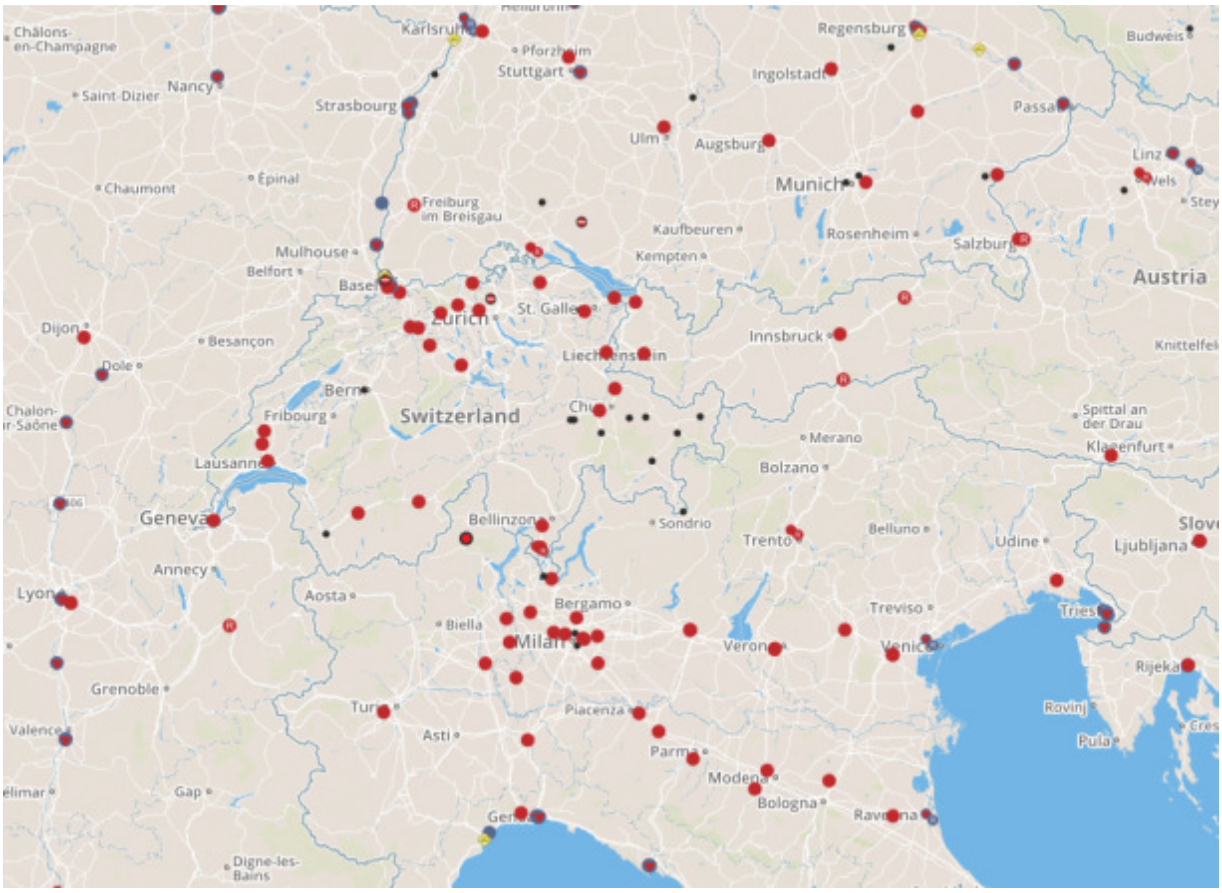


Figure 6: Terminals in Alpine regions[16]

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. SGKV (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.

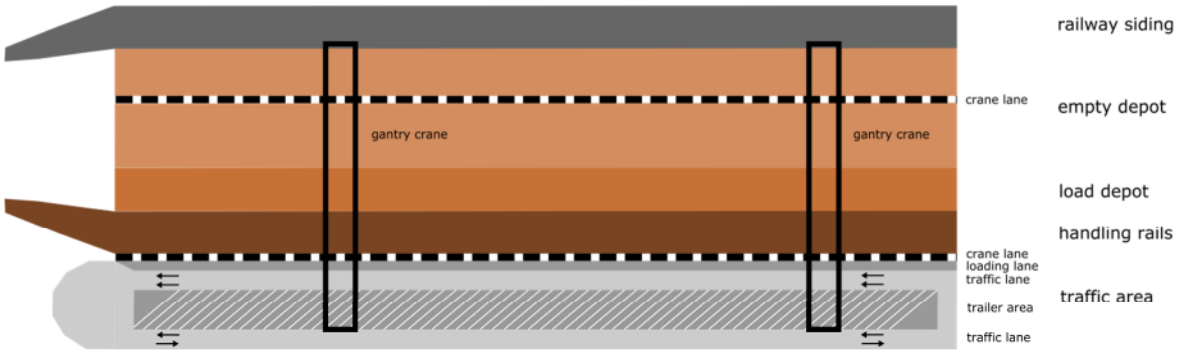


Figure 7: Integration of a premium parking space[35]

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]

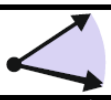
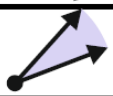
Country		Road	ACT	UCT	change rates
France	long distances				-0,8% à +1,3%
	short distances				-0,4% à +3,0%
Switzerland	long distances				-1,4% à +0.1%
	short distances		-		-0,8% à +0,6%
Austria	long distances				-1,0% à +4,9%
	short distances				+0,1% à +10,3%

Table 5: Transport costs 2014 compared with 2013[37]

"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. xlvi.
[37] EC, OFT (2016), p. xlvi.
[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 components[40]:

- 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.

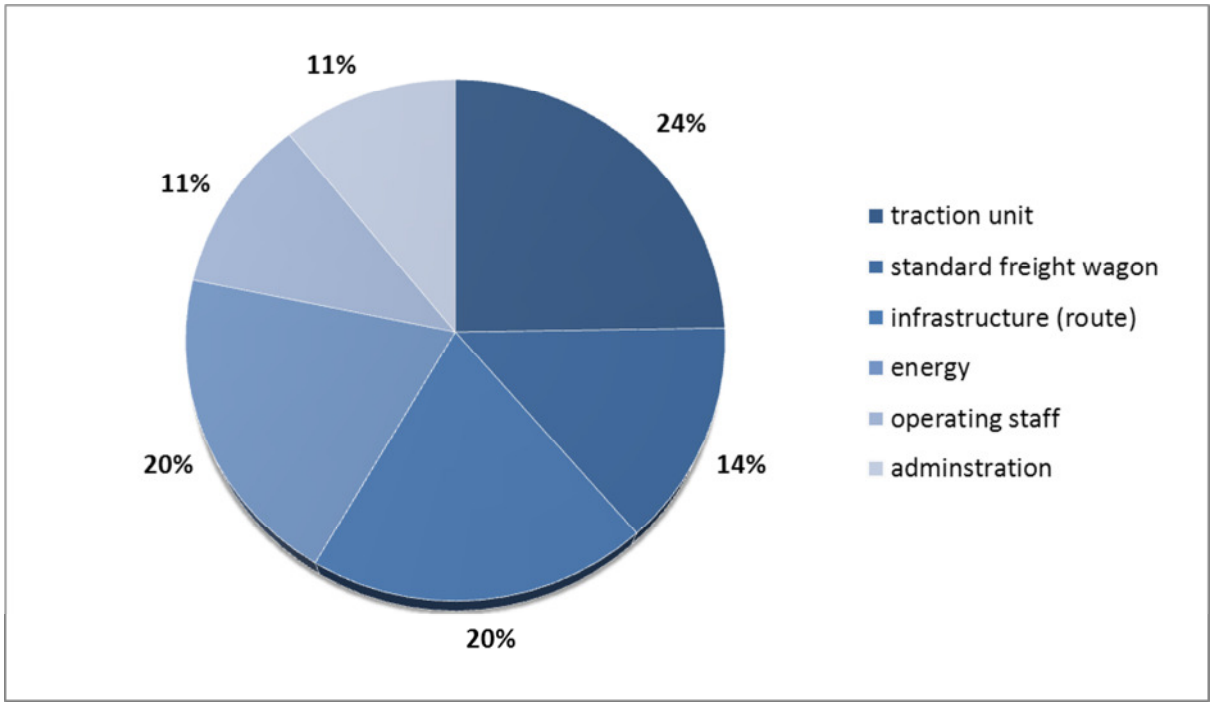


Figure 8: Cost structure rail freight transport (example in Germany with standard freight wagon[41])

2.3.2 Cost Structure of Road Freight Transport

The costs in road freight transport can consist of following parts[42]:

- Procurement costs
- Imputed interest
- Imputed amortization
- Fuel and lubricant costs
    - diesel consumption per 100 kilometers
    - annual mileage of trucks
    - diesel price for internal and external refueling
    - share of equity and debt refueling
    - 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.

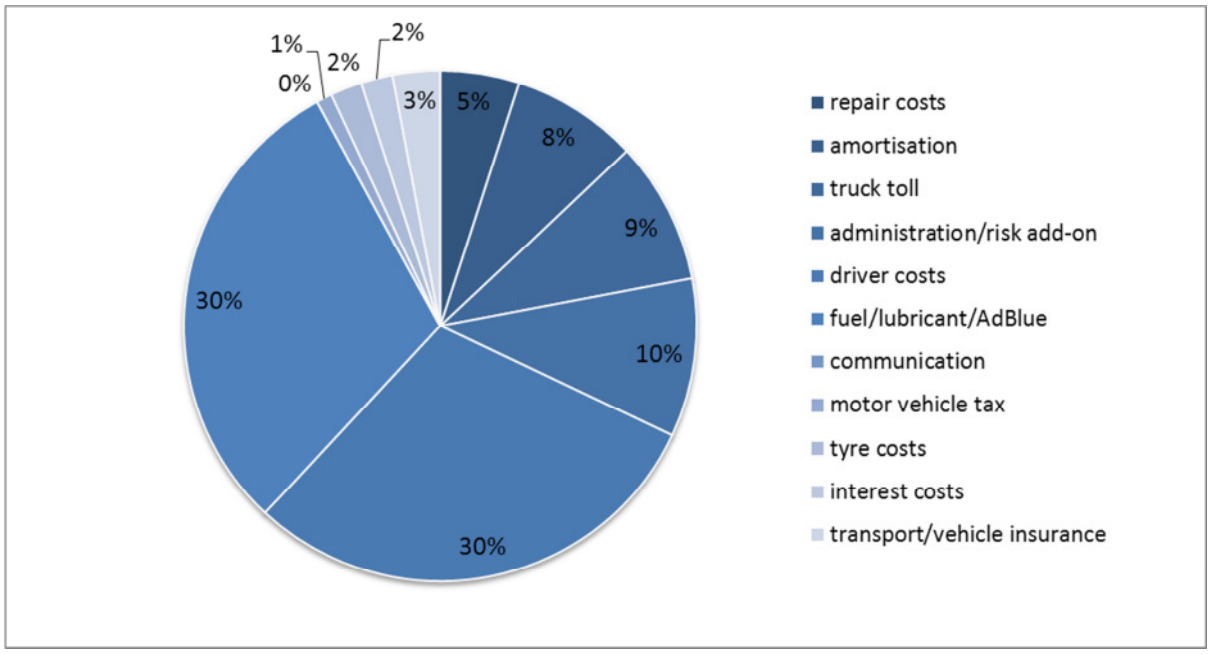


Figure 9: Cost structure truck transport drawbar-trailer EURO V - example Germany[43]

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.

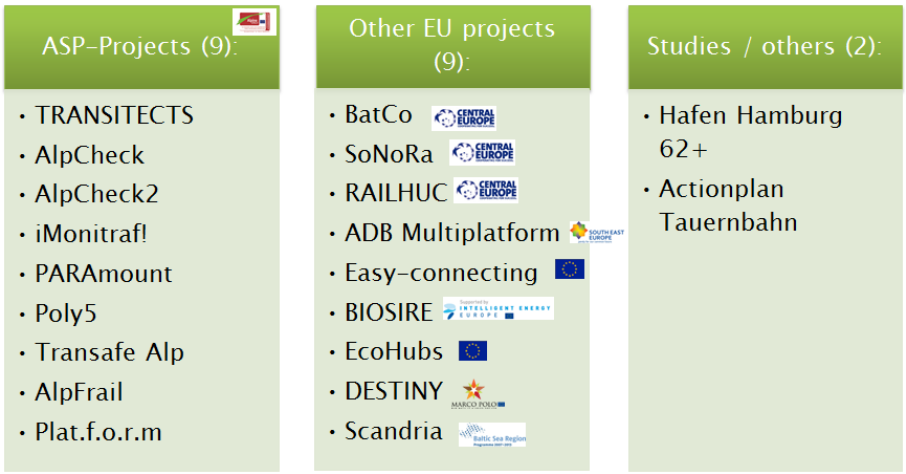


Figure 10: Analyzed projects and studies in freight transport by the project SusFreight[45]

[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, iMonitraf!, 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 adress 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 dealed 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 live in the adjoining housing areas. Transition points do, however, lead to a better quality of live 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 governement 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 governement 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 ressources 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)

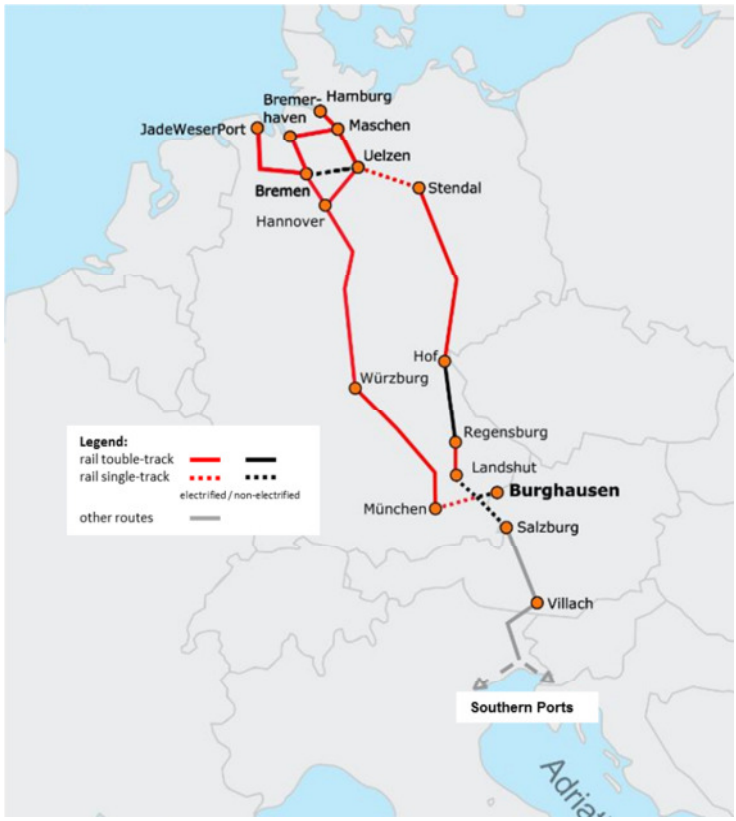


Figure 11: East corridor[46]

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 transhipment 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 containers[49] the majority corresponds with the standard.[50]

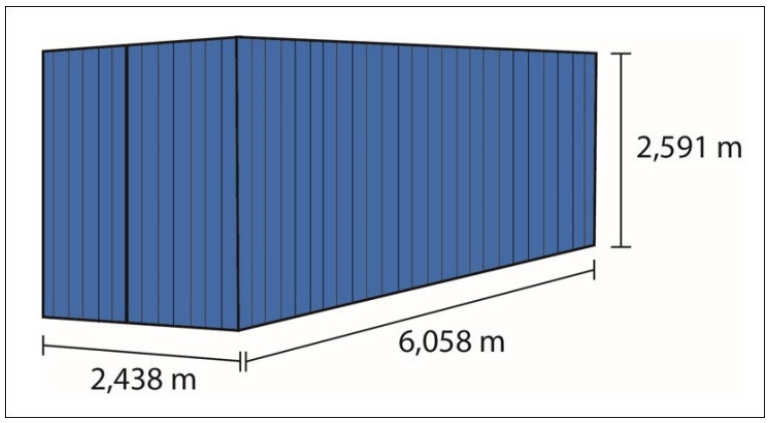


Figure 12: 1 TEU (20-foot ISO-standard container)[51]

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).

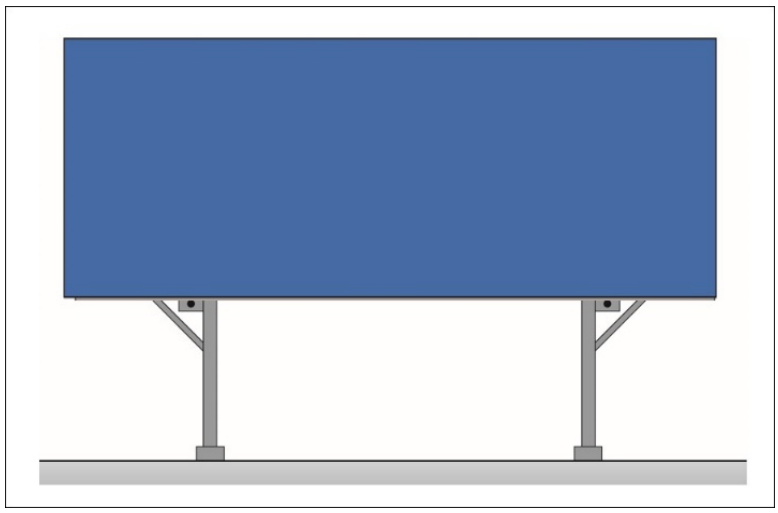


Figure 13: Placed swap body[58]

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 where developed.[60] Since 1936 special truck semitrailers here 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).

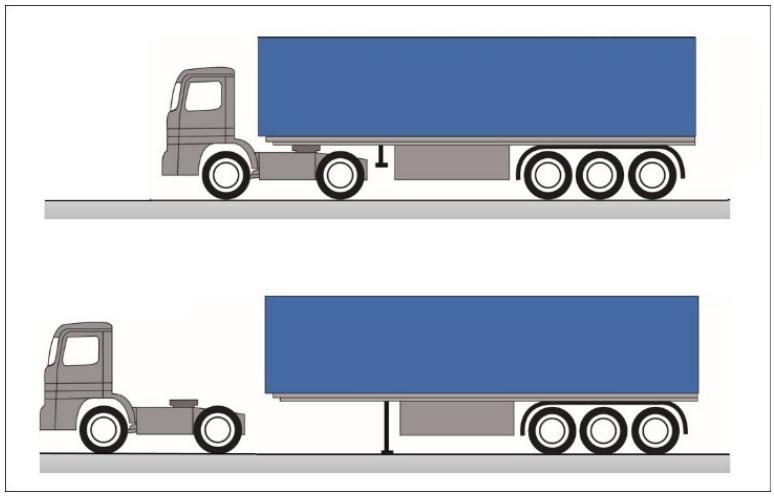


Figure 14: Depiction of a semitrailer[63]

[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: CargoBeamer[65]

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 addtion to automated CargoBeamer terminals, operation in all existing convetnional 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]

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[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 Sattelauflieger 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: ISU[73]

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 transhipment 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 ciculating. 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: Modalohr[75]

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 freight 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 variaty 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 collected and brought together. Despite these difficulties, all requirements could be fullfilled.

Figure 18: Transshipment with the NiKRASA system[77]

Accompanying documents:
http://www.nikrasa.eu/en/home.html

3.1.8 ContainerMover 3000 truck-mounted rail-road transhipment 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 transhipment at every freight station with load transfer point or at private sidings. The system can be used for the direct transhipment 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 transhipment 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 transhipment 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 develped the system ContainerMover 3000. The company was founded in 2010 as a private competence-centre for intermodal liner trains and transhipment 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	• ISU-traverse • ISU-spreader • ISU-ramp • ISU-wheel gripper[2]	• terminal-platform • transport-platform	• Cargogate with transshipment module • or: Wagon composition with crane biting edges	• Modalohr-terminal with transshipment modules
Costs transshipment infrastructure & equipment	*Investment:* • 60.000€ for the intermediate frame with lifting straps and two loading ramps [3] *Ongoing:* • Maintenance of ISU-components	*Investment:* • terminal-platform: modest 5-digit amount • transport-platform: modest 5-digit amount *Ongoing:* • Maintenance of transport platform & terminal platform	*Investment:* • Cargogate: 10-20 Mio.€ per site [1] *Ongoing:* • Maintenance of facility	*Investment:* • Modalohr-terminal: ca. 6,7 millions € per site [1] *Ongoing:* • Maintenance of facility
Costs wagon & additional equipment	• Double pocket wagon: 180.000€[1] for 2 parking spaces	• Double pocket wagon: 180.000€[1] for 2 parking spaces	• Cargo Beamer wagon: 360.000€[1] for 2 parking spaces • Wagon base: 20.000€ x 2 pallets per wagon = 40.000€	• Modalohr wagon: 385.000€ [5] for 2 parking spaces
Know-How & processes	• 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	• 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	• 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	• transshipment at Modalohr-terminal: know-how necessary by technical handling because of (new) system not comply with the standard transshipment
Capacity train length	40 semitrailer **Calculation:** 700m/34,03m = 20,57 wagons → at 20 TWIN-double pocket wagon, each with 2 parking spaces complied a capacity of 40 semitrailers	40 semitrailer **Calculation:** 700m/34,03m = 20,57 wagons → at 20 TWIN-double pocket wagon, each with 2 parking spaces complied a capacity of 40 semitrailers	36 semitrailer[4] **Calculation:** 700m/39,00m = 17,95 wagons → at around 18 wagons, each with 2 parking spaces complied a capacity of 36 semitrailers	42 semitrailer **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

Table 6: Detailed comparison of selected systems for Combined Transport[78]

[78] LKZ Prien GmbH representation following others (Cf. [1]www.zukunft-mobilitaet.net; [2]ISU Systemübersicht DI Erich Possegger; [3]Tandetzki: Machbarkeitsstudie ISU-System[4]CargoBeamer)

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)

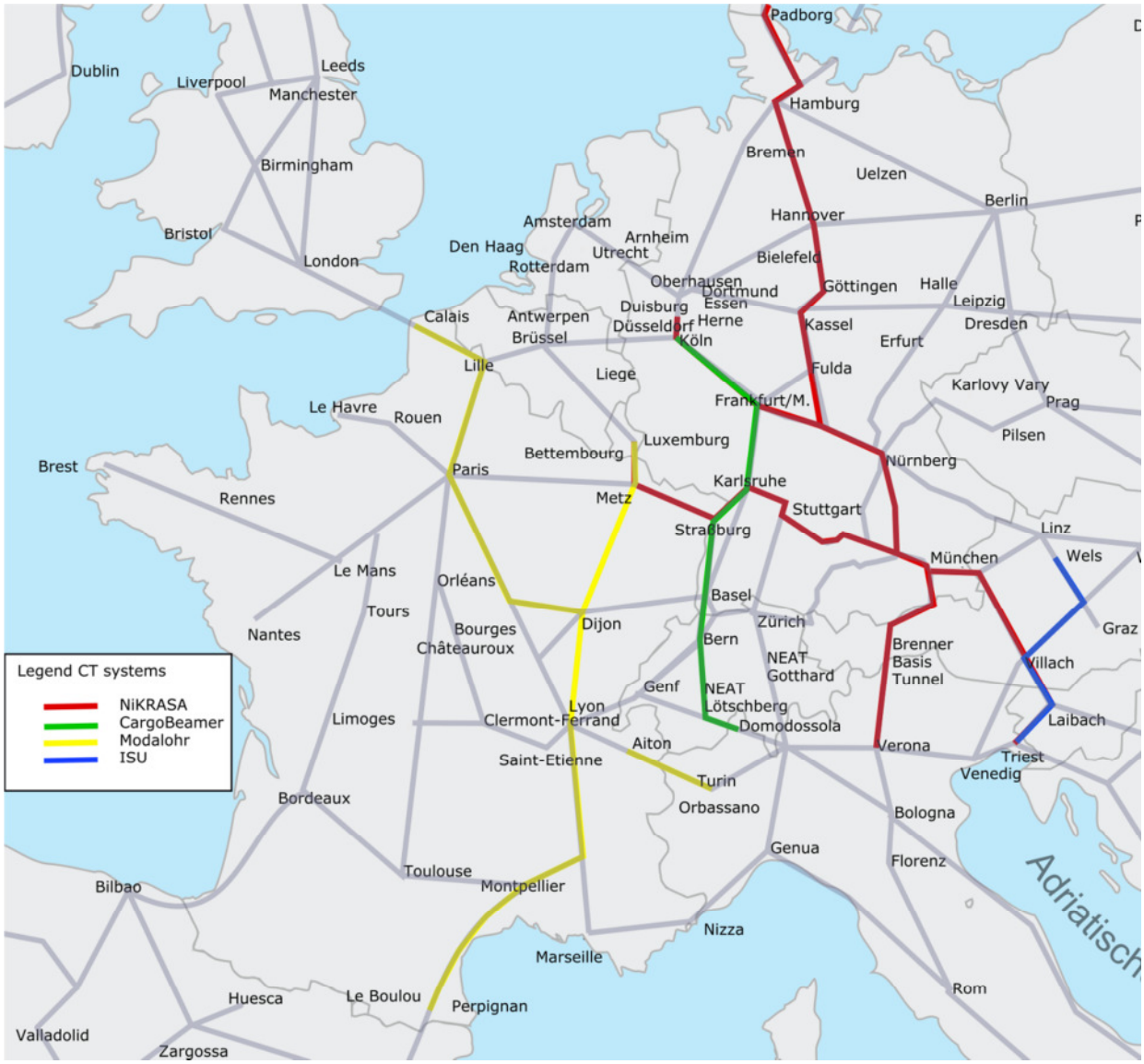

Figure 19: Map of connections of CT systems[86]

[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 daugther 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 imformation campaign for potential users of electric powered vehicles is under way.

Expected impacts:
A reduction of 85 % of CO_2 emissions is possible due to the substitution of 200 light duty vehicles by electric powerde vehicles. This means more than 230 tons CO_2 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 accross 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 experimenation 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 disproportionally 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 mesures 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. through[90]:

- 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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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_review.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, pilote 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.

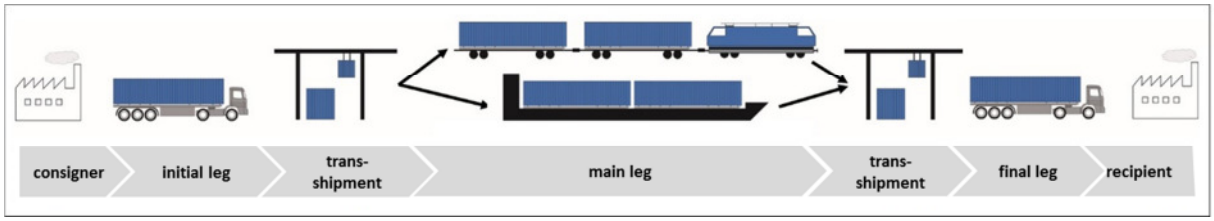

Figure 20: Transport chain Combined Transport[91]

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.

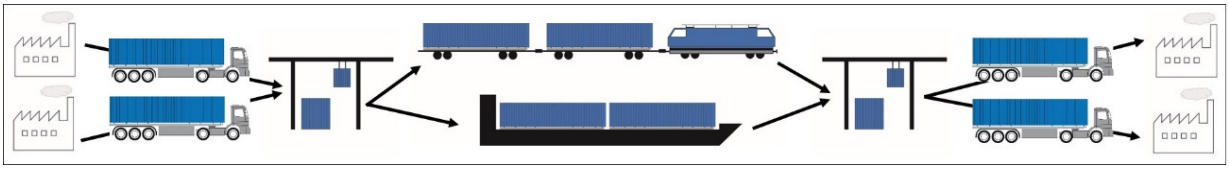

Figure 21: Unaccompanied CT[93]

[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]

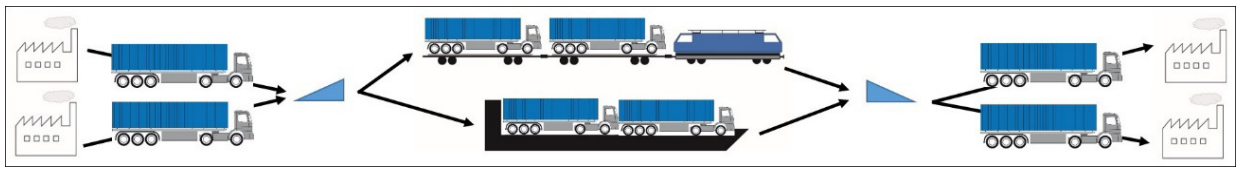

Figure 22: Accompanied CT[98]

[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 crane[104]

Mobile transshipment modules, which are also equipped with a combined spreader grapplers 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 stacker[106]

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 tractors [107] (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 semitrailer[108]

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]

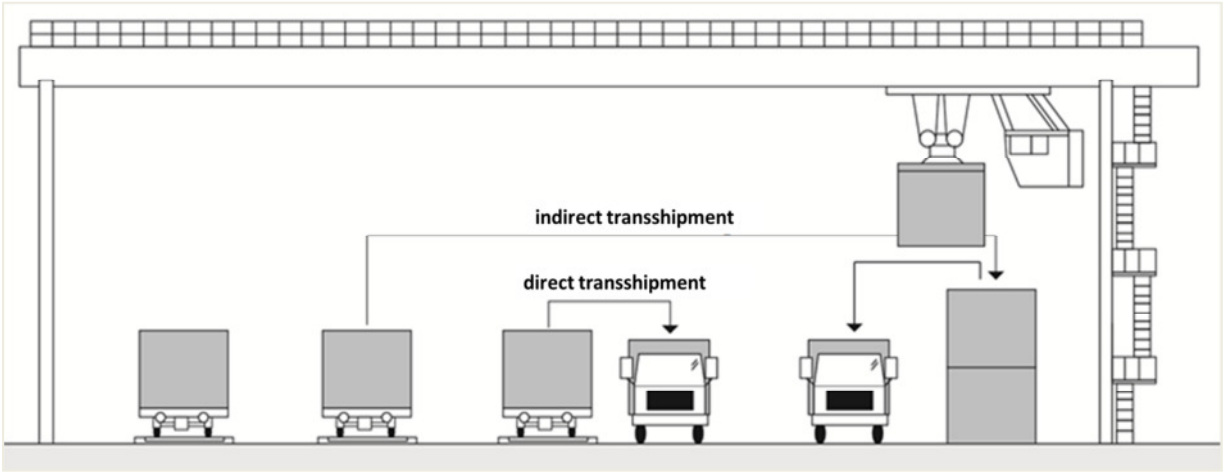

Figure 26: Direct and indirect transshipment between rail and road[112]

[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.

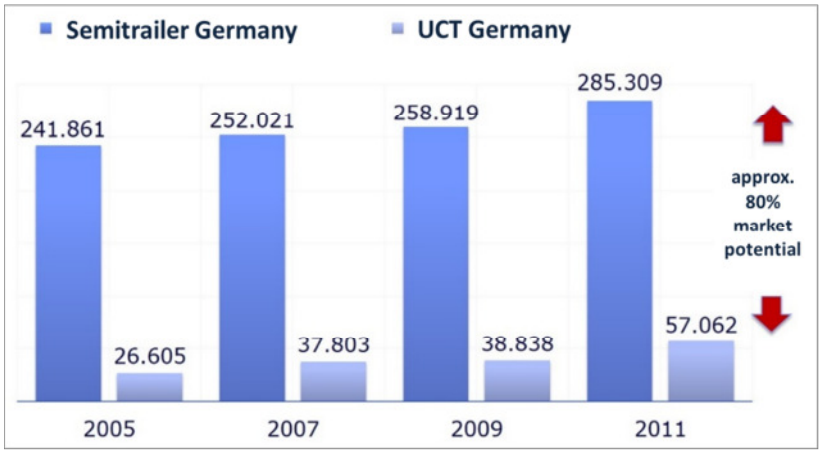

Figure 27: Example: Development in Germany - trailer & UCT[115]

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 transport[117]

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.

Handbook for Transport and Tourism Operators

BETTER INFORMED, BETTER TRAVEL

towards a sustainable mobility information network

ALP INFO NET

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towards a sustainable mobility information network

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ALPINFONET - SUSTAINABLE MOBILITY INFORMATION NETWORK FOR THE ALPINE SPACE

Lead Partner:
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Project partners:
Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (AT)
Regional Development Agency East Tyrol (AT)
Administration of the State Government of Vorarlberg – Department for Economic Affairs (AT)
European Academy of Bolzano (IT)
Politecnico di Torino – Interuniversity Department of Regional and Urban Studies and Planning (IT)
Municipality of Gorizia (IT)
Department of Transport Management, Infrastructure, Mobility and Logistics of Regione Piemonte (IT)
Ministry for Ecology, Sustainable Development, Transport and Housing (FR)
Provence-Alpes-Côte d'Azur Region, Transport Department (FR)
Rhône-Alpes Region, Transport Department (FR)
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FOREWORD

Holidaying without a car? Unimaginable for many tourists. Several researches as well as national transport surveys all over Europe show how the car still remains the most important and most popular form of transport – for holidays or in everyday life – owing to the independence it provides. In recent years, the number of tourists – and thus their journeys – has been increasing. In the Alpine Space the growing volume of traffic, and not only from tourism, is even more significant and therefore it is absolutely necessary to rethink and change people's travel behaviour to achieve more sustainable mobility patterns.

What is needed to change this way of thinking and to motivate people to make use of (often available and highly developed) sustainable means of transport? Our answer is: information for everybody, at any time, any place and for any destination, including the last mile to work or home or any other accommodation.

Providing easy, accessible and clear information about eco-friendly transport for tourists and residents will motivate the change from motorised private transport to sustainable transport services and strengthen both the tourism and the public transport sector.

Within the AlpInfoNet project, five pilot regions from the Alpine Space tested different technical and organisational solutions to provide comprehensive and easily accessible information on (cross-border) mobility. Acting as pioneers, they had to overcome various technical, organisational and political barriers. In the end, they opted for the solution that was most appropriate for their specific regional situation.

AlpInfoNet strove to find long lasting, sustainable and practical solution(s) for providing adequate mobility information that can continue to be improved after the end of the project.

This handbook aims at imparting the experiences and solutions of the AlpInfoNet project also to other regions than those involved in the project, supporting them in implementing appropriate solutions in their own regions. Sharing innovative solutions will enable the network to grow and will ensure that the Alpine Space remains an attractive tourist destination and a valuable place to live.

Harry Seybert, Bavarian State Ministry of the Interior, for Building and Transport

"Why can't I yet plan or book my journey through Europe – switching from air to rail or sea, to urban or road transport – in one single go and online?"

Siim Kallas, European Commission Vice-President and Commissioner for Mobility and Transport, ITS Conference, 22nd June 2010

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THE PROJECT AND ITS AIMS

Increasing the use of sustainable transport also for leisure travel is becoming of utmost importance to further reduce the use of private cars. To this end, travellers should have reliable and detailed door-to-door information about the available sustainable transport options to get to their destination. However, despite the fact that there are numerous tourism and mobility information systems (TIS and MISs) available online, often users cannot find the information they need, which is severely hampering the shift from cars to using sustainable transport. Failure to provide information about public transport, last mile offers and local mobility at the destination prevents tourists, and even commuters, from using public transport. And travelling between countries by means of sustainable transport is even more challenging: while in most cases there are local, regional and national information systems (ISs), impartial and comprehensive cross-border information is still missing.

These issues are some of the reasons why the Working Group Transport of the Alpine Convention supported the AlpInfoNet project, the first European project on this matter initiated by the Alpine Convention.

The initial objectives of the AlpInfoNet project were ambitious and highly challenging: to develop an integrated information service across the Alps to connect tourism and public transport data and provide travellers with comprehensive, smart and reliable transnational information about the sustainable mobility offers to/from and within the Alpine Space.

The ultimate aim was to encourage a behavioural change in travellers and to bring about a modal diversion by improving the quality of the information services and thus facilitating access to public transport.

The project involves three cross-border and two national pilot regions in the Alpine Space with five different situations regarding tourism and mobility services, ISs, and covers diverse juridical situations.

The pilot regions cover the territory of Lake Constance, Lake Chiemsee, East Tyrol, Province of Goriza and Goriška, Piemonte, Provence-Alpes-Côte-d'Azur and Rhône-Alpes (Figure 1); the characteristics of the regions involved are showed in table 1 while more detailed information is given in Annex 1.

Figure 1 – AlpInfoNet pilot regions.

The complexity of the context and the diversity of the regions involved made creating a new platform inadvisable; instead an attempt was made to integrate the existing ISs that are well established at local, regional and national level.

Specific attention was paid to the interoperability and to the harmonisation of the selected ISs in order to provide 'smart' sustainable mobility information (SMI) to travellers and inhabitants. To guarantee the implementation of suitable solutions and the achievement of long lasting results, technical and political key actors from transport, tourism and environment sectors were actively involved in the project. A target group was also picked to find out their needs and expectations and propose a communication strategy. Existing technical solutions were compiled, evaluated in terms of their strengths and weaknesses and tested by the pilot regions. In addition, the legal and political framework for establishing a cross-border mobility information service was analysed, challenges were identified and their solutions were developed.

The following chapters will provide an overview of the activities, the challenges and the solutions of AlpInfoNet through to setting up and implementing a cross-border SMI network.

	Area/Regions	Area	Population	Yearly tourists (arrivals)
Lake Constance	Lindau County / Bodenseekreis County Federal State Vorarlberg	3,589.63km²	660,831	3,567,768
Lake Chiemsee	City of Rosenheim, district of Rosenheim, district of Traunstein, district of Berchtesgadener Land, City of Salzburg (Austria)	3,850.54km²	578,407	1,975,813
East Tyrol	East Tyrol (district with 33 communities)	2,019.87 km²	49,885	417,301
Province of Gorizia and Goriška	Province of Gorizia – 25 municipalities, Goriška region – 13 municipalities	2,792km²	261,265	592,901
Piemonte, Provence Alpes Côte d'Azur and Rhônes-Alpes	Provincia Cuneo, Provincia Torino, Maurienne valley, Romanche valley & Oisans and Valbonnais Massifs, Briançonnais, Ecrins, Queyras, Champsaur, Valgaudemar, Dévoluy, Embrunais, Serre-Ponçon, Gapençais, High Verdon and Ubaye valleys	25,977.56km²	3,086.082	no data available

Table 1 – Characteristics of the pilot regions.

BRINGING TOGETHER TRANSPORT AND TOURISM

The first challenge of AlpInfoNet was to bring together the transport and tourism operators who will be the users of the ISs developed within the project. The following sections present the target users and provide details of the system developed up to this point.

The target users of AlpInfoNet

AlpInfoNet allows end users travelling to the Alps to rapidly get all the information they need for a seamless, car-free service chain to their holiday destination and during the stay to:

- easily plan their eco-friendly arrival at the holiday destination from door-to-door;
- inform them about options for sustainable mobility at the holiday destination.

As mentioned above, the main target groups of AlpInfoNet are not the end-users but the tourism and transport stakeholders who are - or shall be - the providers of the information. In fact, they are the ones who take part in the value chain for producing the service (Figure 2) and give the relevant information on methods of sustainable transport as well as about tourism activities.

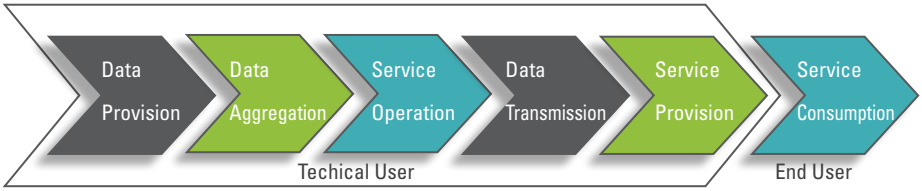


Figure 2 – Chain of Sustainable Mobility information and related users.

To understand the target groups' needs, a survey of the transport and tourism stakeholders was conducted in all the countries involved. The survey used several methods – workshops, focus groups, interviews and questionnaires – aiming at investigating the following issues:

- What are the needs of transport and tourism operators?
- What transport methods should be covered?
- What products and services should be developed?
- What tools are appropriate for the exchange of information?
- What are the conditions for cooperation?

- What is the current situation in terms of transport information shared among people?
- What data exist and in what format are they available?

The chief finding from the survey was that the main challenge to be tackled to build high-quality information services for tourists in the Alpine region about sustainable transport is to **integrate information** from transport and tourism sectors and **achieve harmonisation**.

Specifically, the **transport actors** dealing with MISs are primarily focused on interoperable and seamless sustainable mobility information systems (SMIs) for travellers, and this requires making the **existing MISs interoperable**. The stakeholders insist on enhancing transnational information in the pilot regions. Their key objective is for a modal shift as this fits with their public policies and implies more customers for the transport companies. Their main concern is to make the (potential) travellers confident that their travel comfort and ease will be guaranteed. They are fully aware that, in order to achieve comprehensive and solid information, a lot of effort has to be put into the data quality and standards.

The **tourism actors** dealing with tourist information systems (TISs) are interested in having **greater cooperation with the transport sector** and are ready to be involved in the project. Their key objective is customer satisfaction, to attract more users by providing the best services. To this end, they need interoperability among their TISs and between TISs and MISs to offer to their customers a **complete sustainable mobility information chain: long distance, last kilometre (or last mile) and on-site mobility information** given through smart and high value services. Users need to feel confident about the information displayed, meaning that the quality and reliability of information are the key aspects of the service.

The transport modes covered by AlpInfoNet

The modal shift towards sustainable mobility can only be obtained by involving all parties supplying sustainable transport. The surveys in the pilot regions revealed what types of transport services are present, how they are managed, who provides the information and what types of information about the services are available to the users. Regarding tourism mobility, the most interesting, but difficult, issue was to integrate not only the traditional operators of public transport, but also all the shuttle services (private and public) that are used for the “last mile” in the tourist areas. For this reason, less attention was paid to the road network for private cars and the main focus was on:

- Walking (Private transport)
- Bike (Private transport)
- Carpooling (Private transport)

- Taxi (AMS: Additional Mobility Services)
- Car rental (AMS: Additional Mobility Services)
- Car sharing (AMS: Additional Mobility Services)
- Bike sharing (AMS: Additional Mobility Services)
- Bike rental (AMS: Additional Mobility Services)
- Demand responsive transport (DRT) (AMS: Additional Mobility Services)
- Tourist Shuttle (AMS: Additional Mobility Services)
- Train (Public transport)
- Long-distance Coach (Public transport)
- Bus (Public transport)
- Tram/Metro (Public transport)
- Passenger ship (Public transport)
- Cableway (Public transport)

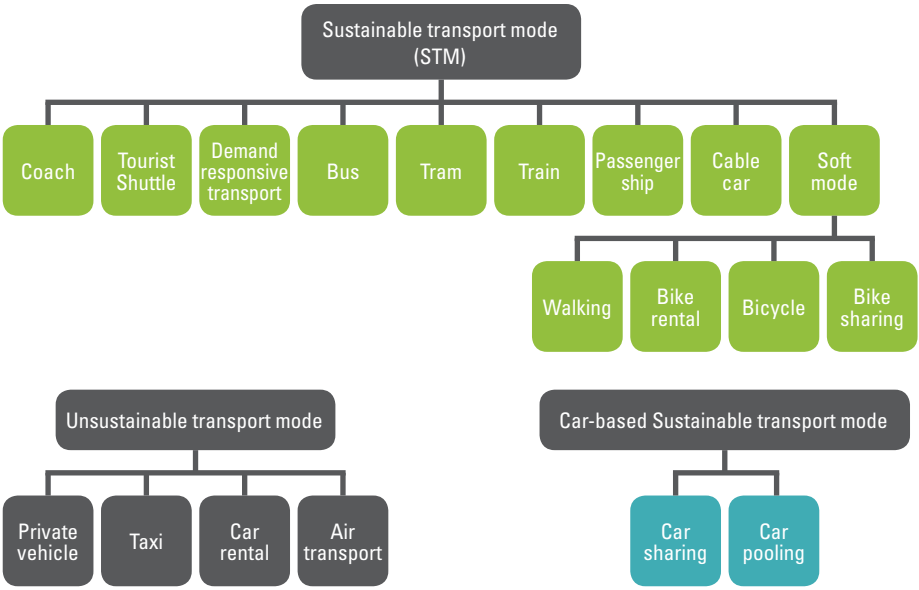


Figure 3 – Overview of transport modes.

Products and services developed in AlpInfoNet

The most basic service expected is to achieve a **smart link to tourism points of interest (POIs) and SMI services**. This service could be achieved by connecting public transport passenger pickup points with tourist POIs in order to provide consistent services (for example common digital maps, easy to use journey planners, combined geo-localisations, etc.).

The ideal would be to develop a journey-planning service combining POIs with sustainable mobility journey options (including walking and cycling). This web-service could be accessible through an interface for tourism operators so that they could include journey-planner results in their tourist services, add a search box or a widget on their homepage and integrate a journey planning service (front end).

The development of existing ISs in the different countries of the AlpInfoNet pilot regions will be in successive steps, giving time for a targeted exchange of information and the appropriate conditions for cooperation.

The exchange of information

The main need for the information exchange is at regional and transnational level. This means that, in the pilot regions, on both sides of the borders, existing ISs should be able to communicate and to understand each other in order to set up interoperable and seamless SMIs for the travellers.

Transport and tourism stakeholders have different levels of expertise and needs: data ownership and the expertise on data processing are dealt with by transport actors while tourist information (POIs, accommodation, leisure activities, etc.) is managed by tourism operators. Therefore, the joint action is focused on the presentation of the SMIs and of the related services.

Furthermore, each IS provider will use what is already working or is currently being developed and not introduce any innovation. In fact, the main effort will be to create a synergy among what already exists, currently differing widely in terms of technological level. This diversity requires that ISs share common specifications for information exchange so that existing systems can communicate; these specifications could involve having common data formats, common data models, common interfaces, common protocols, common services, common data quality standard, common services and quality standards.

The **first category of information** to be dealt with regards the location of the different points. **Transport pickup points and POIs** (as well as other geo-located information) should be linked and have a common format and a common map projection. There are currently several different formats and map projections being used. In AlpInfoNet this issue was faced in two ways:

- a common format and common map projection are defined and each system develops a unique data conversion tool between its own format and the common format (some of them already exist);
- no common format or common map projection is defined and each system develops as many data conversion tools as there are ISs with which it wants to communicate.

The **second category of information is represented by scheduled and real-time transport data**. The surveys of all the public transport operators provided an understanding of the current standard they use; none of them promoted the use of European Standards (NeTEx or SIRI), while some mentioned GTFS. The only exception is the Piemonte region that has worked extensively on integrating standards. In the very near future, the region will implement the regional global standard based on the NeTEx standard: it will be the BipEx standard – a "dialect" of NeTEx – because it includes the section related to electronic ticketing. Obviously applying a standard is a dynamic process under construction and, even though the European Commission promotes this solution, in practice operators and institutions are waiting to find out which will be the best solution. In this scenario the AlpInfoNet solutions are not intent on introducing new standards but aim to put different MISs in communication with each other.

The conditions for cooperation

Building sustainable solutions for tourist mobility requires the collaboration of many players. The AlpInfoNet project made it possible to bring together all the important subjects involved in people's mobility to try and find points in common and to encourage partnerships both locally and across borders. A key issue was to investigate the readiness of the various players to exchange information, essential for offering a truly integrated IS on sustainable mobility. The survey showed that all the transport players agreed to exchange data, information or connections to services of all other parties. The surveys and interviews with the transport operators revealed some common points of view and suggestions regarding the sharing of information:

- exchange of information must be free of charge;
- data not to be commercially used (data selling is forbidden, but, for example, services can be profit-oriented by advertising);
- prepared to send information for completely non-commercial services;
- discrimination-free services;
- impartial presentation of transport supply;
- reciprocal data exchange;
- inclusion of references to data provider on derived services;
- exclusion of commercial-sensitive data;
- control over re-use (sharing of traffic figures).

Likewise, tourism operators clearly expect free of charge access, with reciprocity and transparency. They are aware that they are in competition with foreign territories, but they state they are willing to cooperate and to share information.

LESSONS LEARNED

As shown in the previous chapter, the situation and the framework conditions for establishing a SMI vary among regions and countries and a single universal solution fitting all the requirements is very difficult to implement. Therefore, rather than proposing an "all inclusive server", AlpInfoNet offers the "AlpInfoNet Toolbox" that, based on the existing ISs, builds up an information network including all those systems.

The "AlpInfoNet Toolbox". Short presentation of each tool

The **"AlpInfoNet Toolbox"** includes detailed specifications of many different technical solutions that can be helpful for enhancing and improving existing ISs, as well as for building connections between two or more of these systems. All these techniques fit with each other and any organisation interested in providing people with better information about sustainable mobility can pick from this toolbox just the most helpful and suitable solutions according to the individual organisational, financial, and technical framework conditions. The modular system, a broad spectrum ranging from easily implemented techniques to more complex solutions, is designed to encourage beginners to embark on the first step towards better information about sustainable mobility and, at the same time, to stimulate advanced stakeholders and regions to further improve and implement even more user-friendly solutions.

Thanks to this approach, people can find SMI on the websites they already know, because the tools enable existing websites and tourist and mobility information systems to be connected to each other.

Detailed descriptions of the 12 tools developed during the project are shown below.

Smart Links

Static links simply direct the user to relevant information on the linked website, while smart links lead the user to a web service on another website in a smart way. For example, a hotel website can offer a smart link to a journey planner. This smart link not only puts through to the journey planner website, but also transfers parameters to specify certain features of the web service, so that the user is transferred to a trip-planning form of the journey planner, where the hotel is already pre-filled as destination. Static links can connect to any website, while smart links must be supported by the

linked web service and documentation (which specifies the parameters accepted by the system) must be provided by the operator of the linked system.

Website Links are easy to implement, but the drawback is that the user is directed to another website. Implementing links to sites offering information about local and regional sustainable mobility options, website operators (such as municipalities, regions, tourism associations, tourist attractions, providers of accommodation and tourist activities, etc.) can help users find relevant information for planning holidays without a car and journeys by sustainable transport.

Journey planner Widgets

Some MISs offer a so-called widget. This is a configurable small area to be displayed on a third-party website, such as a hotel website. A visitor to this website can enter her/his start address and, by clicking "submit", she/he will be transferred to the journey planner, where the mobility information is offered.

Thus, for example, a widget builds a link between a tourist website and a journey planner and is the first step towards a sustainable information network.

XML-Interface/Webservice

A tourist website can be enhanced by retrieving the mobility information from the journey planner via an XML-interface or web service. This is an interface for communication from machine to machine. The destination website can get the mobility information in the background and display it as its own content, without forwarding to another website. This is a big advantage compared to "Smart Link", "Journey planner Widget" or "start widget", which transfers the user to another website.

However, to implement such an interface is expensive and time-consuming and needs a considerable effort of coordination with the provider of the journey planner.

Connection of two Journey planners

A journey planner usually offers trip information related to small areas but does not provide information for a longer journey. In order to cover larger areas, adjacent journey planners should be connected so that they are able to give detailed information for longer journeys. For successfully connecting two journey planners, AlpInfoNet suggests to use one of the existing well-defined interfaces (like EU-Spirit or DELFI in Germany) and to define some meta information, like a set of transition points, at the outset.

Time Table Completion

Ideally, public transport journey planners should include detailed and up-to-date information about all public transport services available in a certain area for users to have comprehensive travel information and advice. However, quite often there are

gaps in the information, mainly in cases of public transport services provided by small operators or the transport offer in "peripheral" areas. Whenever information is missing from public transport journey planners, the data need to be completed and regular updating of the information in the journey planners has to be guaranteed.

The techniques to fill the gaps in public transport information very much depend on the underlying journey planner system and need to be agreed with the system operator. Most journey planner systems offer the so-called Import Interfaces, which can be used to include timetable data. If it is not possible to add timetable information via an Import Interface, the data can be imported manually, for example via a web-based editor.

Enhancement of Journey Planners

Existing journey planners cannot normally handle requests for information when planning a trip well into the future; for example, when entering a date for a trip taking place in the following year, most systems say that there is no offer available at the requested time.

Furthermore, existing journey planners do not usually offer information regarding additional mobility services such as shuttle buses or cableways. Most journey planners only show fixed dates and times and so they cannot handle transport services not having a timetable. Therefore, AlpInfoNet suggests enhancing the journeys planners so that the system explains for what dates it can give information and gives some hints when the user enters a date that is too far in the future.

The systems shall also be enhanced to handle mobility services providing days and times of the service (e.g. Monday to Friday from 8:00 to 18:00), the duration of the journey and the average waiting time for the next transport to arrive.

Additional Mobility Services (AMSs) / Last Mile

Additional Mobility Services are a supply complementing conventional public transport. Such services include tourist buses, shuttle buses, cableways, taxis, car rental and car sharing. These AMSs are especially important for travellers since they can help to cover the "last mile" from the public transport alighting point to the final destination and often are a significant part of the sustainable on-site transport supply. However, although such AMSs are often found in tourist regions, they are not usually covered by the existing ISs. In order to provide people with all necessary information for planning both the door-to-door journey with sustainable transport modes and the sustainable on-site mobility, it is of utmost importance to add information about AMSs to the existing ISs.

AMSs can be classified according to:

- availability (e.g. whether the service can be used by the general public or by certain groups of people such as customers, guests, card owners, etc.);

- schedule (e.g. whether the service has a fixed time table, runs at fixed time intervals or "always");
- type of service (e.g. whether the customer will be transported or gets a self-drive vehicle to hire).

AMSs, which operate on a fixed timetable or at fixed time intervals, can normally be easily integrated into existing MIS from a technical point of view (see section "Enhancement of Journey Planners"). However, there might be organisational barriers and problems that hinder integration of such systems into existing public transport journey planners.

Even though full integration of an AMS into an existing public transport journey planner is not possible, at least basic information for all AMSs should be given: for example, editorial text (see section "Editorial Information") in existing MISs and TISs and "Mobility POIs" added on the maps (see section "Maps"). Editorial text and "Mobility POIs" for AMSs should give clear information about the position of the pick-up points (e.g. rental stations, pickup/set down point of shuttle bus, etc.), type of AMSs offered, operation time and time intervals, user group restrictions (if any), phone number or website where the service can be ordered and additional information obtained, route or area, etc.

Editorial Information

Editorial information is a very simple but effective tool providing simple texts or graphical information regarding any kind of transport. Thus, when detailed timetables and/or route information for mobility services are not available, a good solution is to give at least some useful editorial information describing the available service and the conditions for using it, as well as providing a phone number, email-address or link to a website where more information can be obtained. In addition, text-based information is also helpful for the user when graphical information (such as schematic route maps for AMSs or instructional pictures) is included.

Since editorial information is usually hosted locally and not linked to any external information source, special care should be taken to ensure that the information given is correct and always up-to-date. Therefore, before providing editorial information, it is of utmost importance to establish contact with the provider/operator of the related mobility service and specify how this information can be kept up-to-date.

Maps

In order to be able to assess the feasibility of on-site mobility without a car, tourists need an overview of the mobility services offered in a region. To this end, most people would prefer a visualisation of the mobility services offered in relation to the POIs they plan to visit in the region.

Maps are a powerful way of providing such additional geographical information to the user. For the information systems, several types of existing map services such as community map services (e.g. Open Street Map), free map services (e.g. Google maps) and commercial map services (e.g. here maps, TeleAtlas) can be used; the specific license issues should be taken into account already at the planning stage. For example, existing community map services such as Open Street Map may be used to give POIs information. However, it should be kept in mind that such a community map is not a suitable tool for "storing" information since it can be changed by any community member at any time. Therefore, it is essential to record all the data and information so that they can be restored whenever this might be necessary.

POIs adaption

Points of interest are valuable, important or otherwise interesting places such as sights, restaurants, hotels, police stations, hospitals, museums, public buildings and authorities.

Both tourist and mobility services deal with POIs: tourist websites offer information about POIs while mobility services use POIs as the start or destination of a trip. When a tourist uses both systems, (s)he could be confused if a POI exists in one system, but not in the other or if the POI has different names (e.g. a hotel has changed its name and only one system has been updated accordingly). To avoid such a problem, AlpInfoNet recommends adapting the POIs in the TISs and MISs. This can be done manually by comparing the POI-lists of all systems involved, unifying the names and coordinates and complementing missing POIs. A better alternative is to define a leading system for each category of POIs and to share this part of the POI-list between the leading system and all the other systems.

Internationalisation

All the information is offered at least in the local language and in English since tourists make up one of the main target groups for the SMI. In fact, any additional language improves the usability of the IS for tourists unable to speak the local language. However, special care needs to be taken, using "simple language", especially in the English version, since it is often used by non-native English speakers.

A special focus should be put on names (e.g. names of cities, POIs) and local characters when providing information to the user. It is recommended to use always the local characters (such as ü, ß, á, ô, etc.) as well as names in local language, since this helps the user with orientation on-site. However, when the system handles user's input, it should always accept and understand names in all languages, and the "simple" form of any local characters. For example it should not matter whether the user enters München, Munich, Munchen or Muenchen - the system should recognise all these names as "München".

Start Widget

In order to give to the user good and comprehensive information on a tourist website about a destination like a hotel or another point of interest, it would be useful to offer:

- one or more journey planners covering the destination;
- information about AMSs;
- some more editorial information;
- maps.

To help the administrator of the tourist websites present all this information, AlpInfoNet has developed the so called "start widget". It can be included in any website and combines some of the aforementioned tools in just one easy tool. The "start widget" provides Smart Links to appropriate Journey planners. In order to determine which Journey planner fits best, the "start widget" offers buttons where the user has to choose her/his start region. A second variant of the "start widget" asks for postcode or city.

The "start widget" also includes Editorial Text offering information about AMSs, explaining how to get to the next station and describing further offers at the destination such as transfer to station or airport, or bike rental.

A German and English version of the "start widget" can be downloaded from the AlpInfoNet Server (www.alpinfonet.eu). It contains a simple configuration file in which the webmaster of the destination website adds the address or the coordinates of the destination and can set up the widget's colours. This colour adaptation enables the widget to be harmoniously integrated into the design of the destination website. The existing documentation on how to use the widget facilitates the integration of the "start widget" into any website.

The AlpInfoNet Toolbox with a detailed description of the technical solutions can be downloaded from the AlpInfoNet website (www.alpinfonet.eu).

Use of the tools in the pilot regions. A short overview

This overview shows the work done within the AlpInfoNet project in the pilot regions using the tools described and provides a picture of the present situation in the regions, also including activities carried out in parallel to AlpInfoNet.

The different ways AlpInfoNet has been implemented in the pilot regions reflect the different framework conditions of these regions. Annex 1 provides more detailed information about the technical solutions implemented in the pilot regions.

Lake Constance

German side

Analysing the mobility information offered to users in the German pilot region showed that there is a strong need to improve how public transport is promoted on websites of tourist service providers.

A comprehensive analysis of mobility information of 208 hotel websites revealed that the promotion of public transport on such websites can be significantly improved: 67% of the examined hotel websites did not refer to public transport options at all and about 90% did not offer any last mile information. Furthermore, of the total of 122 websites that do provide modal-specific travel information, motorised individual transport is very much favoured: 44% of the websites only refer to the private car, 89% mention the private car in the first place and only about 10% of these websites mainly list trains and buses as eco-friendly travel options before private cars and planes. In view of these findings, one of the main tools implemented in the German pilot regions is the AlpInfoNet "start widget" (Figure 4) which helps tourist operators provide information about sustainable mobility options.

Consequently, a "start widget", encompassing all relevant transport modes both for travelling to and within the region, was developed for the pilot region Lake Constance (and Lake Chiemsee). The "start widget" is a web tool that forwards the users to the most suitable national or international MISs and presents regional and service-

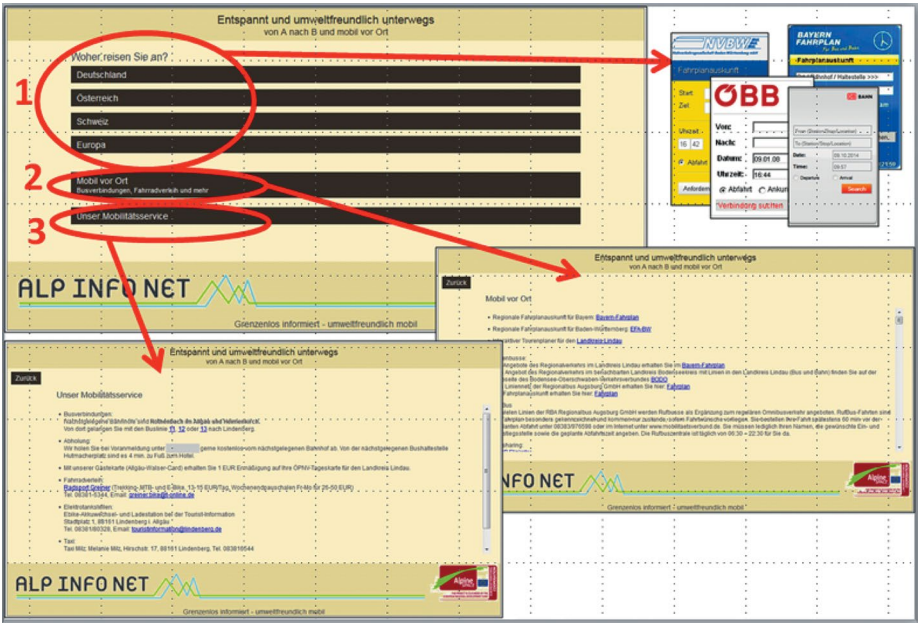


Figure 4 – Start widget in the Lake Constance pilot region - German side.

provider-specific mobility offers; it allows webmasters to conveniently include mobility information in existing websites.

The "start widget" also links to the Austrian and Swiss mobility system around Lake Constance.

At regional level, the "start widget" shares and displays specific regional mobility options that are maintained in a single database or, very simply, in a web page hosted by a regional stakeholder (e.g. district authorities, regional tourism authority).

At individual (tourism) service provider level, webmasters can easily modify the AlpInfoNet "start widget" to give information about local transport services (e.g. pick-up services, rental options, by adding local-specific descriptions). Furthermore, the AlpInfoNet "start widget" can easily be adapted to the corporate design requirements of the service providers.

The technical data files are available on the AlpInfoNet website at: http://www.alpinfonet.eu/download/Pages/Practical_Implementation.aspx. A German language guideline and a summary of the pilot activities are available for downloading, offering help to tourism service providers to improve the sustainable mobility information on their websites.

Austrian side

In Vorarlberg widgets are used to connect the TIS and the MIS. As regards the TIS – related, for instance, to the website of a hotel – the customer can find a widget with prefilled destination. In order to get information about travelling to this destination, the customer has only to fill in the starting point and another window (from the MIS) shows the route to the hotel.

For providing cross-border routes, journey planners are connected. For the time being, this connection is implemented by an exchange of raw-data, such as between Bavaria and Austria. In the future it will be ensured by using an interface like EU-Spirit. Thanks to this technology, the state of Vorarlberg aims to increase the accuracy and the quality of the MISs. In fact, journey planners that are connected but still separate provide several benefits since the separate systems can be updated more often, they can include real time information and each system operator strives to provide good maps without the map license costs.

The enhancement of the timetables to include tourist services – such as a hiking bus – is made via the timetable management software.

Exchange of POIs between the TIS (hotels, etc.) and the MIS (transport stops) is done by a web-service called Web Feature Service or "WFS". Due to this exchange of POIs, a customer can see information about the hotels in the MIS and can also set these

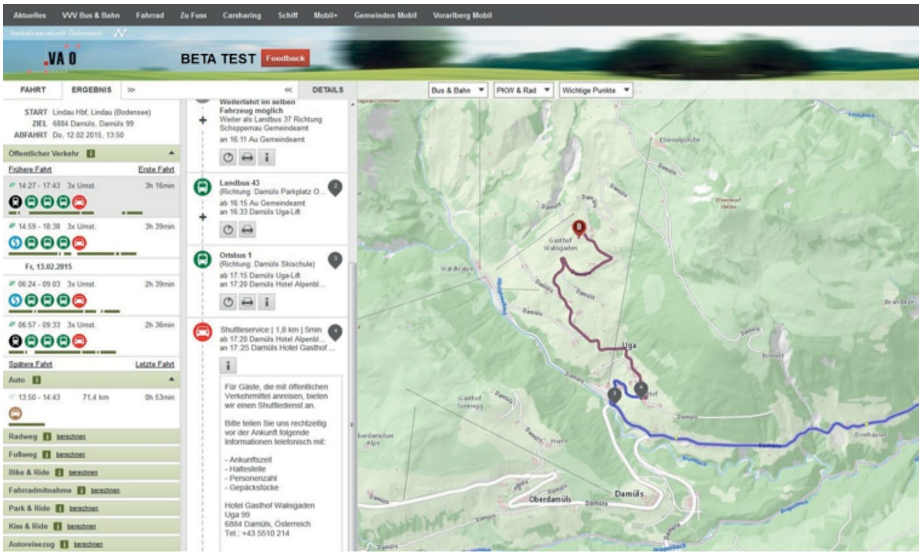


Figure 5 – Example of last mile information in the Lake Constance pilot region - Austrian side. Source: http://fahrplan.vmobil.at/

POIs as start or destination points for routing requests. In addition, last mile information is integrated into the MIS: the TIS is enhanced, so that hotel owners (who operate an AMS) are able to add information about their last mile offers. This information will be exchanged with the MIS thanks to an interface. The MIS processes this information for providing a multimodal routing, a chain of different transport modes from the departure point to the hotel. For example, in the screenshot shown in Figure 5, the last part of the route (marked in red) is an on-demand shuttle-service provided by the hotel to bring customers from the nearest bus stop to the hotel.

Lake Chiemsee

The solution and implementation in the pilot region Lake Chiemsee focuses on three pillars:

- Free and editable worldwide map – OpenStreetMap. Within the project it was agreed that the OpenStreetMap, with all its regional know-how, is integrated in the Bavarian MIS BayernFahrplan as the basis for the map. In this way the user gets all information from the tourism sector (in the OpenStreetMap) and the timetable data.
- Regional Know-How as the best source for tourism data and on-site information. Updated data about POIs, restaurants, hotels and sights will be integrated in the MIS BayernFahrplan (system DEFAS) on a regular basis twice a year. So all POIs etc. can be shown and routed on the map inclusive of the last mile and footpath (Figure 6).
- Connection of MIS and TIS – The AlpInfoNet "widget". The majority of the websites of hotels, guesthouses and apartments only give information on travelling by car (e.g. a link to Google maps) or no information at all about how to get to the hotel. Furthermore, it would also be necessary to provide the guests with on-site mobility information and last mile offers (e.g. hotel shuttles, taxis, rental cars, etc.). To this end, the AlpInfoNet "start widget" was developed; it can be integrated free of charge and with a minimum of (programming) effort into websites of hotels, guesthouses, restaurants, public buildings, associations and further interested companies/clubs who want to provide travel information and tourist information.

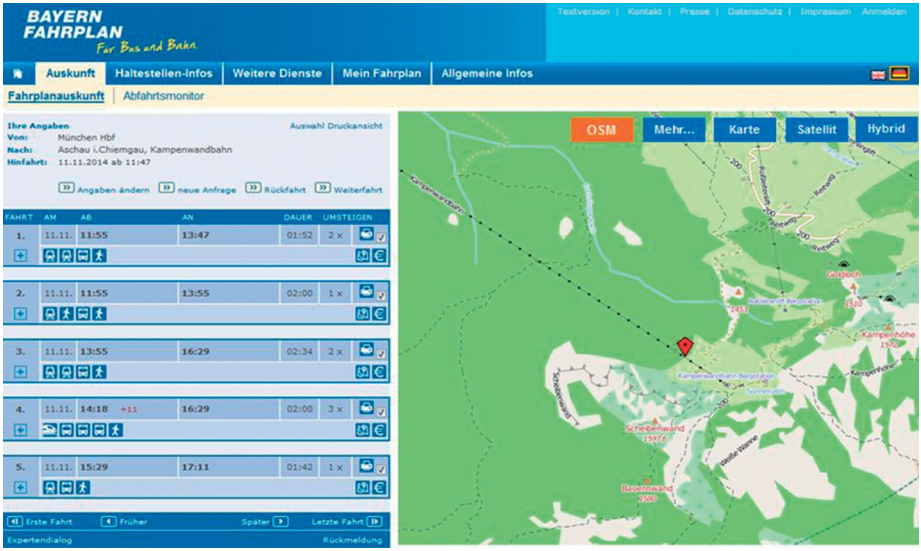


Figure 6 – Integrated OSM map in the MIS BayernFahrplan

The widget is a tool that links to the best journey planner for the guest's departure point (Figure 7); for example, if the guest's origin address is in Bavaria, the AlpInfoNet "start widget" placed on the website of a Bavarian hotel would link to the MIS BayernFahrplan (www.bayern-fahrplan.de); if the guest arrives from outside of Bavaria, the "start widget" links to the MIS Deutsche Bahn (German Railway Association / www.bahn.de).

The "start widget" is available on the AlpInfoNet website for downloading in German and English.

Figure 7 – Example of "start widget" in the Lake Chiemsee pilot region.
Source: http://www.lkzprien.de/de/main/anfahrt_2.htm

East Tyrol

In the pilot region East Tyrol, the timetable and route information for AMS is digitally collected and included in the MIS of the Verkehrsverbund Tirol (VVT).

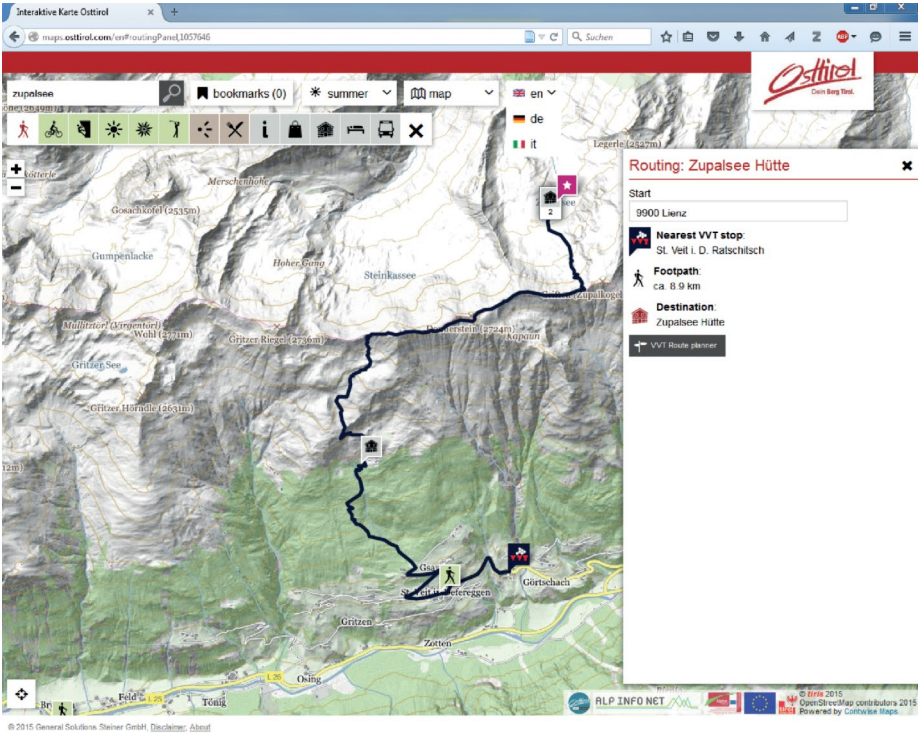


Figure 8 – Tourism POIs (e.g. mountain huts, hiking tours) and mobility POIs (public transport stops) integrated in the interactive tourism map of East Tyrol.
Source: http://maps.osttirol.com

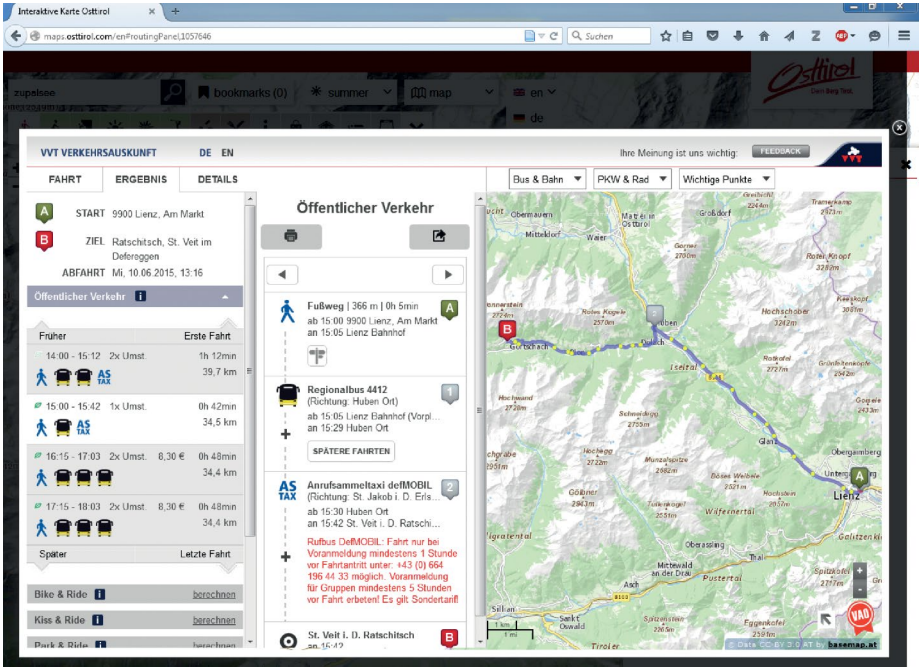


Figure 9 – Interactive map allowing the user to get routing information to/from any POI. Source: http://maps.osttirol.com

Since the end of November 2014, the MIS of the VVT has been connected with the VAO "Verkehrsauskunft Österreich" (a MIS providing information about public transport throughout Austria). The timetable information given in the VVT travel planner is provided by the VAO.

AMS and public transport stops will be integrated into the interactive Software Contwise Maps, visualised on tirisMaps – the geographical information system of the Austrian Province of Tyrol – showing all tourism POIs in the region (Figure 8). The AMS stop points are currently being added to the interactive map. The stop-data (data format: shape file) will be updated in Contwise Maps via an import-interface.

The interactive map allows the user to get routing information to/from any POI: by clicking on the "routing" button, an overlay (using the light box technology) displays the VVT journey planner, which offers intermodal routing. Since this overlay is directly displayed on the website, the user can remain in the website rather than being redirected to another website (Figure 9).

Province of Gorizia and Goriška

In the pilot region Province of Gorizia and Goriška a new, transnational journey planner has been developed connecting mobility and tourist information (point of interests) in a user friendly web-based widget (Figure 10).

The solution contains train and bus timetables covering the whole country of Slovenia and the Italian Province of Gorizia and also includes tourist POIs of both regions. The end-user can select to travel from the origin to the destination (point on the map or POI) by available public transport – train or bus (not integrated solution) – on the chosen day of travelling.

The system generates the journey plan as text and on a GIS map (transport map from Open Street Map covering local POI's and transport stations). Moreover, from the train/bus stop to the chosen end destination (POI) the user receives information regarding AMSs (last mile offers) and other POIs nearby.

The system is available in Slovene, Italian and English. The application is only informative and contains mobility and tourism data from official data providers in Slovenia and Italy.

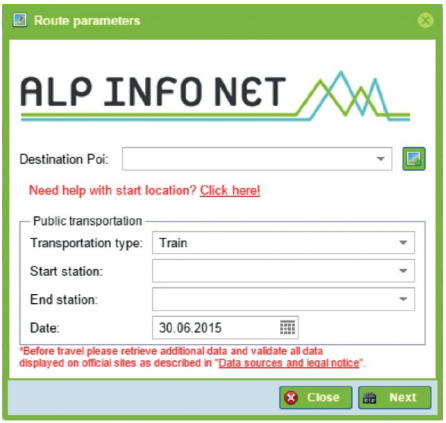
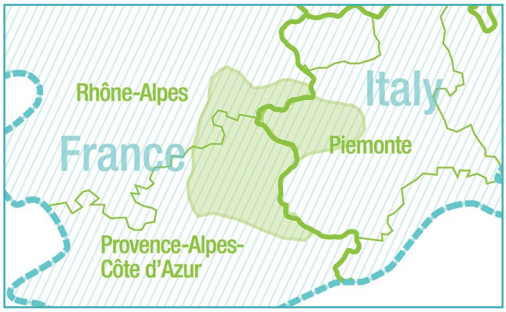


Figure 10 – AlpInfoNet journey planner widget of the Province of Gorizia and Goriška. Source: http://alpinfonet.rra-sp.si/



Piemonte, Provence Alpes Côte d'Azur and Rhône-Alpes

The AlpInfoNet solution in the French-Italian pilot region is based on two websites.

The first website, called "AlpInfoNet sustainable mobility information kit", provides (after having created an account) different types of widgets for tourism operators:

- Widget "info-access": to display any kind of editorial information about sustainable mobility and accessibility (text, image, link, etc.);
- Widget "next departure": provides schedules of the next transport due to arrive at a specific stop point;
- Widget "info-transport repository": linked to the national repository "PASSIM", the widget provides information about transport information services and offers in a specific town, district, region, etc.; the perimeter of the repository was extended to Piemonte during the AlpInfoNet project;
- Widget "map": interactive map combining stop points, associated schedules and POIs.
- Widget "itineraries": this makes routing requests directly from the same map because the widget "map" combines POIs and stop points. The request "calls" the multimodal trans-regional journey planner (second website included in the AlpInfoNet solution of the French-Italian pilot region) and provides a routing solution directly in the widget.
- Furthermore, a "last mile" module, based on an open source GIS, was also produced; it is provided as an additional "information layer" on the "map" and "itineraries" widgets. The aim of this module is to display the AMSs available in a remote area whose perimeter is drawn and visible on the "map" and "itineraries" widgets. When clicking on the zone, all the AMS solutions are displayed in a popup. The user consequently gets all the required information to build her/his door-to-door travel using just one tool in a single web window.

All these widgets are easy to customise (colour, title, shape, etc.) and easy to integrate in a third-party tourism website by a simple "cut-and-paste" of the automatically generated html code (WYSIWYG = What You See Is What You Get).

Video tutorials are also provided to help the user step by step.

The second website hosts the demonstrator of the multimodal trans-regional journey planner (Figures 11 and 12). Currently, the journey planner provides routing solutions only on the French side of the pilot region. Cross-border solutions will be available as soon as the web services of the new Piemonte MIS are available.

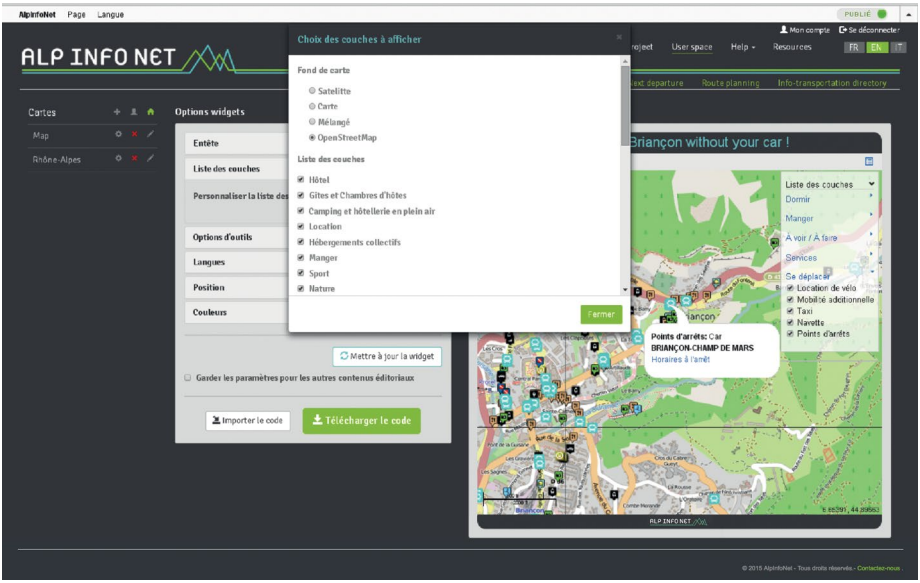


Figure 11 – AlpInfoNet sustainable mobility information kit. Shaping a personalised "map" widget from the AlpInfoNet platform for tourism operators.
Source: http://www.alpinfonet.org/alpinfonet/fr/

The most innovative characteristic of this cross-border multimodal journey planner refers to its technical conception, based on a distributed system architecture. The data are not centralised; the meta-engine sends requests to the interconnected systems and then a "switcher" organises and builds different routing solutions. Such solutions depend on the information sent by the MISs and take into account some travel criteria (date and time of departure, transports modes).

Due to this distributed journey planner, routing solutions are available from and to any address in the pilot region and also from the stop points of the main French cities (Paris, Lyon, Lille, etc.) which are integrated in the databases of the interconnected MISs.

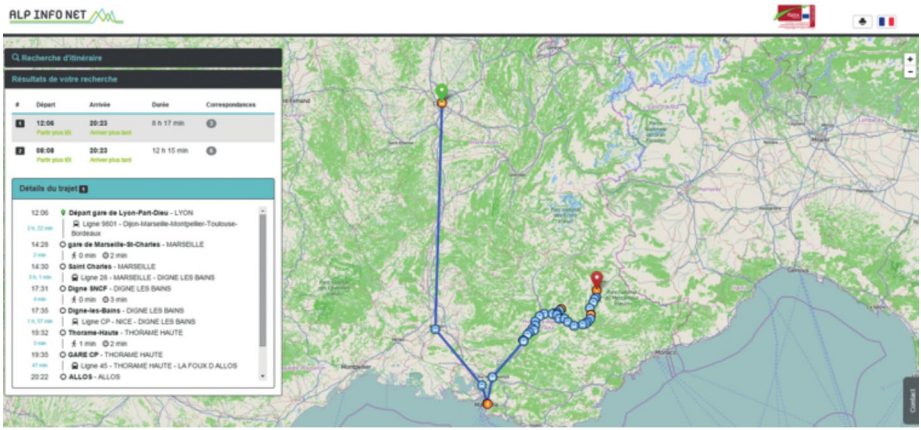


Figure 12 – Multimodal trans-regional routing solutions from the AlpInfoNet journey planner (demo version).
Source: http://mobi.alpinfonet.org/#/home

On the Italian side of the pilot region, the Piemonte Region implemented a software procedure for converting the public transport timetable data of regional buses from a proprietary format into the GTFS format. The publication of these data by Piemonte Region in the regional Open Data Portal (www.dati.piemonte.it) will encourage both re-use by third parties and data integration with cross-border areas (Italy-France).

In addition, tourism data already published in the regional Open Data Portal (museums, architectural heritage and accommodation structures) have been enhanced by adding new information and multi-language descriptions and converting the data from csv to xml format.

SECURING COOPERATION AND DATA EXCHANGE IN A TRANSNATIONAL PERSPECTIVE

A set of legislative and policy aspects need to be addressed to establish a sustainable mobility information network (SMIN). This is essential in order to understand commercial and market conditions and their influence on stakeholders' willingness to cooperate. These legal and policy aspects - together with identifying suitable technical solutions - constitute the key conditions to ensure the interoperability of MISs and TISs in the AlpInfoNet cross-border pilot regions, in accordance with the project's integrated approach.

A first challenge is to **identify the existing relevant legislative frameworks and policy schemes** regulating commercial conditions concerning MIS and TIS data. These legislative and policy frameworks mainly include:

- policies and laws directly referring to adoption of ISs in public transport at EU level as well as in project partners' countries and regions;
- policies and laws directly referring to adoption of ISs in a context related to the management of the tourist destination or to the POIs in the project partners' countries and regions;
- policies and laws directly referring to adoption of TISs and MISs or referring to any improvement in ISs that can enhance the transport and tourism experience.

There are a number of aspects facilitating or hindering potential cooperation in MIS and TIS data management at transnational level.

A first element favouring cooperation is to set up standardised procedures and solutions able to overcome any barriers perceived by the various groups of stakeholders – the public and private actors in the sectors of transport and tourism – making them unwilling to cooperate. These procedures and standards must include firm agreements about legal and financial requirements to set up a long-term feasible business model for transnational cooperation in data exchange.

A second important element helping good cooperation is the EU Directive 2010/40 on the "ITS - Intelligent Transport System", which deals with the opportunities deriving from improvements to the interoperability of transport information services.

Alongside the evolution of the EU Open Data policies, a growing number of EU legislative frameworks, policy initiatives and guidelines aim at providing real guidance to Member States for promoting the development of cooperation in intelligent information and data exchange. However, difficulties may occur owing to the very uneven implementing of EU Directive 2013/37 on the re-use of public sector information (PSI Directive). This is common even in the Alpine Space where various solutions have been adopted by Member States to comply with EU law. Germany and Italy, for

instance, have adopted specific PSI re-use measures, while Austria and Slovenia have implemented a combination of new measures, specifically addressing PSI data re-use and adaptation of previous legislation. France has confirmed its existing legislation to include the PSI Directive's requirements.

Thus, **in order to work out suitable models for cooperation in a cross-border context as regards MIS and TIS data exchange, the AlpInfoNet experience shows that comparative, context-appropriate solutions must be developed**. These solutions need to respond to the different features and combinations of the following categories of limitations that can be found in each specific transnational context:

- *governance-related limitations:* the lack of coordination between stakeholders is certainly the most critical factor highlighted so far (both at cross-border and public/private level), as it is fairly widespread in all the Member States;
- *technical limitations:* the consequence of a lack of coordination and insufficient dialogue among the stakeholders can also be seen at a technical level. Different EU standardised data formats are being used, making interfaces or interchanges with other networks more complicated;
- *commercial and legislative limitations:* a very close relationship exists between commercial and legislative aspects. The differences in the agreements and licenses in place for implementing SMINs, even within the same Member State, call for the need to define clear procedures for both private and public data ownership and use.

The AlpInfoNet experience shows that the proposed solutions need to be addressed also at cross-border level. Based on such an approach, the stakeholders must be provided with harmonised procedures and standards to ensure that data exchange takes into account the context-specific legislative, political, commercial and market conditions.

Defining procedures and standards for cooperation on data exchange at a transnational level: lessons learned from the AlpInfoNet Pilot Regions

The project analysed procedures and standards in the Pilot Regions, addressing all present conditions of data exchange used for developing the AlpInfoNet solution or used in the frame of existing MIS and TIS.

The Project then identified a **set of contractual terms and recommended schemes for cooperation. This portfolio of solutions is a valuable legacy left to the stakeholders by all partners, to help them to establish perennial and efficient interaction for transport and tourism data exchange**.

In general, tourist information is mainly managed by public organisations. Private operators are usually data-providers, mainly of specific tourism and transport supply and/or regional products. The project activities in the **pilot regions** have shown that, despite the diverse nature of MIS market stakeholders, there are some **common points for defining an agreement**:

- the principle of **free data sharing** is viewed as the pre-condition for the creation of a valuable and steady MIS market;
- the preferred way of sharing data is to **use existing systems**;
- the organisations considered as most "legitimised" to ensure the integration of the data exchange between bodies are the public tourism offices. The integration made by a private operator is not accepted.

Furthermore, the **stakeholders outlined some important conditions**:

- **sensitive data** about the internal organisation of the service **should not be shared**;
- a **direct and visible reference to the source of the data** should be present in all the services developed using such data.

Narrowing the territorial focus to the transnational pilot regions, important elements emerged, as summarised below.

Piemonte, Provence-Alpes-Côte d'Azur and Rhône-Alpes (Italy, France)

- The partners worked to properly integrate the local transport supply information in the MIS. However, the availability of last mile and AMS information has not been contractually established. Informal arrangements based on a shared "win-win" motivation ensure the progressive integration of such data in AlpInfoNet outputs, but without a guarantee of long-lasting efficacy. Different hypotheses for a more efficient process are being discussed in collaboration with different local and regional stakeholders.
- A specific contractual agreement (convention) has been signed between the Provence-Alpes-Côte-d'Azur Region (which is responsible for the realisation, hosting and maintenance of the AlpInfoNet outputs) and the Departmental Councils of Savoie and Isère to make the transport data included in their MISs "MobiSavoie" and "Itinisère" accessible for the AlpInfoNet cross-border journey planner and the "sustainable mobility information kit". The agreement lasts until July 2016 and is tacitly renewed each year. The geographical perimeter of the agreement may be extended to Piemonte and to the whole Rhône-Alpes Region if their reciprocal forthcoming regional MISs (new Pronto TPL, Centrale Où'RA) are connected to the pilot region outputs.
- The Public authorities (Departmental Councils of Savoie and Isère, PACA Region) in charge of the MISs got the authorisation from their data providers (local transport

authorities and transports operators) to re-use the data which, however, remains their property. This task mostly consisted of:

- updating the existing conventions or
- taking a decision in the steering committee.

Lake Constance (Austria, Germany)

- Since tourism data are not publicly available, the signature of a contract with the tourism organisations (Lindau Tourismus und Kongress GmbH and Allgäu GmbH) will be necessary, in order to use data about the tourism POIs in the regional MIS.
- All the contractual agreements for data exchange from the Austrian side of the pilot region are already settled.

Lake Chiemsee (Austria, Germany)

- To get access to information regarding private transport supply (last mile) and SMI data from local transport operators (AMS) for being re-used in existing MIS (DEFAS FGI BAYERN), mostly informal arrangements took place, without a guarantee of long-lasting efficacy.
- Since tourism data are not publicly available, the signature of a contract between the tourism associations and the Bayerische Eisenbahngesellschaft (BEG) was necessary, in order to integrate the tourism POIs in the regional MIS (DEFAS system).

Province of Gorizia and Goriška (Italy, Slovenia)

- In Italy, the transport service provider provided raw data thanks to informal arrangements. An informal agreement between the Municipality and the Tourism Board (Agency) has been required (to upload POIs on the OSM platform for re-use in the SMIN).
- LMO information was collected and uploaded manually to the system, with no need to require authorisation from any service provider since this is publicly available and usable information.
- In Slovenia, the partners got access to the web-service of Slovenian Railways (in GFTS format) while e-mail agreements were made for the bus transport supply and the POIs.

East Tyrol (Austria)

The procedure in East Tyrol is quite similar to that in Vorarlberg. The regional tourism association and the state wide Tyrol Tourism are financed by public funding and by visitors' taxes and the Verkehrsverbund Tirol (VVT) by public funding and revenues from fares. Thus, the model in Tyrol connects already existing systems through their

respective interfaces, which implies an ideal utilization of existing infrastructure and resources:

- Transport: VVT is the co-ordinating point for all issues concerning fares, timetables and infrastructure in Tyrol's short-distance public transport system. The connection to public transport is ensured by using the Verkehrsauskunft Österreich (VAO). AMSs with a timetable have already been integrated in the system and further technical measures are being developed;
- Tourism: Tyrol tourism operates a geo-database which locates information of relevance to tourism in the form of points and lines based on TIRIS maps (geographical information system of the State of Tyrol). The data of the regional tourism association are integrated in this common data pool. The interactive map shows routes and activities/objects - hiking, biking or Nordic walking trails, ski lifts, hotels, tourist attractions or mountain shelters: all routes and activities/objects are located in the map and can be routed. The cooperation partners provide tourism-relevant content free of charge and ensure that the data are updated regularly.

The **contractual issue** is often overlooked, but it **remains crucial** for the sustainability of the development and for the system's implementation. Therefore, to ensure the sustainability of the AlpInfoNet products, it is recommended that the interested parties for data access or the exchange process **make formal agreements**. To ease this process, a set of contractual terms and recommendations on how to cooperate has been developed. Any agreement, whatever its form, should cover the following aspects:

- definition of the **parties**: name, organization, governance, stakeholders' roles, objectives, rights and duties;
- definition of the **functional responsibilities** (updating processes, data quality checking, etc.);
- definition of the **technical activities** (access data and rules, service level agreement, etc.);
- definition of the **financial responsibilities** between the parties and about the financial terms;
- definition of the **legal responsibilities** (liabilities carried by the parties, ownership of the data, the databases and the derived products, personal data protection clauses);
- definition of the exchanged **content**;
- definition of the **access**, conditions of **re-use** and **dissemination** of the data, databases and derived products;

- definition of the **editorial rules** (impartial and non-discriminatory presentation of the information, compulsory referencing to the data provider, no anticipatory restrictions of scope for the re-use, etc.);
- definition of the **evolution characteristics** of the agreement (duration, revision process, termination, etc.).

The **licence provided by the European Commission** in "D8 – FINAL REPORT – Study regarding guaranteed access to traffic and travel data and free provision of universal traffic information" fits both the regional and transnational needs for data exchange arrangements, and can easily be adapted, therefore representing an interesting and affordable model.

Ensuring the feasibility of long-term cooperation: recommendations for a business model

Another fundamental aim of the project was to provide a long-term (perennial) business model to deal with the provision of information on sustainable mobility in the Alpine Space.

Data owners involved in the AlpInfoNet project differed significantly depending on their characteristics (private and public) and their nationality. This meant that the project had to produce a list of alternative or comparable solutions, deriving from several different approaches to the willingness to cooperate and the method chosen for cooperation.

While the project was in progress it became clear that there is no single, standardised and preferred business model. As a consequence, a flexible and adaptable model is proposed, supporting operators and public institutions to adopt the technical solution and implement the most adequate agreement for the long-term.

The development of a business model must be considered as a dynamic process. Its logic must be tested, adjusted and fine-tuned in each region as the applications progressively enter the market and once the market structure is well understood.

THE SHOW MUST GO ON. FUTURE PROSPECTS

The SMIN for the Alpine Space had the ambitious goal of providing travellers and tourists with comprehensive information about sustainable means of transport beyond regional and national borders. This has been tested by connecting already existing ISs in transport and tourism in order to facilitate access to the Alpine Space and to local mobility in the pilot regions of the Alpine project.

The successful implementation of the SMIN in the Lake Constance Region (Germany: Bavaria and Baden-Württemberg; Austria: Vorarlberg), East Tyrol, Province of Gorizia and Goriška (Italy and Slovenia), Piemonte, Provence Alpes Cote d'Azur, Rhone-Alpes (Italy and France) and Lake Chiemsee (Germany and Austria) gives a clear demonstration of how a SMIN could work.

Despite legal, economic and technical challenges for implementing such a network, the five pilot regions developed and implemented transnational solutions and paved the way to a cross-border information network.

One of the lessons learned is that it is essential to have an agreement on mutual use of data in the tourism and transport sectors – data on POIs, on sights, on hotels and gastronomy, on bike and hiking routes, on (real time) timetable data, on stops and stations, on transport-on-demand, etc. – as well as an agreement on the interfaces to implement such data in the SMIN.

Thus, the emerging question is what is to follow in the future. The project has tried to answer this question by proposing two possible solutions to maintain and support the AlpInfoNet results: the implementation of a metadata server and/or the creation of an AlpInfoNet association.

Implementation of an AlpInfoNet metadata server as an interface between tourism and transport

The idea behind the AlpInfoNet metadata server is that all information about existing mobility and tourist information systems in the Alps are linked together in a virtual place, the AlpInfoNet metadata server. The server could provide a web interface for the uniform and structured collecting of all useful information to produce a really integrated SMIN. In this way all the transport and tourism operators, as well as the data providers, could make their data accessible for being integrated.

The local and regional data collected and hosted have to be updated at local and regional level because the input data continue to belong to their respective owners and the reliability, the quality and the timelines of the data are under the local and regional responsibility.

The follow up would extend the data sharing and integration outside the Alpine Space to make AlpInfoNet a Europe-wide tool, since tourists going to the Alps come from a wide range of countries (also from outside Europe).

Founding an AlpInfoNet association

To ensure the implementation and evolution of AlpInfoNet, the relevant stakeholders of the Alpine Space could establish an association. Such an association could be successively opened to other stakeholders or representatives outside of the Alpine Area. In order to achieve clear (political) support and commitment, the AlpInfoNet association should be linked to political institutions at different levels in the countries concerned as well as with the Alpine Convention and the EU.

The AlpInfoNet association would be responsible for financing the limited work necessary for the AlpInfoNet metadata server and for extending it to other regions and states, firstly in the Alpine Space and then in the rest of Europe.

LIST OF ABBREVIATIONS

AMS Additional Mobility Service(s)
Mobility services that do not have a timetable, such as Shuttle buses, demand-oriented transport, rental bikes, rental cars, cable cars, rack railroad etc.

ASP Alpine Space Programme (www.alpine-space.eu)

BEG Bavarian Railway Association

DB Deutsche Bahn (German Railways)

EU European Union

IS Information Systems

MIS Mobility Information System(s)

POI Points of Interest(s)

PSI Public Sector Information

SMI Sustainable Mobility Information

SMIS Sustainable Mobility Information System

SMIN Sustainable Mobility Information Network

TIS Tourist Information System(s)

VAO Verkehrsauskunft Österreich (Mobility information Austria)

VVT Verkehrsverbund Tirol (Transport association Tyrol)

ANNEX 1: USE OF THE TOOLS IN THE PILOT REGIONS

A short overview

In this Annex, a short overview is given on the present situation in the regions, including also the activities carried out in parallel to AlpInfoNet.

Lake Constance (Germany/Austria)

AlpInfoNet Tools	DE	AT	How this tool is used in the pilot region
Smart links	✓	✓	Germany: There are smart links established on various websites of service providers and public administrations (such as district governments, municipalities).
Journey planner widgets	✓	✓	Germany: Journey planner widgets (such as Deutsche Bahn) are rarely integrated in the websites of service providers.
XML-interface/Web service		✓	Austria: Exchange of POIs between the TIS (hotels, etc.) and the MIS (stopping points). This is done via a web-service called Web Feature Service or "WFS".
Connection of two journey planners		✓	Austria: Journey Planners are connected to provide cross-border routes. Today this is done by exchanging raw-data, as between Bavaria and Austria. In the future it will be done through an interface like EU-Spirit.
Timetable completion		✓	Austria: Timetables are enhanced with tourism services such as buses for hikers. This is done by feeding it into the timetable management software. Germany: The exchange of data will also be implemented on the German side so that data for Austria will be used in the Bavarian DEFAS system.
Enhancement of journey planners		✓	
Additional mobility services/Last Mile	✓		Germany: info on AMSs, such as bike rentals and e-cars, has been collected and documented. The AMSs of the pilot region are visualized for customers through the "start widget". Individual AMSs can be offered by service providers via their mobility offer, after implementing the start widget. Austria: Last mile information is added to the MIS. The TIS is enhanced to enable hotel owners (which operate the AMSs) to insert information about their last mile offers. This information will be exchanged with the MIS via an interface so that the MIS can provide a chain of different transport modes from tourist home to the hotel.

AlpInfoNet Tools	DE	AT	How this tool is used in the pilot region
Editorial information	✓		Germany: Editorial information is individually provided by service providers. A systematic implementation is offered in the "start widget" for the pilot region Lake Constance (see below).
Maps	✓	✓	Germany: Some maps have already been implemented, for example via the outdoor active platform of ALPSTEIN Tourismus GmbH & Co. KG. The maps also provide the location of POIs. Additional access to the portal and its maps is provided through the "start widget", developed for the pilot region.
POIs adaption	✓	✓	Germany: The geographic information of AMS has been collected within the pilot region and is offered for use in the official MIS DEFAS of the Bavarian Railway Association (BEG). Furthermore, collecting and amending POIs from the tourism association Allgäu/Bayerisch-Schwaben e.V. has begun.
Internationalisation		✓	Germany: Multi-language offers are rare because, in the German pilot region, tourists mainly come from the Federal States Baden-Württemberg and Nordrhein-Westfalen: about 90% of arrivals come from within Germany, while international tourism only plays a minor role.
Start widget	✓	✓	Germany: A "start widget" for a joint link to the relevant MISs in the German pilot region has been developed. The implementation of the "start widget" has been presented to the regional representatives. The "start widget" still has to be implemented in the websites of service providers in the region. Austria: On accessing the TIS (e.g. homepage of the hotel) the customer finds a widget with the destination already inserted. He has only to fill in his starting point and then go to a new window (of the MIS) showing the route to the hotel.

Lake Chiemsee

AlpInfoNet Tools		How this tool is used in the pilot region
Smart links	✓	See description below
Journey planner widgets	✓	See description below
XML-interface/Web service		
Connection of two journey planners		
Timetable completion		
Enhancement of journey planners	✓	The regional tourism associations have the best know-how and overview in the regions with always up-to-date tourist data about POIs, restaurants, hotels and sights. These data are integrated in the MIS BayernFahrplan (system DEFAS) on a regular basis twice a year.
Additional mobility services/Last Mile	✓	The hotel can describe its mobility services and offers in a text box in the widget ("Mobil vor Ort"). A template text is provided in the widget for the hotel to adjust to its own requirements. Information given in the text box refers to hotel shuttles, taxi companies, sights, walking distance to the next bus stops and train station, own bike rentals, link to all POIs available on the website of the tourism associations, etc. A single source gives the user all information on how to reach the destination including the last mile by sustainable transport and how to get around at the destination.
Editorial information	✓	See field "Additional mobility services/Last Mile"
Maps	✓	The tourism associations, hotels, transport providers and a lot of individuals are working on OpenStreetMap every day to integrate data like POIs, public buildings, paths, bike routes, roads, tracks, hotels, restaurants, rental stations, letter boxes, parks, etc. Within the project it was agreed that the OpenStreetMap is integrated in the Bavarian MIS BayernFahrplan as a basic map. In this way the user gets all information from the tourism sector (in the Open Street Map) and the timetable data in one system.
POIs adaption	✓	See field "Enhancement of journey planners"
Internationalisation		
Start widget	✓	See description in the chapter

East Tyrol

AlpInfoNet Tools		How this tool is used in the pilot region
Smart links	✓	Hotels will link from their websites to http://maps.osttirol.com
Journey planner widgets		
XML-interface/ Webservice	✓	Multimodal Routing Information from VVT is displayed in an overlay (using "lightbox" technology) on the interactive map at http://maps.osttirol.com
Connection of two journey planners	✓	Since September 2014 the MIS of VVT ("Verkehrsverbund Tirol") is connected with the MIS VAO ("Verkehrsauskunft Österreich")
Timetable completion	✓	While connecting the MIS of VVT with the MIS VAO, any data missing from the public transport information were completed.
Enhancement of journey planners	✓	AMS information will be integrated into the MIS of VVT.
Additional mobility services/Last Mile	✓	AMS information will be integrated into the MIS of VVT.
Editorial information	✓	The "routing information" for the POIs names the next public transport stop as well as giving the walking distance to this stop.
Maps	✓	AMS and public transport stops will be integrated into the interactive Software Contwise Maps, visualised on tirisMaps (geographical information system of the Austrian Province of Tyrol), showing all tourism POIs in the region. The AMS stopping points are currently being added to the interactive map. The data on stopping points (data format: shapefile) will be periodically updated in Contwise Maps via an import-interface.
POIs adaption	✓	The TVB Osttirol will complete and adapt the POI information included in TVB's tourism database. This information is then fed into the geographical database of "Tirolwerbung" (Tourism Association of Tyrol) that collects the information from all regions within the Austrian Province of Tyrol.
Internationalisation	✓	The information on http://maps.osttirol.com is available in German, English and Italian
Start widget		

Province of Gorizia and Goriška

AlpInfoNet Tools		How this tool is used in the pilot region
Smart links	✓	Simple integration by smart widget configuration and embedded to end user websites by cut-and-pasting HTML code (included in iframe)
Journey planner widgets	✓	Users can create a journey planner.
XML-interface/ Webservice		Only smart links by embedded HTML code are provided.
Connection of two journey planners	✓	The Slovenian and Italian timetables are linked at the Gorizia/Nova Gorica entry/exit point. The user is asked to confirm the starting point when changing transport mode, from trains to buses and vice versa.
Timetable completion	✓	Train and Bus timetables from Slovenia and Italy are integrated.
Enhancement of journey planners		Users can browse LMO and other options (tourist POIs)
Additional mobility services/Last Mile	✓	Integrated into the widget for tourist POIs (for Goriška region, by SPIRIT Slovenia; for the province of Gorizia they were extracted from OSM).
Editorial information	✓	
Maps	✓	Base map by OSM, Google, Bing, all layers provided by OGC services (WMS/WFS).
POIs adaption	✓	Integrated from SPIRIT Slovenia and Agenzia Turismo Friuli Venezia Giulia (FGV).
Internationalisation	✓	The languages SI/IT/ENG are enabled.
Start widget	✓	Simple configuration and widget configurator is provided.

Piemonte, Provence-Alpes-Côte-d'Azur and Rhône-Alpes

AlpInfoNet Tools		How this tool is used in the pilot region
Smart links	✓	Smart links are used in different "customisable" widgets provided in the AlpInfoNet platform, such as in the "info-transport directory" widget. A smart link to a specific request about the "origin-destination" in a journey planner can also be easily integrated in an "info-access" widget by the person creating a personal widget.
Journey planner widgets	✓	The AlpInfoNet Sustainable Mobility Information Kit available on a specific web platform provides five different widgets and each of them is customisable (design, colour, localisation, destination, data layers to be displayed, etc.). One of these five widgets is a journey planner widget ("itineraries"). It is directly linked to the URL of a webpage providing trans-regional routings thanks to a distributed architecture system and MetaServer currently connecting three French MISs. The new Piemonte MIS is currently in progress and is planned to be connected. The AlpInfoNet platform also provides, in the library of Journey Planner (JP) widgets, all the elements required for integrating existing JP widgets (the widgets for PACA Mobilité, MobiSavoie and Itinisère) in any website. The elements related to the widget of the new Piemonte JP will also be provided as soon as they are available.
XML-interface/ Webservice	✓	Many interfaces have been realised with the AlpInfoNet kit (widgets and web platform) and between the different connected MISs. For instance, entry (input) interfaces were made between the MISs and the "next departure", "info transport directory" and "itineraries" widgets which use their data. Output web services were built for all widgets for them to be integrated in third-parties websites. By means of a MetaServer, output web services can update information displayed in the widgets and coming from the platform, or going through the platform and coming from interconnected MISs. Input and output web services have consequently been developed in the pilot region. Other output web services are planned, for instance to send data flows to third-party websites or interested TISs.
Connection of two journey planners	✓	Three JPs were connected in the pilot region (distributed architecture system) through a MetaServer. The new Piemonte MIS is planned to be connected as soon as it becomes available (autumn 2015).
Timetable completion	✓	The interconnection of JP implies various modifications and updates to the JP concerned. The tests that are still ongoing to validate the efficiency of the distributed route plans have revealed various failings, errors and problems in the timetable and the MISs connected. Additions were consequently made to the timetable, and some have still to be done.

AlpInfoNet Tools		How this tool is used in the pilot region
Enhancement of journey planners	✓	The interconnection of JP implies various modifications to the JP concerned. The functioning of the MetaServer requires many updates and enhancements, especially on the web services of the MIS, despite most of them being quite new (two years old maximum). It is scheduled to integrate AMS into the existing MIS of the pilot region (see next row).
Additional mobility services/Last Mile	✓	AMS information is provided through the "info-access" and "info transport directory" widgets. The first is for creating your own "info access" widget and inserting all the information related to AMS and last mile offers. As regards the second, when the AMS and last mile info becomes available for a location (e.g. Briançon), they will be integrated with the PASSIM database and displayed in the "info-transport directory" widget created for that location (e.g. Briançon). A specific last mile add-on was created on a specific open source GIS conceived and realised by one of our external IT providers. This Last Mile add-on allows remote areas mostly served by last mile offers to be defined/drawn and described. A web service was created to link this add-on and, consequently, the "last mile zones" to the "maps" and "itineraries" widgets available on the platform. In the end, a single map provides: tourism info (POI) and mobility info (stopping point + last mile info + routing or next departure time from stopping points).
Editorial information	✓	The "info-access" widget provides editorial information on all relevant and required issues, topics, offers, etc., aimed at fostering sustainable mobility and accessibility of any location which benefits from such widgets.
Maps	✓	The "maps" and "itineraries" widgets are based on interactive and dynamic maps (various background maps available: Google, OSM, satellite, mix) combining POIs and stopping points. Routing requests can be sent directly from the map.
POIs adaption	✓	Many sources of POIs, from France and Italy (Piemonte), are used for the AlpInfoNet sustainable mobility information kit and for the demonstrator of a trans-regional JP. All these POIs were consequently adapted and standardised in order to be correctly displayed in the various tools. For instance, in Piemonte, tourism data already published in the regional Open data portal (museums, architectural heritage and accommodation structures) have been enhanced by adding new information and multi-language descriptions and converting the data format from csv to xml. A global and standardised POI categorising of all the MIS and TIS concerned in the pilot region was not possible owing to the great diversity of the ISs and the very large size of the pilot region (too many POIs involved). But, at least in France, this work can begin by interlinking the two regional TIS (RA and PACA), ready to share their data (input and output) with the existing TIS.

AlpInfoNet Tools		How this tool is used in the pilot region
Internationalisation	✓	The AlpInfoNet kit is provided in French, English and Italian. The kit integrates Italian POIs and Stopping Points (gtfs format). The demonstrator of a trans-regional JP is available in French and English.
Start widget		No start widget, but there is a KIT and mobi-alpinfonet.org

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