MONITRAF WP 10

Final report on Common Measures

INFRAS with inputs of MONITRAF partners WP 10

(Lead institution: Zentralschweizer Umweltschutzdirektoren - Konferenz ZUDK)

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Alpine Space

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Introduction and background

As sensitive areas, the Alpine transit regions suffer from the increasing traffic volumes and their environmental impacts. Especially, transalpine road freight traffic on the road leads to critical noise and air pollution levels and derogates the living conditions for the local population as well as nature and landscape (MONITRAF 2007; Alpine Convention 2007, ALPNAP 2007). Under the current situation, the legally defined limit values for NO_2 and PM10 cannot be met which leads to a significant imbalance between environmental burdens and reduction of quality of life for alpine regions (see figure i).

EXCEEDANCE OF LIMIT VALUES FOR NO2 AND PM10 AT THE MONITRAF CORRIDORS

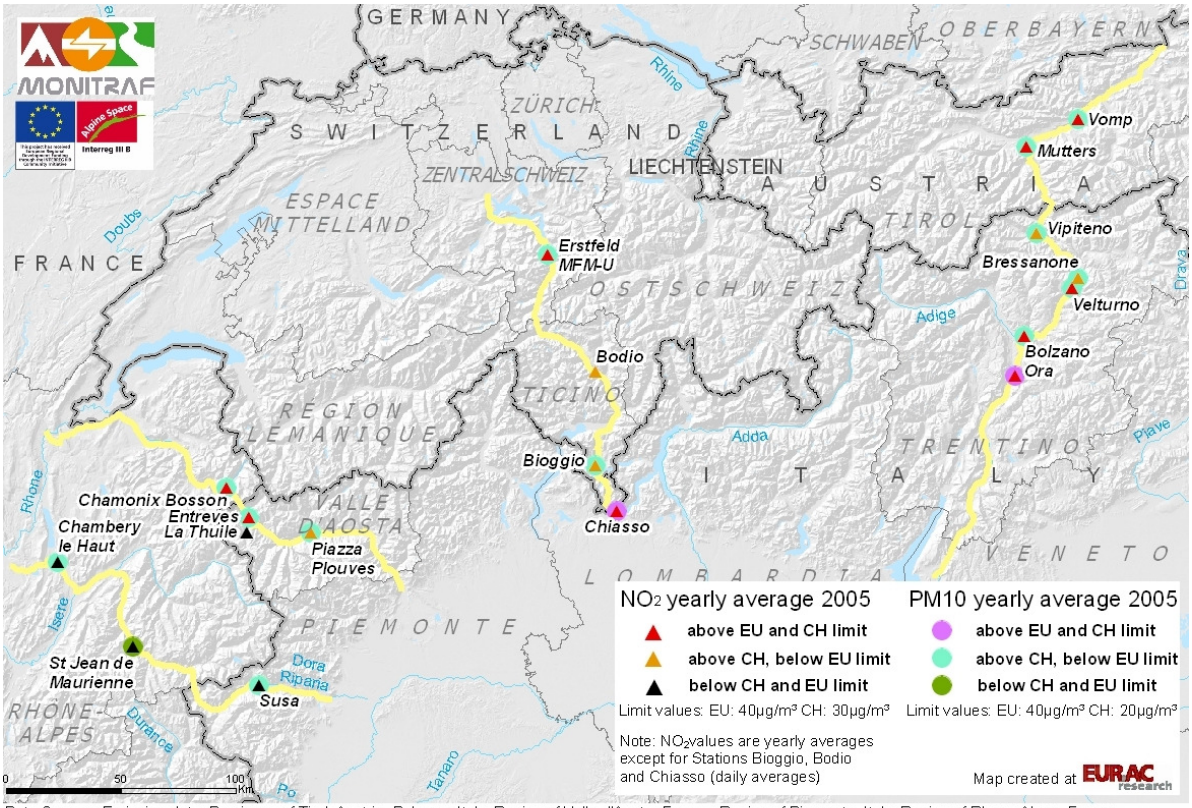

Figure i *Exceedance of limit values for NO_2 and PM10 at the MONITRAF corridors. Source: MONITRAF, WP 8.*

Although technological development will help to reduce specific vehicle emissions, the negative impacts from Alpine freight traffic will further increase if growth trends of the last years (see figure i) will be continued as forecasted for the countries of the Alpine bow (ARE 2004a, European Commission 2006a). If furthermore the safety problems within tunnels are considered, these burdens for the population, the environment and the transport users are clearly not in line with the aims of sustainable development.

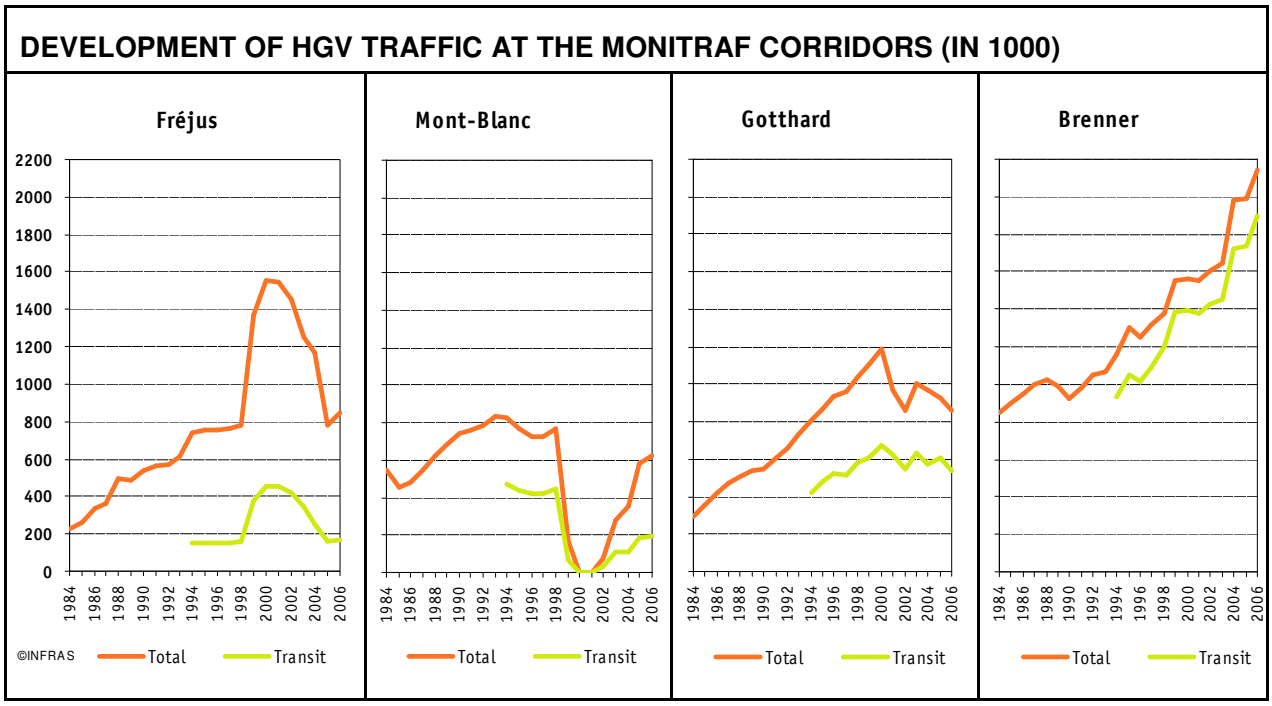

Figure ii: *Source: BAV Alpinfo 1985-2006. Transit traffic is defined as in the CAFT surveys and Alpinfo as traffic which is crossing the country of the corridor/which has its origin and destination outside of the country. For Fréjus and Mont Blanc, the transit share is based on French CAFT data, for Gotthard on Swiss and for the Brenner on Austrian CAFT data.*

The Alpine area as sensitive region

The specific topographical and meteorological conditions in the Alpine area lead to higher external costs than in "insensitive", flat areas. Due to complex topography, emissions of air pollutants are higher than in flat areas. Noise exposition is increased through inversions, amphitheatre effect and reflections. Also, the risk of accidents of passenger cars is higher due to longer braking distance on steep roads and the fatal effects of accidents in tunnels.

In sensitive regions, the environmental pressures are not only higher than in insensitive regions, also the meteorological and topographic conditions result in the fact that the same level of pressures induces higher damages than in insensitive regions. Scientific studies have shown that external costs in sensitive regions are 2 to 5 times higher than in flat areas (Lieb et al. 2006). These differences in external costs are up to now however inadequately considered in road charges and the discussion on other market-based instruments like an Alpine Crossing Exchange have only started. In order to consider the higher external costs in sensitive regions in future market-based instruments, also a specific definition and delimitation of sensitive regions would be necessary.

Many activities but insufficient improvements – the need for a common approach

Transalpine transport policy is an important issue at regional, national as well as European level. In line with the White Paper on transport policy of the European Commission of 2001, all Alpine Countries follow the main strategy to shift traffic from road to rail and the building of new rail infrastructure and have implemented a great number of different measures for steering transalpine traffic towards a sustainable solution. On national level, Switzerland has introduced the most stringent transport policy with a legally binding modal shift aim, the building of new base tunnels and the distance-related heavy vehicle fee (LSVA). The Austrian strategy is dominated by regulatory measures which are mostly implemented on the regional level. An important part are the construction of the Brenner base tunnel and its access routes which shall support the shift from road to rail. The policy approach in Italy and France focuses on the provision of new rail infrastructure (new base tunnels) with accompanying regulating measures while fiscal instruments play a less important role.

All these existing initiatives are however not sufficient to achieve a sustainable improvement of living and environmental conditions along the transit corridors from the viewpoint of the Alpine regions. There is a risk that the planned rail infrastructure projects will not lead to a sufficient shift from road to rail if it they are not accompanied by an effective set of additional measures.

MONITRAF is not supposed to question and harmonise the overall approach of Alpine policies but wants to develop recommendations on specific common approaches which enable a better co-ordination between the regions and an effective reduction of environmental pressures. Therefore MONITRAF ideas are based on existing experiences on Best Practice measures in all Alpine countries as well as the framework set by European legislation. Looking at the ongoing politcal processes and its "windows of opportunities" at national and European level, it becomes clear that MONITRAF brings its recommendations at a crucial point of time to set the course for an improved transalpine transport policy.

Four main directions for common measures of MONITRAF

Based on the existing political framework, MONITRAF partners have developed four directions of common measures which can be seen as a comprehensive strategy for reducing transalpine freight traffic and its impacts These four main directions supplement each other and will only become effective if implemented altogether.

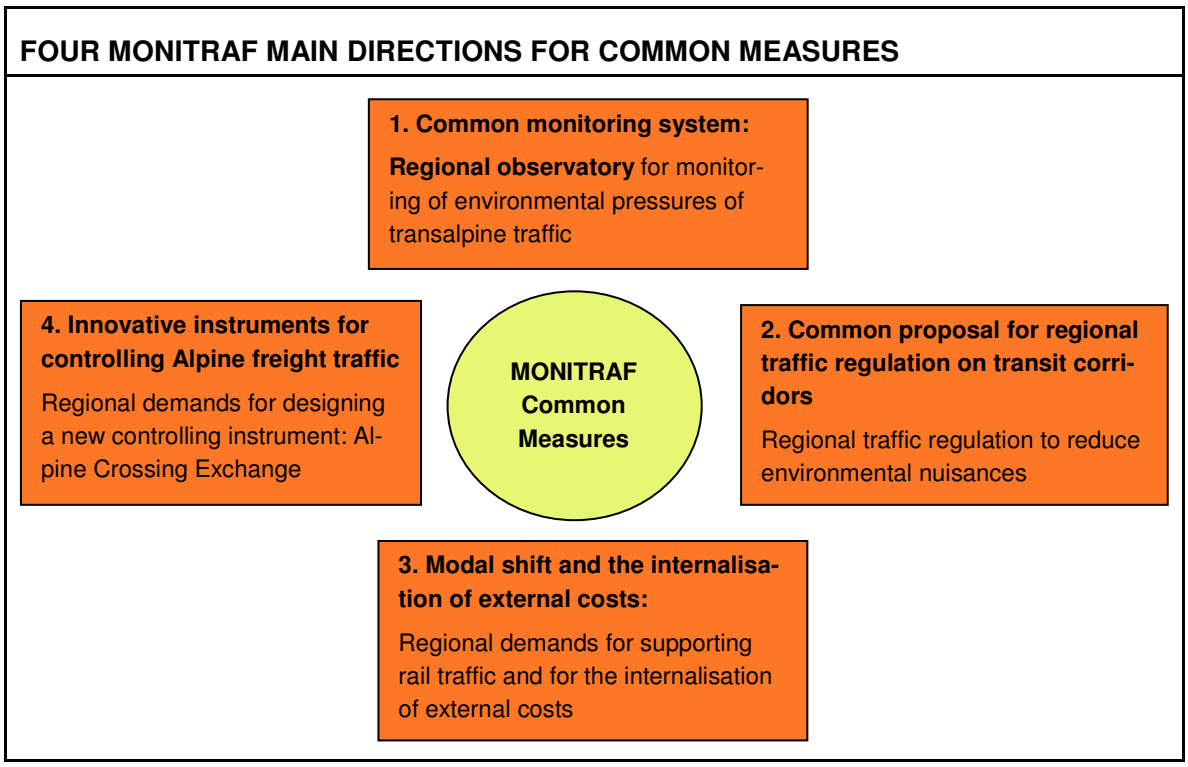

Figure iii

The focus of the main directions is a considerable reduction of transit traffic and its environmental impacts (environmental dimension). Important additional aims are improved accessibility, an economic contribution to the development of the regions in transit corridors (economic and social dimension) as well as a fair distribution of impacts of transit traffic between the Alpine corridors and countries (political dimension). The MONITRAF measures also give the possibility for developing a common voice of Alpine regions with a common approach for implementing superordinate and comprehensive measures for reducing Alpine transit traffic.

Main direction 1: Common monitoring system

The common monitoring system builds the basis for all other measures as it delivers the necessary information. A high-quality, validated and politically accepted data basis on the development of traffic in the Alpine regions (road/rail), its quality (congestion on road, delays on rail) and its impacts (air pollution, noise, accidents) is a crucial starting point for the identification of political objectives and corresponding measures.

Up to now, the different Alpine countries have conducted data with partly different methodologies. Thus, the comparison of data is not possible for all indicators. MONITRAF has collected the relevant data with the help of MONITRAF partners and provided comparable data for all Alpine corridors. This gives valuable information and has shown the necessity to institutionalise a common monitoring system.

According to the results of MONITRAF, a continuous monitoring system should build on the following objectives:

- The MONITRAF monitoring system should mainly aim at comparing **environmental pressures/burdens** from Alpine traffic. Data on concentration levels and emissions needs to be periodically presented in a comparable and representative way in order to allow an optimum design of common measures.
- The monitoring system should further allow an **evaluation of the effectiveness of common measures**. This requires both a continuous monitoring of the environmental situation (time-series) as well as an exchange on implementation, enforcement and success of the Best Practices with regard to other aims.
- With respect to regional measures, the monitoring system should be the basis to **trigger off intervention measures** when threshold values (e.g. critical concentration levels) are exceeded. This requires a close link of the monitoring system to the relevant authorities and an on-line availability of data.
- In the medium term, the monitoring system should collect data for the complete list of indicators that were defined within the MONITRAF project – including **socio-economic indicators** to present the interaction between sustainable development and traffic volumes.

Main direction 2: Common proposal for traffic regulation on transit corridors

Most MONITRAF regions have introduced regulating measures for HGV road transport which aim at reducing air pollution and noise and at improving security. Existing Best Practice approaches include temporal driving bans with Sunday, weekend and night bans as well as different types of safety measures. Also, high-emission vehicles have been banned by some regions and Austria is still discussing the implementation of a sectoral driviing ban with the EU. The MONiTRAF region Tyrol also makes use of speed limits to reduce wintersmog.In addition, dosing systems have been implemented to improve security in the tunnels.

An analysis of existing approaches and a comparison of its impacts has shown that a carefully designed set of these measures can lead to an improvement of air quality and security.

- **Night and Sunday driving bans** as well as a **ban of high-emission vehicles** should be implemented as general and permanent measures. The ban of high-emissions vehicles leads to a reduction of NO_2 concentrations and soot emissions. Night driving bans can also improve air quality and are crucially for an improvement of noise exposure during resting hours. For the ban of high-emission vehicles, a dynamic adjustment needs to be implemented to ensure that the impact of this measure does not get lost.
- A set of **intervention measures** which are implemented at times of high concentrations/pollution peaks can supplement the permanent measures. Intervention measures could include a flexible use of speed limits as well as an extension of the ban of high-emission vehicles.
- **"Dosing systems", speed limits as well as a ban of dangerous good transports** should be enforced to strengthen the security of tunnels and Alpine passages.

Main direction 3: Modal shift and the internalisation of external costs

Currently, the Alpine Countries have different tolls/charges for HGV. Switzerland has introduced a distance-related heavy vehicle fee in 2001 which sets a financial incentive for shifting from road to rail. The other MONITRAF regions are bound to the framework of the Eurovignette Directive for implementing tolls or charges. Currently, Austria, France and Italy charge motorway tolls as well as specific tolls for the tunnels or Alpine Passages. However, the charges differ considerably with very high tunnel tolls at the French/Italian tunnels and lower tolls at the Brenner motorway. As the Eurovignette Directive does currently not allow the integration of external costs into HGV charges or tolls, existing charges do only represent infrastructure costs.

The current system of tollls/charges has two major drawbacks. The first is the **missing inclusion of external costs in road charges** which leads to a distortion of prices between road and rail. With the upcoming revision of the Eurovignette Directive, this problem can be resolved and MONITRAF calls for a harmonised surcharge on HGV tolls for higher emissions, noise and accidents in sensitive Alpine regions. The second problem which is still unresolved is the **difference (level and structure) in tolls on the Alpine corridors** which leads to an inefficient use of road infrastructure and to diverted traffic and longer distances. A harmonised approach of HGV charging would clearly be preferable and is recommended by the MONITRAF project. A harmonised approach of HGV charging would clearly be preferable and is recommended by the MONITRAF project. The ongoing process to implement these external costs into the EU Eurovignette should lead to increased tolls at least to a comparable level of existing international agreements (e.g the Overland Transport Agreement between Switzerland an the EU). "

However, measures focusing on the road part alone are not sufficient. On the other side, the attractiveness of rail needs to be improved in order to achieve a shift from road to rail. This includes the building of new infrastructure (especially new base tunnels in Switzerland, at the Brenner and Mont Cenis) and financial support to combined traffic to set additional incentives for a modal shift. The experience in Switzerland has shown that a well-designed subsidy scheme for rail transport can effectively support modal shift policy.

Main direction 4: Innovative instruments for controlling Alpine freight traffic

The development of transalpine freight traffic over the last years has made clear that regulations or moderate increases of charges or tolls alone are not sufficient to reduce the volume of HGV freight traffic on the road and its environmental impacts. Thus, it needs to be discussed if an innovative instrument is necessary which can limit the overall amount of HGV traffic in the Alps.

With the ecopoint system, Austria had already introduced a measure pointing into this direction. After the system had to be stopped due to pressure from the EU, the idea has been further developed into a cap-and-trade solution which has been presented under the name "**Alpine Crossing Exchange**" by the Alpine Initiative and taken up by both Austrian and Swiss politicians. In Switzerland, the Alpine Crossing Exchange has officially been taken up in the Swiss modal shift policy and two comprehensive studies have been conducted.

The idea of an Alpine Crossing Exchange has also been taken up on international level and the process of the 'Suivi de Zurich' has commissioned a international feasibility study. MONITRAF has send a proposal with MONITRAF inputs for the description of work to be considered for the Suivi de Zurich study, also stating the wish to support the further discussion on the European level and to bring in the regional perspectives. From a MONITRAF point of view, the international introduction of an Alpine Crossing Exchange is supposed to have a positive cost-benefit balance if negative impacts on the regional economies are prevented through specific regulations for short-distance traffic.

Implementation of common measures and suggestions for further steps

For an effective implementation of MONITRAF common measures, it needs to be ensured that the existing MONITRAF platform is further developed to serve as exchange platform for the regions. An effective as well as efficient set of measures will have to be adjusted over time according to monitoring results and new developments on regional, national and European level. MONITRAF currently acts as a common voice for the most affected Alpine regions; this should be institutionalised in a sustainable manner.

The recommendations on common measures have been transported to politicians and European institutions via the common voice of MONITRAF regions. The main proposals of the common measures are summarised in a political resolution which has been signed by official representatives from all MONITRAF regions at the final MONITRAF conference in Innsbruck in January 2008. This political resolution includes recommendations on the main directions of common measures as presented in this report and a specific proposal for the continuation of MONITRAF activities in a second phase with a focus on institutionalising the common monitoring system. As up to now common efforts to tackle the growing pressures from freight traffic were limited, the signing of the common resolution can be seen as a crucial milestone within Alpine freight traffic policy and lays the basis for a future cooperation between the Alpine regions.

1 INTRODUCTION AND AIM

High and increasing pressures in transit regions

As sensitive regions, the Alpine transit regions suffer from the increasing traffic volumes and their environmental impacts. Especially, transit freight traffic on the road leads to noise and air pollution above tolerable threshold values and derogates the living conditions for the local population as well as nature and landscape (MONITRAF 2007; Alpine Convention 2007, ALPNAP 2007). Due to the specific characteristics of Alpine regions (sensitivity of natural resources, narrow valleys with inversions and slopes, meteorological conditions), these pressures are especially damaging. This leads to a significant imbalance of environmental burdens and reduction of quality of life and economic benefits for Alpine regions. The burdens for the population and the environment outweigh the economic benefits by far. Furthermore, they reduce the attractiveness to tourists and prevent a sustainable development.

Traffic forecasts for both freight and passenger traffic show that the pressures will grow in the future even if specific vehicle emissions will be reduced due to new technologies. Traffic volumes will develop with a further expansion of the common European market and social cohesion between EU Member States (ARE 2004a, European Commission 2006a). For example, the economic development in the Mediterranean countries (especially Spain and Portugal) has led to an increase in traffic volumes at Ventimiglia which connects the French-Italian Mediterranean coast.

MONITRAF REGIONS

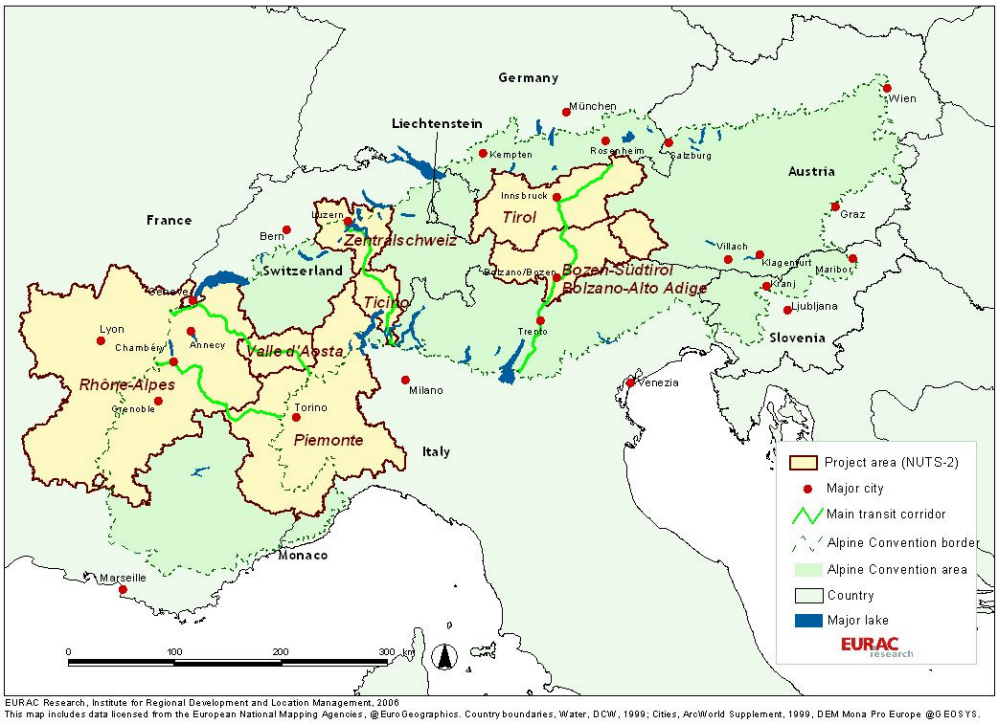

Figure 1:*From the different regions along the Alpine crossings, the regions Tyrol, South Tyrol, Central Switzerland, Ticino, Rhônes-Alpes, Valley d'Aosta and Piemont are MONITRAF partners.*

Finding the balance between economic profit of European regions and an effective protection of the suffering transalpine regions is an ongoing challenge in national and transnational transport policy. Thus transport policy measures to increase environmental efficiency, to divert road traffic to rail or to increase safety have a long tradition in the MONITRAF regions. Nevertheless there is a need to increase common efforts to lead future traffic volumes in a sustainable direction.

Different situations in the Alpine corridors

Due to their geographic situation, the different Alpine corridors which are considered within MONITRAF have faced different developments of traffic volumes in the last years. With regard to the implementation of common measures, it is especially necessary to consider the share of different traffic types for the different corridors and regions. Due to their central geographic situation between North/central Europe and the Mediterranean countries, transit traffic takes an especially high share in Switzerland (Gotthard) and Austria (Brenner).

Figure 2 shows the absolute freight traffic volumes for the year 2006 at the four corridors as well as the share of transit traffic. On the Brenner axis, the absolute traffic volume is considerably higher than at the other corridors with more than 2 Mio. HGV per year. Freight traffic is dominated by transit traffic which makes up 87% of total HGV traffic. At the French/Italian and the Gotthard, total traffic volumes are in a similar range but the share of transit traffic differs considerably. At the Gotthard axis, transit traffic is due for two thirds of total traffic volume. On the corridors between France and Italy, transit traffic takes a less important role.

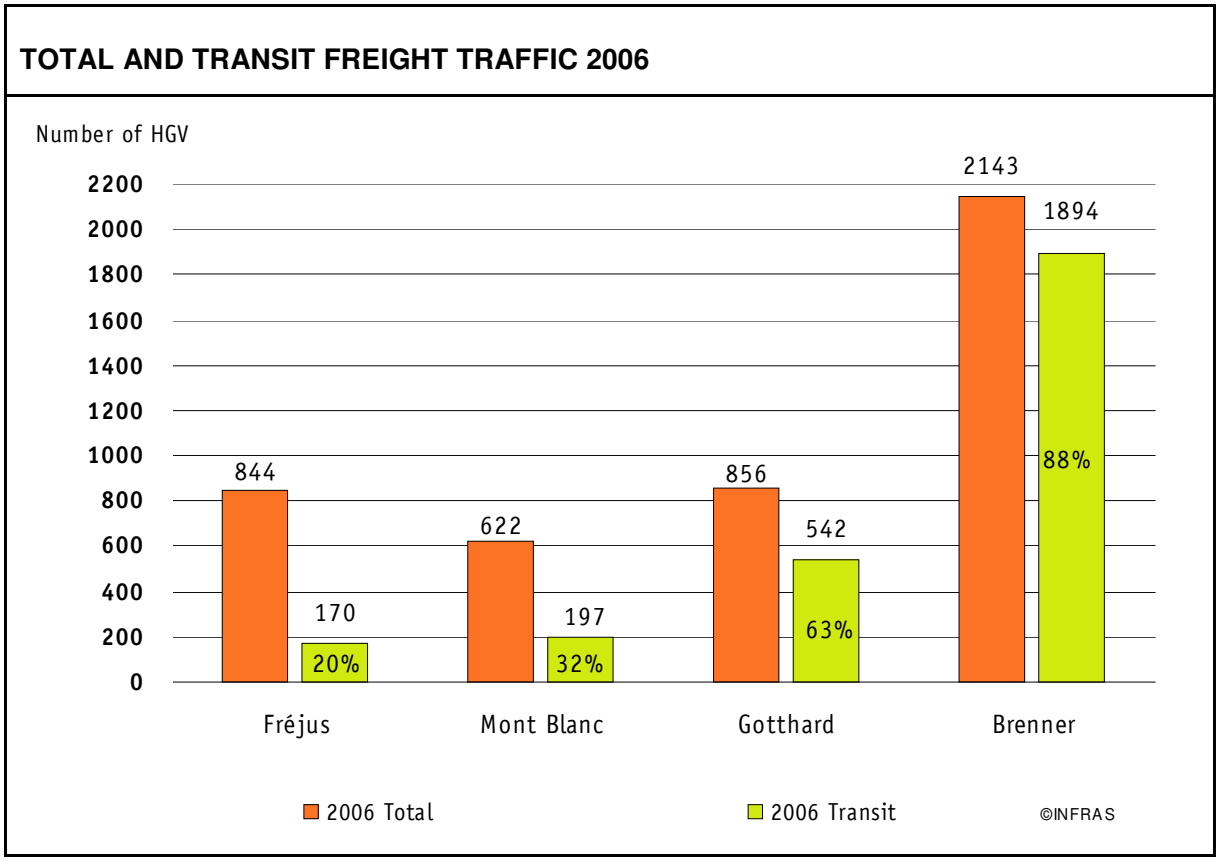

Figure 2: *For the four corridors within the focus of MONITRAF both total HGV traffic and transit traffic are displayed. The percentage of transit traffic is indicated in the green bars of transit traffic. Source: Alpinfo 2006. Transit traffic is defined as in the CAFT surveys and Alpinfo as traffic which is crossing the country of the corridor/which has its origin and destination outside of the country. For Fréjus and Mont Blanc, the transit share is based on French CAFT data, for Gotthard on Swiss and for the Brenner on Austrian CAFT data.*

Also, the increase of traffic volume at the MONITRAF corridors has developed in different ways. Especially the Gotthard and Brenner corridor have seen a large increase of HGV traffic since the 1980s. At the Gotthard axis, the number of HGV has grown from about 300.000 in the mid 1980s to nearly 1.2 Mio. in 2000. Since this peak, the traffic volume could be reduced through a wide-reaching set of measures. At Brenner, traffic volume is increasing continuously and has reached the number of 2 Mio. HGV per year. On the other hand, the traffic volume at the two tunnels between France and Italy has increased during the 1980s but has stabilised in the 1990s with shifts between the two tunnels due to the incident in the Mont Blanc tunnel. The Ventimiglia corridor – which does not belong to the MONITRAF project area and is thus not included in the figures – has however seen an increase of traffic volume in the last ten years. Between 1996 and 2006, the number of HGV passing the Ventimiglia corridor has increased from 812'000 to nearly 1.4 Mio.

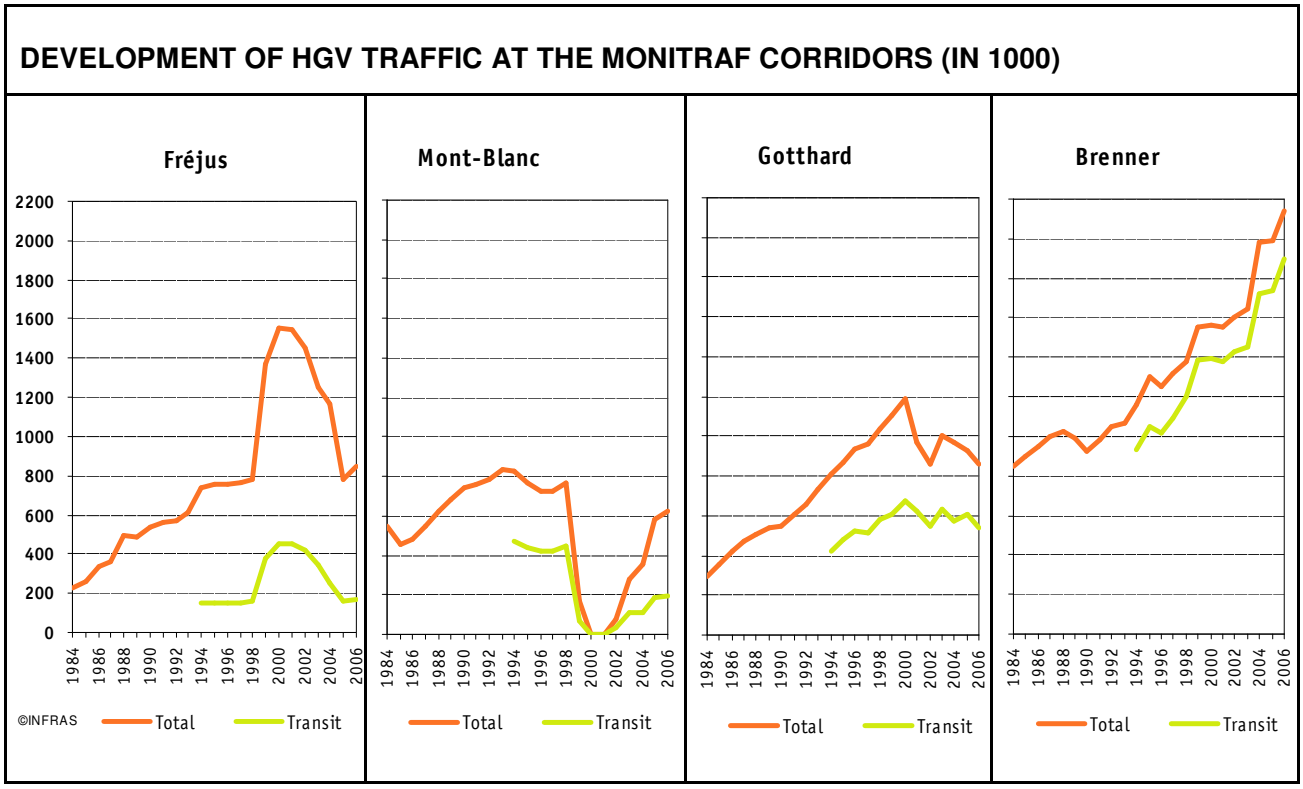

Figure 3: *Source: BAV Alpinfo 1985-2006.*

Many activities but insufficient improvements – the need for a common approach

Alpine transit policy is an important issue on regional, national as well as European level. In all countries, Alpine transit traffic has grown over a long period and includes a great number of different measures for steering the transit traffic towards a sustainable solution. Although the measures are developed on the basis of the same objective, there are considerable differences regarding regional competences, directions of measures and their design. MONITRAF is not supposed to question and harmonise the total approach of Alpine policies but shall much more develop recommendations on specific common approaches which enable a better co-ordination between the regions and an effective reduction of environmental pressures.

Aim of MONITRAF WP 10

The final work package of MONITRAF (WP 10) aims at developing a set of common measures supporting the objectives of MONITRAF with a special focus on assisting a sustainable development in transalpine traffic. With these measures, the MONITRAF regions aim at a more harmonised approach for reducing transalpine freight traf-

fic and its impact. A common approach both strengthens the voice of Alpine regions with regard to higher authorities (especially the European Union) and prevents a shifting of traffic and unwanted distributional effects which come along with unilateral measures. Although passenger traffic can also have a transit character, the share of transit within total passenger traffic is much lower as a lot of traffic is due to commuter and other short-distance traffic (except for holiday times). Also, the distributional effects of passenger traffic are less distinct than for freight traffic, so that WP10 focuses primarily on the development of common measures for freight traffic. Concerning passenger traffic, some important Best Practice measures are depicted in the report but the further development of these measures is left to regional and national authorities.

On a governmental conference in Innsbruck in April 2007, four main directions of measures have been presented by MONITRAF partners and discussed with political representatives from the MONITRAF regions. These main measures are generally addressed to different levels of decision making: some of them are recommendations and calls to higher authorities, for example to the European Union and its member states to improve the instrument mix regarding Alpine transit politics. On the other hand, there are measures which MONITRAF partners can implement within their own responsibility on regional level.

This final report on common measures summarises the findings and presents suggestions for common activities. The following chapter will present existing strategies and measures in the different Alpine countries and MONITRAF regions as well as current discussions on international/EU and national level for further developing Alpine transport policy. Chapter 3 presents an overview of the common MONITRAF measures and illustrates the interaction between measures. The common measures are structured in four main directions which are presented in the following chapters, starting with the common monitoring system as basis for the other measures. The last chapter gives recommendations for the implementation of the common MONITRAF measures, shows further actions within the MONITRAF project and demonstrates the necessity for a prolongation of MONITRAF activities.

2 STATUS QUO AND OVERVIEW ON EXISTING MEASURES

2.1 Overview on strategies and existing policies in the MONITRAF regions

With the growing size of the European Union, transport policy on the European level has focused on meeting two partly conflicting objectives: on the one hand, the creation of a European transport market has been a target to enhance economic and social cohesion between Member States; on the other hand, the need for reaching a sustainable development path and the limitation of the growing freight traffic volume became an important cornerstone. The dilemma between the creation of economic benefits through a further economic integration and its environmental impacts is especially visible in the sensitive Alpine region so that the second target of a sustainable development takes over a more and more important role. Thus, all Alpine countries as well as the European Union have developed strategies for the reduction of Alpine transit traffic which include a range of different measures and instruments. Also, institutions like the Alpine Convention or the Conference of ministers of transport of the Alpine countries (Suivi de Zurich) play an important role for developing common ideas as well as for supporting the design, implementation and coordination process of measures. Regarding the development of common measures, it is especially important to take a look at the existing objectives of Alpine transport policy in the different Alpine countries and to analyse their strategies for meeting these objectives. Due to similar pressures from increasing transalpine freight traffic, all countries basically follow the same objectives. However, different philosophies of policy making can be seen in the strategies to meet these objectives.

On the European level, The White Paper on transport policy of the European Commission of 2001 is based on the main strategy to shift traffic from road to other transport modes in order to develop a sustainable transport system. Regarding the Alps, the White Paper focuses on the importance of new rail infrastructure (base tunnels) as well as ideas on more flexibility of cross-financing from road to rail (European Commission 2001). Although the Commission has weakened the strategic direction of modal split change in its mid term review 2006, the approach is still valid and important for Alpine corridors and sensitive regions.

Concerning cross-financing, the White Paper mentions the Swiss modal shift policy as example. Switzerland has introduced the most stringent transport policy with a legally binding modal shift aim which especially limits the amount of transalpine HGV traffic. This modal shift aim is supported by the building of new base tunnels which are partly cross-financed from the distance-related heavy vehicle fee (LSVA). The fiscal instruments are supported by regulating measures, of which the general night driving is the most important measure with highest impact. These measures for reaching the modal shift target have been acknowledged by the European Union within the "Overland Transport Agreement between Switzerland and the EU". Furthermore, Switzerland has also implemented an effective dosing system at the Gotthard tunnel to improve tunnel safety and launched several studies on future traffic management systems (reservation systems, Alpine Crossing Exchange).

Austria has a similar objective than Switzerland and also focuses on a modal shift from road to rail, considering especially the reduction of environmental nuisances. However, the Austrian strategy is dominated by regulatory measures of which the ecopoint system was the most prominent example. After this broad measure had to be abolished in 2003 due to pressure from the European Union, Austria has implemented the law on air pollution concentration control which transfers the competence for implementing regulating measures to the regional level. An important part of the Austrian strategy regarding transalpine freight traffic is the construction of the Brenner base tunnel with the necessary access routes which shall support the shift from road to rail. In addition to specific legislation on air quality and transport policy, the sustainable development in strategy needs to be taken into account.

The strategic element of shifting freight traffic from road to rail is also prominent in French and Italian Alpine transport policies. The policy approach in these two countries however focuses on the provision of new rail infrastructure (new base tunnels) with accompanying regulating measures. Fiscal instruments play, up to now, a much lower importance. In France, a national strategy for sustainable development has been adopted in 2003 which includes a specific programme for transport aiming at decoupling the impacts of transport from economic growth. In 2007, the new president has launched a consultative process to update the French environment policy ("Grennelle de l'environnement"). Under the climate change section, the final report of this process contains ideas for the transport sectors including new speed limits, higher taxes and new regulations e.g. on the use of biofuels (Tuot 2007). Following the "Grenelle de l'environnement", the French government has also stated that it plans the general introduction of road tolls according to the Eurovignette Directive and a differentiation of road tolls according to EURO classes until the end of 2008. Furthermore, it has published the far-reaching plan to ban transit traffic from the road within the next four years. Transit HGV should until then be banned from French motorways and be shifted to the rail. This objective requires an extension of the rolling motorway.

In Italy, the national strategies are organised as a general transport and logistics plan (PGTL), which was adopted in 2001 and which favours transalpine and intra-alpine mobility. The transport plan is supported by local strategies which are linked to local mobility. In 2007, a new mobility plan has been developed which aims at a better integration of national and international traffic, of different traffic types (road, rail, maritime) as well as of different levels of traffic (local, regional, etc.) (Ministero dei Trasporti 2007).

ELEMENTS OF NATIONAL/EU STRATEGIES (MAIN ASPECTS)				
Aspect	**F** **Rhône-Alpes**	**I** **Brenner and Aosta Vallley**	**CH** **Gotthard**	**A** **Brenner**
National/EU Alpine policy	General policy aims (modal shift, transport security)	General policy aims (modal shift, transport security) Due to geographic situation, no instruments which aim at increasing road transport costs.	Specific policy aims according to the reduction aim for freight traffic in the constitution (Alpine Initiative) and modal shift. Focus on fiscal instruments with accompanying measures.	Specific policy aims (reduction of negative impacts of road transport, modal shift). Tyrol: Focus on regulating measures
Design of street infrastructure	Tunnel (Mont Blanc, Fréjus)	Tunnel to France, no tunnel at Brenner	Tunnels at Gotthard and San Bernardino	No tunnels
Institutional aspects (road)	Tunnels are run by private operators	Motorways are partly run by private companies in which public authorities however hold significant shares. 44% of the motorway net are run by private operators	Tunnels are operated by public authorities.	Motorways are run by private operators (public business)
Condition of rail infrastructure	New rail base tunnel between Lyon and Torino is planned.	New rail base tunnels between Lyon and Torino and at Brenner are planned.	Two rail base tunnels under construction: Lötschberg 2007¨ Gotthard 2017	Rail base tunnel at Brenner is planned.
Fiscal instruments	› Motorway toll and tunnel charges (for HGV differentiated according to environmental criteria) › Implementation of Eurovignette Dir. under way, first trials in 2007.	› Motorway toll for HGV (undifferentiated) › Sticker for passenger vehicles.	› HGV fee (differentiated according to distance, weight and emission standard) › Sticker for passenger cars for motorways.	› Motorway toll for vehicles > 3.5 t (according to Eurovignette-Directive) › Sticker for motorways for PV › Additonal charges for specific stretches of Alpine roads (all vehicles)
Regulating measures for road transport	› Weekend driving bans for HGV › Bans of transport of dangerous goods from tunnels. › Security and traffic regulations, additional accompanying measures (minimum distances, speed limits) for tunnels of Mont Blanc and Fréjus	› Weekend driving ban for HGV › Night driving ban for loud HGV (South Tyrol) › Driving bans for HGV Euro 0+1 in South Tyrol (dynamic adjustment to Euro 2) › Security and traffic regulations, additional accompanying measures (min. distances, speed limits) for tunnels of Mont Blanc and Fréjus › Ban on passing for HGV on A 22	› Night and weekend driving ban for HGVs › Additional accompanying measures (transport and speed controls) › Traffic regulation system at Gotthard tunnel (dosing system)	› Weekend driving ban for HGVs › Night driving ban in lower Inntal and night driving ban for loud HGV at Brenner › Speed limits on Inntal motorway during wintertimes › Driving bans for HGV Euro 0+1 in South Tyrol (dynamic adjustment to Euro 2) › Ecopoint system until 2003
Additional measures rail	› Rolling motorway at Mont Cenis › Subsidies to rolling motorway	› Subsidies to rolling motorway and CT-Terminals › Subsidies to rolling motorway	› Subsidies to CT and rolling motorway › Subsidies to terminals	Subsidies rolling motorway.

Table 1: *PV: Passenger vehicle, CT: Combined transport*

An important aspect of the national policies is also the taxation of mineral oil products, especially the tax levels for diesel which differ considerably between the Alpine countries. While diesel taxes are rather high in Switzerland, the Austrian taxes lie in the lower range compared to other EU countries. The most important strategies and existing measures in the Alpine countries are summarised in this overview chapter and are illustrated in more depth in Annex 1 of this report.

2.2 Regional action plans

Some MONITRAF regions have developed regional action plans which especially aim at improving air quality. In these action plans, transport measures focus on the following aspects:

- Local and regional measures (especially in agglomeration areas) which can be implemented within regional responsibilities (e.g. traffic calming on subordinate routes, support of non-motorised traffic and technical improvements of public transport fleet).
- Measures demanded by regions but implemented on national level (motorways, tunnels). In this respect, competences of regional authorities are different in the Alpine countries with a special situation in Austria. According to the law on immission control, the Austrian regions (Länder) have the competence to implement measures like regional night driving bans (for specific motorway stretches or vehicle types) or speed limits. Tyrol will further expand the night driving ban and plans a further tightening of regulating measures (including a sectoral driving ban).
- Proposals/ideas for comprehensive measures on national or European level which aim at reducing the negative impacts of transit traffic. These are fiscal or regulating measures which mostly focus on road traffic.
- In addition to permanent and general measures, the regional action plans also contain temporary measures which are for example triggered at times of unfavourable weather conditions and which shall reduce smog situations in summer or wintertime. In this respect, the regional action plans have implemented temporary speed limits or temporary bans of high-emissions vehicles.

2.3 Best Practice examples

The following European, national and regional strategies and measures can be seen as Best Practice measures in the field of Alpine transport policy. The most important aspects and ideas which serve as basis for the development of common measures are presented in this chapter (see for details Annex 1).

General traffic

- Noise barriers at motorways (and railways) in all MONITRAF regions

Freight traffic

Most Best Practice measures concerning freight traffic focus on a modal shift from road to rail and a corresponding reduction of negative environmental impacts of freight traffic.

France/Italy:

- Charges for transalpine tunnels: Charges at these tunnels are rather high and cover the full infrastructure costs. Currently, tunnel charges are differentiated for different emission standards and vehicle types.
- Dangerous goods can only be transported in the tunnels under special conditions (pre-registration, escorting) and further bans are planned.
- The "dosing system" in the tunnels of Mont Blanc and Fréjus (150 m intervals between vehicles) which has been implemented for security reasons and a speed limit of 70 km/h virtually limit the total number of possible tunnel crossings.
- Driving bans for semi-trailers with low emission-standards (Euro 0 and 1) in South Tyrol on the Brenner motorway and the Brenner national road, as well as Mont Blanc. Dynamic adjustment to Euro 2.

- In South Tyrol, a noise protection programme has been developed together with rail operators, operators of the A 22 motorway and regional authorities.

Austria:

- Local and regional night driving bans for HGV on the Brenner motorway. An extension to sub-ordinate roads is planned to prevent shifting of traffic. The current exemptions for vehicles with Euro 4 and Euro 5 emission standards will be stopped in November 2008 for HGV with trailer and in November 2009 for all HGV.
- A sectoral driving ban for goods which can be easily transported on rail is planned for November 2007 (however still under discussion with the EU).
- Speed limits on Inntal motorway during wintertimes: In the winter 06/07, the speed limit was implemented as general measure, in winter 07/08 it will be linked to actual air quality.
- Driving bans for semi-trailers (Euro 0 and 1) on the Brenner motorway which will be extended to Euro 2 in 2008.
- Austrian ecopoint system for road freight traffic which has been the first instrument to implement an absolute cap for the emission of air pollutants by freight traffic. Although the instrument had to be stopped in 2003 due to pressure from the EU, experiences with this system are an important input for developing a transalpine cap-and-trade system.

Switzerland

- The Swiss distance-related heavy goods vehicle fee (LSVA) leads to an internalisation of external costs and sets incentives for efficient transport on the total Swiss road network. It is planned to further increase the fee in 2008.
- The night driving ban sets additional incentives in shifting from road to rail transport and guarantees an effective protection from negative impacts of road traffic.
- The Swiss rail policy focuses on a comprehensive support of rail transport with several short- and longterm measures (improvement of infrastructure, support of combined transport, improvement/extension of terminals, etc.).

Passenger traffic

In contrast to freight traffic, innovative measures concerning passenger traffic mostly have a more regional focus. The following approaches seem interesting for the MONITRAF regions:

- Innovative and attractive offers for public passenger transport (e.g. in tourist areas)
- Mobility management system in tourist areas which have already been implemented in some regions (with a close link to improved public transport solutions)
- Traffic information systems for hikers
- Support of bicycle traffic (e.g. extension of bicycle lanes and renting of bicycles)
- Car sharing offers
- Support of "soft mobility" (slow traffic/environmental friendly traffic) in mountain regions.

Other interesting Best Practice examples correspond to an improved accessibility of Alpine regions for tourists and the regulation of leisure/tourist traffic:

- Investments in Andermatt for new tourism projects (or in other regions like Chamonix/Courmayeur, Stubai, Bozen/Dolomiten)
- Advantageous treatment of regional traffic in high tourist seasons (restrictions for transit traffic at such peak times in Austria).

2.4 Strategies of the EU concerning freight traffic and other traffic-relevant policies

The modal shift policy is also supported by the European Union and specific measures have been implemented on the European level. Over the last 15 years or so, the European Community has launched a series of initiatives aimed at revitalising rail freight transport and giving it a more European dimension, concerning both the way in which the sector is organised (rail freight has been gradually opened up to competition, and has been totally opened up to competition since 2007) and the development of technical interoperability as well as the construction of key infrastructures for the continent of Europe through the TEN-T programme. The White Paper on Transport for 2010 already expressed the Commission's desire to promote a European network giving priority to freight (European Commission 2007b).

In 2007, the European Commission has launched a new series of policy initiatives to improve the efficiency and sustainability of freight transport in Europe. These initiatives are in line with the 2006 mid-term review of the transport White Paper and include two main pillars (European Commission 2007):

1) The Freight Logistics Action Plan and the Communication on a freight-oriented rail network for land-based freight traffic.
   - The Freight Logistics Action Plan proposes six main areas of action including the improvement of information and communication technologies (ICT), improvements of quality/performance, simplification of transport chains, the harmonisation of vehicle dimensions and loading standards as well as the development of "green" transport corridors and the urban dimension of freight transport (European Commission 2007d).
   - The Communication on a freight-oriented rail network proposes the creation of a freight-oriented corridor structure to optimise the use of financial resources, to simplify administration and technical procedures at borders and to ensure a better continuity of services. In order to reach this objective, the communication lays down that each Member State will have to participate in at least one transnational corridor structure by 2012. Concerning the improvement of quality, the Commission aims at the development of harmonised quality indicators. For quality improvements, the corridor structures will have to draw up programmes for the elimination of bottle necks. Furthermore, the Commission plans to improve the coordination and to give higher priority to international freight (European Commission 2007e).
2) A communication and working papers on improving maritime freight transport.

The European legislation also includes strategies and policies aiming at other policy fields which however have a clear connection to freight traffic and need to be considered when designing common measures.

- **Safety policies:** Road safety has become an important issue on European scale and an ambitious target to save yearly 25.000 lives on roads by 2010 is included in the Transport White Paper. In 2003, the European Road Safety Action Programme was tabled which contains many specific measures to achieve this goal including measures to improve behaviour and to improve safety of infrastructure and vehicles. The Action Programme also includes ideas on the improvement of tunnel safety which have been further developed in the Tunnel Safety Directive of 2004

  The Tunnel Safety Directive[1] requires that all tunnels longer than 500 meters and belonging to the Trans European Road Network meet minimum safety requirements. More than 500 tunnels in operation, under construction or at the design stage, are concerned by the Directive. Objective of the Directive is to prevent accidents endangering human life, the environment and tunnel installations. Moreover, it aims at improving self-rescue conditions for people involved in serious accidents, like large-scale fires.

  Also, a European Road Safety Observatory has been set up which coordinates all Community activities in the fields of road accident and injury data collection and analysis. It is the forum in the EU for the exchange of information on best practice and, ultimately, organises and manages Community best practice guidelines.
- **Climate and energy:** The European Union is pursuing an ambitious climate change policy. The European Commission has taken many climate-related initiatives since 1991, when it issued the first Community strategy to limit CO_2 emissions and improve energy efficiency. These include: a directive to promote electricity from renewable energy, voluntary commitments by car makers to reduce CO_2 emissions by 25% and a directive on the taxation of energy products. In order to implement the Kyoto Protocol, the Commission

[1] Directive 2004/54/EC of the European Parliament and of the Council of 29 April 2004 on minimum safety requirements for tunnels in the trans-European road network.

has launched the European Climate Change Programme in 2000 which also set the framework for the EU Emissions Trading System. In 2007, a new European climate change strategy has been presented which aims at higher reduction targets and at a integration of climate change and energy policies. Both for energy efficiency and the use of renewable energies, ambitious targets are included in the new strategy which will also have effects on the transport sector (European Commission 2007a).

- **Biofuels:** The EU is supporting biofuels with the aim of reducing greenhouse gas emissions, boosting the decarbonisation of transport fuels, diversifying fuel supply sources, offering new income opportunities in rural areas and developing long-term replacements for fossil fuel. Climate change, rising oil prices and a concern for future supplies, have led to a growing interest in the potential of using biomass for energy purposes. In December 2005 the European Commission adopted an Action Plan designed to increase the use of energy from forestry, agriculture and waste materials. The European Commission is now focusing on transport, which is responsible for around 21% of the EU's harmful greenhouse gas emissions. In 2003 the Biofuels Directive[2] on the promotion of the use of biofuels and other renewable fuels for transport, set out indicative targets for Member States. To help meet the 2010 target – a 5.75% market share for biofuels in the overall transport fuel supply – the European Commission has adopted an EU Strategy for Biofuels along seven policy axes (European Commission 2006b):
  - Stimulating demand for biofuels
  - Capturing environmental benefits
  - Developing the production and distribution of biofuels
  - Expanding feedstock supplies
  - Enhancing trade opportunities
  - Supporting developing countries
  - Supporting research and development

  Based on the proposals of the biofuels strategy the Directive is currently under revision.

Taking account of the fact that the review of the biofuels Directive is not yet finalised and considering the reservations towards biofuels from the point of landscape/nature protection and the protection of biodiversity, the aspect of biofuels will not be included in the common measures of MONITRAF.

2.5 Current discussions, main policy issues and windows of opportunity

Alpine transit policy is currently discussed and further developed on several political levels and within different institutions. For the common MONITRAF measures, the following activities are important.

EU

- The European Commission has the mandate to develop a proposal for the further development of the European Eurovignette Directive until June 2008. This proposal shall especially include a recommendation how external costs of transport (environmental, noise, congestion and health costs) can be included in the Directive and how sensitive regions (especially mountain regions like the Alps) should be treated. The proposal from the Commission will serve as basis for necessary increases in HGV charges and tolls as well as for a differentiation of charges/tolls according to emission standards. At the same time, the EU legislation on financing of infrastructure shall be developed towards a greater flexibility of cross-financing road-rail.
- The EU Directive on taxation of energy products and electricity 2003/96/EG defines minimum tax levels for mineral oil products and leads to a certain degree of harmonisation in order to reduce tank tourism at national borders and differences in tax levels between West and Eastern European countries. The new climate strategy of the EU "Limiting Global Climate Change to 2 degrees Celsius - The way ahead for 2020 and beyond" also gives a new need for action in the transport sector. It is for example discussed how transport emissions could be included in the EU Emissions Trading System (European Commission 2007a).

[2] Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport.

Supra-regional co-operation on transalpine policy

- The co-operation of Alpine countries and the European Commission (Suivi de Zurich) has confirmed the objective to reduce the volume of Alpine crossing freight traffic on the road and to shift freight traffic to rail. It has been concluded to study the possibility of a common Alpine crossing exchange as new and common instrument for Alpine transit policy. Organised via the European Commission, the invitation to tender for this study has been published in August 2007. As the invitation for tender includes a rather broad approach for investigating innovative instruments to limit road freight transport, this study needs to be seen as important window of opportunity to discuss the Alpine Crossing Exchange on European level.
- The EU and Switzerland (together with France and Austria) are currently developing a transport observatory which continuously monitors the development of Alpine crossing freight traffic on road and rail, the environmental impacts in the regions, the development of costs and prices as well as special events (e.g. closings).
- The Interreg IIIB project AlpFrail analyses common measures for improving Alpine crossing rail transport.

France

- Based on the new French transport policy proposal. France is currently planning a distance-related road charge according to the Eurovignette Directive. The discussion in the Rhône-Alpes region focuses on the building of the new rail basetunnel between Lyon and Torino. Also, a ban of dangerous good transports on roads is discussed. In addition there are plans to shift transit freight traffic from road to rail by implementing a supply of Rolling Motorway between Perpignan and Luxembourg (since summer 2007).
- The plan to ban transit traffic from the road and to shift it completely to the rail may constitute a far-reaching change for French transport policy.

Italy

- At the Brenner axis, discussions focus on the improvement of air quality and the realisation of the Brenner basetunnel with its access routes. In Piemont, the focus lies on the realisation of the Lyon-Torino basetunnel.
- In Piemont, several measures regarding freight traffic (road pricing, driving bans for Euro 0, speed limits) and passenger traffic (flexible busservices, short-term driving bans at times of peak pollutions) are discussed.
- The Valle d'Aosta plans the implementation of a traffic monitoring system for local and international traffic.

Switzerland

- The modal shift policy is currently transposed in a legally binding form. The consultation procedure of the draft law (Güterverkehrsvorlage) has been finalised and it is currently discussed by parliament. It includes the continuation of modal shift measures and aims at setting a specific modal shift aim for the future. However, this reduction aim is still discussed and the final decision will partly also depend on activities in the other Alpine Countries. At the same time, an international introduction of an Alpine Crossing Exchange is proposed.

Austria

- The focus of the Austrian Alpine transport policy lies on the implementation of different measures regarding road charges, driving bans as well as on the realisation of the Brenner basetunnel.
- The basis for existing regional measures is the law on immission control (IG-L) building on the EU Directives 1999/30/EG and 1996/62/EG. Due to the exceedance of threshold values, especially of NO_2, Austria and its regions have the obligation to implement appropriate, effective and efficient measures for improving air quality

Along the different levels of existing policies (regional Best Practices to reduce air pollution and to prevent pollution peaks, measures on national level for improving the modal shift and activities on international/European level), MONITRAF has conducted an in-depth analysis of existing measures and their impacts. Based on this analysis, recommendations for common measures are derived which are presented as main directions in the following chapters. A common monitoring system is suggested as basis for all other measures as first main direction.

An overview of the different windows of opportunities which arise from the existing discussions and initiatives and activities on regional, national and European level makes clear that the resolution (which is based on the common

measures) comes at a crucial point of time and can be directly fed into the different processes. Especially on European level, two important milestones will be reached in mid-2008 with the proposal of the European Commission for the further development of the Eurovignette Directive and the inclusion of external costs as well as the next meeting of the European transport ministers under the Suivi de Zurich during which the introduction of the Alpine Crossing Exchange will be discussed.

Furthermore, some important processes which may strengthen the resolution are running in parallel to discussion and signature of the resolution. The further implementation of regional measures will strengthen regional politicians and will give further evidence of the positive impacts of regional measures. Also, the analysis of indicators and the collection of data on transalpine freight traffic and its impacts has progressed considerably in the last years and it has become clear that a harmonisation and comparison of data would now be crucial for the design of future policies (see e.g. Alpine Convention 2007). Up to now, no common methodology for the collection has been used and there is currently no commonly approved model for the processing of data and the calculation of emissions and scenarios. As the claim from different actors for a harmonised monitoring is increasing, there is a clear window of opportunity for MONITRAF to find acceptance for the proposal on a common monitoring system.

In addition, current discussions in Switzerland on the further development of the modal shift policy and especially the specific reduction aim (within the process of finalising the Güterverkehrsvorlage) may give a further impetus for a common solution. However, there will also be a reciprocal effect between the common resolution and the discussions in Switzerland. As the specific reduction aim and the financial means that should be devoted for reaching a reduction of transalpine freight traffic are still under discussion, activities in other countries and an ambitious common resolution under MONITRAF would clearly have a positive impact on the Swiss policy. Also, preliminary proposals for the revision of the Eurovignette Directive as well as the starting study under the Suivi de Zurich for an innovative traffic management system like the Alpine Crossing Exchange will have positive effects for the Swiss discussion.

IMPORTANT ONGOING DISCUSSIONS AND WINDOWS OF OPPORTUNITY

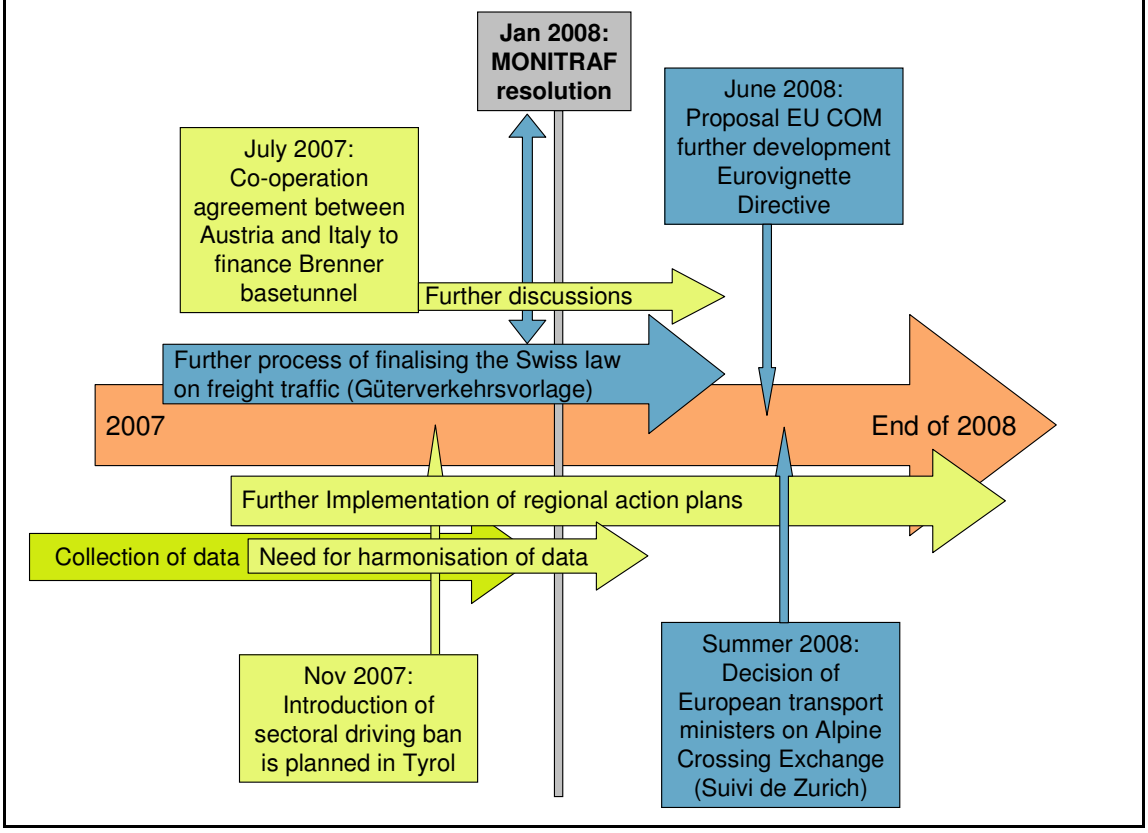

Figure 4

3 OVERVIEW: MAIN DIRECTIONS FOR COMMON MEASURES

Four main directions

The common measures should support a sustainable development in both freight and passenger traffic with a clear focus on freight. The focus of the main directions is a considerable reduction of transit traffic and its environmental impacts (environmental dimension). They aim at a good accessibility, an economic contribution to the development of the regions in transit corridors (economic and social dimension) as well as a fair distribution of impacts of transit traffic between the Alpine corridors and countries (political dimension).

The main directions focus both on measures which can be implemented on regional level as well as on measures with a national or even European scope. An important corner stone and basis for other measures is the implementation of a common monitoring system. MONITRAF shall also give the possibility for developing a common voice of Alpine regions with a common approach for implementing superordinate and comprehensive measures for reducing Alpine transit traffic.

The analysis of existing measures shows that a comprehensive instrument mix is necessary to reach the desired shift from road to rail. A detailed knowledge on traffic flows, types of goods that are transported over the alps, advantages and disadvantages of different traffic types and the impacts of traffic on the environment is necessary to be able to construct a instrument mix in which measures interact closely. The following figure presents an overview of the four directions agreed within the MONITRAF consortium.

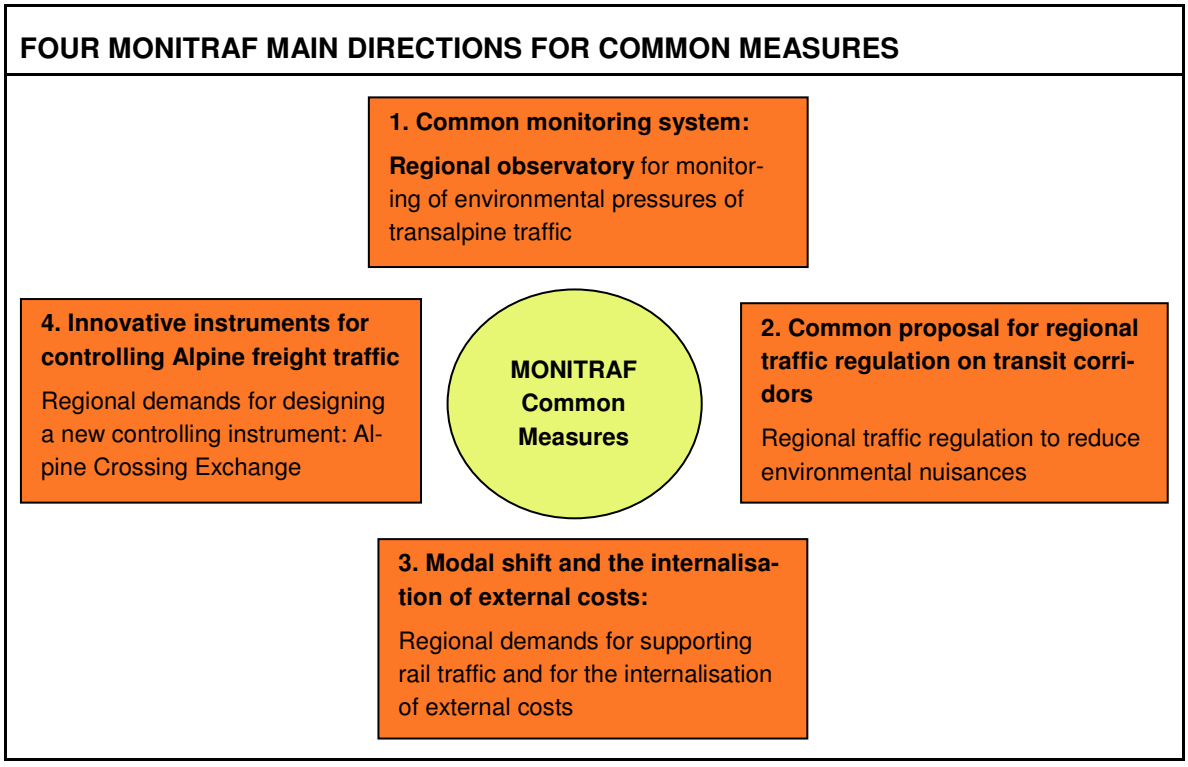

Figure 5

These four main directions supplement each other and will only become effective if implemented altogether:

- Main direction 1 with the common monitoring system builds the basis for all other measures as it delivers the necessary data basis. It will also be crucial for evaluating the effectiveness of MONITRAF measures and for improving the instrument mix.

- Main direction 2 with the regional measures can be seen as "on-top" measures as they mainly aim at reducing peaks in regional/local air pollution. A set of night driving bans and bans for high-emissions vehicles as well as flexible implementations of speed limits seems most effective.
- Main direction 3 is the basis for the common modal shift policy. It builds on the total charging of external costs on the side of road traffic. A common "corridor toll" based on the higher external costs in sensitive regions can reduce the cost differences between different Alpine passages and sets a financial incentive for a shift to rail. On the side of the rail, a further development of infrastructure is necessary for which a good capacity use then needs to be supported through subsidies to rail.
- Main direction 4 with the Alpine Crossing Exchange can be seen complementary to main direction 3 as it will replace the common "corridor toll" in the long-term (if designed as cap-and-trade system). In case that the Alpine Crossing Exchange will only be used as reservation system for improving traffic management over the Alps, it goes side by side with the other measures.

The following figure is presenting the interactions. In the following chapters, each directions is further developed in order to present actions on different policy levels.

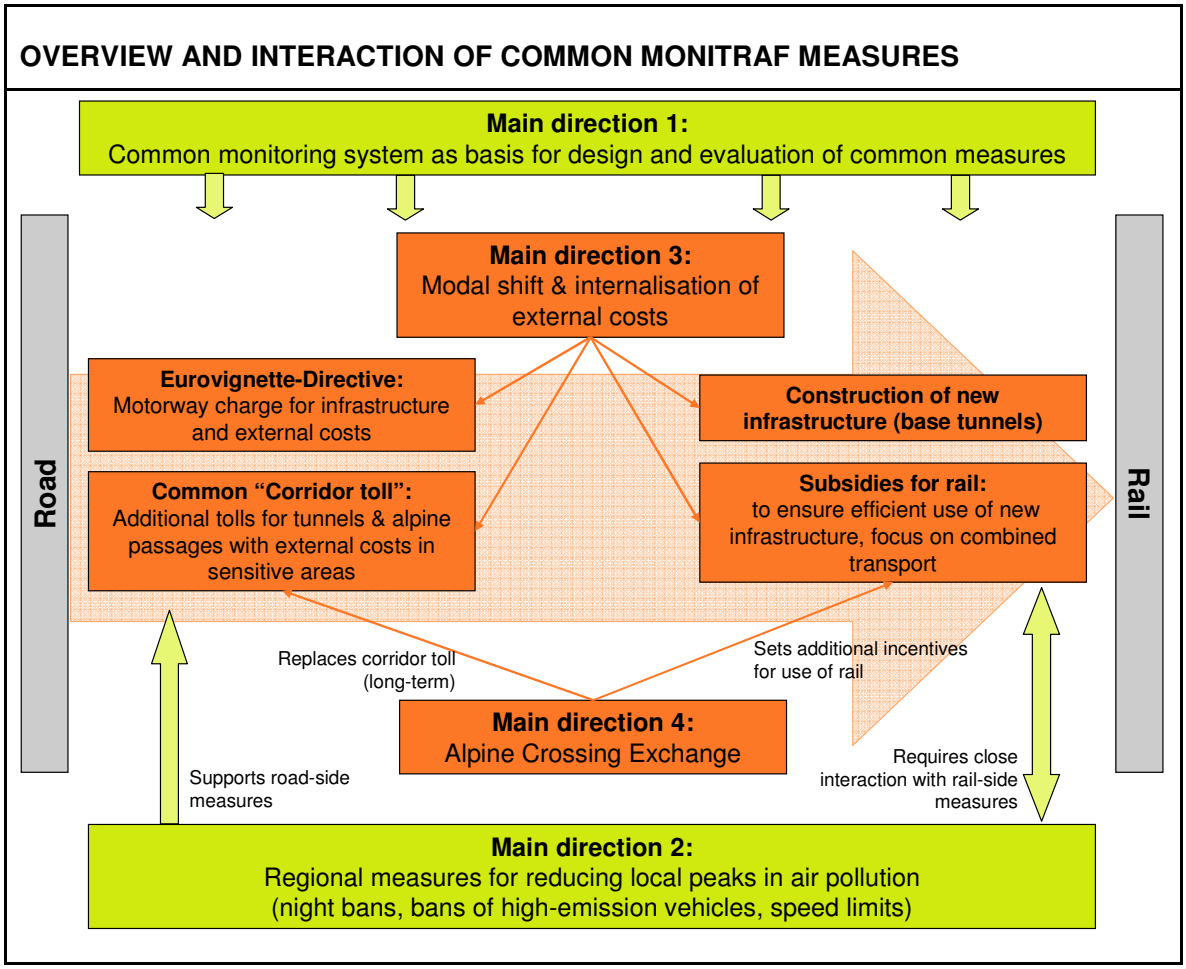

Figure 6

4 MAIN DIRECTION 1: COMMON MONITORING SYSTEM

Main features:

- **Recommendation:** The MONITRAF platform should be used in the future to institutionalise the monitoring data collected within the project activities and to serve as regional network. A MONITRAF monitoring system could build on existing initiatives.
- **Objectives and desired effects:** The MONITRAF monitoring system should serve as regional platform to provide a harmonised collection of monitoring data and its communication and should support the continuous exchange of information between the regions.
- **Short description:**
  - The common monitoring system builds on MONITRAF indicators and serves for data collection
  - The monitoring system can also build as basis for evaluating the effects of measures concerning alpine transit traffic (e.g. driving bans, speed limits).
  - Monitoring data should reflect the latest developments
  - The monitoring system serves as exchange platform for best practices
- **Responsibility:** MONITRAF supports the activities of the Alpine Convention and the traffic observatory Switzerland/EU and aims at establishing an independent communication.

4.1 Need for a common monitoring system and experiences

A high-quality, validated and politically accepted data basis with information on the development of traffic in the Alpine regions (road/rail), its quality (congestion on road, delays on rail) and its impacts (air pollution, noise, accidents) is a crucial starting point for the identification of political objectives and corresponding measures. Such a data basis will also be necessary to evaluate the different measures in Alpine countries as well as the common MONITRAF measures and to work towards an optimal instrument mix.

Up to now, the different Alpine countries have conducted data collections with partly different methodologies. Thus, the comparison of data is not possible for all indicators. In order to obtain a common data basis for the MONITRAF project, WP 7 has defined some crucial indicators for the monitoring in Alpine regions and WP 8 has collected the relevant data with the help of MONITRAF partners (for results see MONITRAF WP 8 report). This exercise made clear that such a data collection is extremely complex and that it will be quickly outdated after the end of the project. For an institutionalisation of a MONITRAF data base it would thus be necessary to link to existing monitoring initiatives and to work towards a prolongation of MONITRAF to supplement the data from these initiatives.

The first decision to monitor **transalpine freight traffic** was taken with the opening of the Gotthard tunnel in 1980. At this time, an annual survey of freight traffic in the Swiss alps has been introduced to serve as basis for further transport policy. Since 1994, this survey has been supplemented by a comprehensive international census which monitors road and rail traffic on the different Alpine passages and is published every five years by Swiss, Austrian and French authorities (CAFT, Cross Alpine Freight Transport). The CAFT surveys give information on the volume of transalpine freight traffic (number of vehicles and tonnes), on the transport mode (road and different types of rail transport), the transport type (import, export, transit, inland traffic) as well as information on the most important origin-destinations (ARE 2004b).

In the period between the five-year CAFT surveys, the Alpine countries publish different monitoring information on road and rail transport. In Austria, information on road transport can be obtained through the points of toll payment and through additional counting stations on national roads (Felbertauern and Reschenpass). For France, information on road transport is also available through information from the toll systems. In Switzerland, an annual survey of transalpine freight traffic is conducted which is based on the results from the automatic counting stations as well as the data base of the distance related heavy vehicle fee.

A problem in comparing the information from the different national monitoring systems lies in the relevant definitions: For example, a heavy good vehicle in Switzerland is defined as vehicle over 3.5 tonnes while it is defined as a vehicle with more than two axles in Austria and France even uses different definitions for motorway and national roads. Also, the differentiation for vehicle categories is organised in different ways within the Alpine countries (SWISS 10 categories in Switzerland, differentiation for passenger cars and HGV without and with trailer or semi-trailer in Austria). Information on **rail transport** can be obtained from the different rail companies, however data is not provided in a summarised way and is thus much more difficult to obtain (especially for data from foreign operators).

A comparison of **environmental data** is even more difficult as it is partly collected by regional authorities. In France, data on air pollution is available for the two Alpine passages considered under MONITRAF (Mont Blanc and Fréjus) but not for Ventimiglia and in Austria the federal states provide monitoring data on air pollution which is obtained with the help of automatic monitoring stations along the motorway. In Switzerland, the Federal legislation on diverting road to rail ('Verlagerungsgesetz') commits the relevant authorities to an environmental monitoring to evaluate the effectiveness of the accompanying measures which results are published in a yearly report "Monitoring of accompanying measures-environment". This environmental monitoring includes measurements of air quality and noise at seven locations along the motorways A2 (Gotthard corridor) and A13 (San Bernardino corridor) and thus shows the impacts of freight traffic on the north-south axis.

Concerning the monitoring of the effectiveness of measures, only Switzerland has institutionalised a regular monitoring with the so-called modal shift reports. This monitoring/evaluation of measures is published every two years and serves as verification for the modal shift policy. The modal shift reports include information on traffic data as well as information on specific traffic and background developments (Federal Council of Switzerland 2004). The next report will include information for the years 2005 and 2006 but is not yet published.

Conclusions:

An inventory of currently available monitoring data shows that data on traffic volume on the Alpine passages is provided within the CAFT surveys which are published every five years but that availability and comparability of data is not as good for the years in between the main surveys. The data on road transport is easier to obtain than data from rail transport as it can be obtained on the basis of tolls or charging systems. Environmental data is mostly obtained by regional authorities and except for Switzerland not compiled in a comparative way and especially the monitoring of noise is not conducted in a comprehensive way.

The need for a more comprehensive monitoring system with comparable data has already been identified by several actors and within the frame of the transport agreement between the European Union and Switzerland a common traffic observatory is currently under construction. Also, the Alpine Convention plans the development of a monitoring system but has not yet specified its design. These existing initiatives can be used as basis for the development of a comprehensive MONITRAF monitoring system. However, there is a unique chance for MONITRAF activities that a common approach on gathering and interpreting especially data with information on the state of environment can be obtained.

4.2 Link/ Institutionalization of a common monitoring system

Link 1: Alpine Convention

The Alpine Convention has published its first report on the state of the Alps "Transport and Mobility in the Alps" in July 2007. Its data has been accepted by national authorities so that the report can be seen as a first major effort to present a common picture of the state of the Alps. With this report, the Alpine Convention is aiming at presenting monitoring data for the Alpine area to provide an understanding of the complex issue of transport in the Alps, to show different structures and problems in the different parts of the Alps and to identify main challenges. However, the report also states that appropriate data is not yet fully available and that the harmonisation of data was a big effort (Alpine Convention 2007).

Members of the Alpine Convention have thus recognised the need for developing a common monitoring system as the basis for getting a better understanding of impacts of Alpine traffic and the development of measures. However, they have up to now only stated their willingness to develop such a system. A working group of the Alpine

Convention focusing on transport and air quality is currently discussing the possibilities for a monitoring system under the Alpine Convention.

MONITRAF has a special interest in the implementation of a monitoring system by the Alpine Convention as it could give the opportunity for synergies with the planned MONITRAF system and could reduce the financial responsibility for MONITRAF regions. Activities of the Alpine Convention are financed through national budgets so that the financial burden is shifted from the regional to the national level.

As the internet platform and communications of the Alpine Convention reach a broad audience and are already well established, it could be useful to link the MONITRAF platform with monitoring data and information on Best Practices closely to the Alpine Convention.

Link 2: Observatory of freight traffic in the Alpine Region

A common monitoring system (observatory) for freight traffic in Alpine regions is currently developed by the project Alpifret within the frame of the agreement on freight and passenger transport between Switzerland and the European Union involving as well the national contact points in Austria and in France. Based on existing data from national contact points, Alpifret will conduct a quality control of existing data and ensure that presented data is comparable. Alpifret will provide quarterly reports on freight traffic in Alpine Regions, including the following indicators:

- Traffic development on the different Alpine passages (number of vehicles and tonnes)
- Environmental quality in Alpine regions
- Quality aspects of freight traffic (congestions, delays, etc.)
- Cost indicators for freight traffic on road and rail
- Special reports on effects of specific measures (not yet in detail defined)

The aspect of transport costs will be one major focus of Alpifret as there is currently no comparable information available and as this information will be crucial for the Swiss possibility to apply protective measures ("mesures de sauvegarde"). Alpifret should also serve as basis for evaluating measures and strategies within the field of Alpine freight transport.

As the spatial focus of Alpifret lies on the level of Alpine passages and freight transport, it won't deliver regional or local data which would be a necessary basis for designing and evaluating regional measures (e.g. speed limits on specific motorway stretches). In this respect, a supplementation of Alpifret data with a continued MONITRAF monitoring would be necessary.

4.3 Concept for a MONITRAF monitoring system

Objectives:

- The MONITRAF monitoring system should mainly aim at comparing **environmental pressures/burdens** from Alpine traffic. Data on concentration levels and emissions needs to be periodically presented in a comparable and representative way in order to allow an optimum design of common measures.
- The monitoring system should further allow an **evaluation of the effectiveness of common measures**. This requires both a continuous monitoring of the environmental situation (time-series) as well as an exchange on implementation, enforcement and success of the Best Practices with regard to other aims.
- With respect to regional measures, the monitoring system should be the basis to **trigger off intervention measures** when threshold values (e.g. critical concentration levels) are exceeded. This requires a close link of the monitoring system to the relevant authorities and an on-line availability of data.
- In the medium term, the monitoring system should collect data for the complete list of indicators that were defined within the MONITRAF project – including **socio-economic indicators** to present the interaction between sustainable development and traffic volumes.

Focus on air quality indicators in the short-term:

- The MONITRAF monitoring system should focus on indicators that represent environmental pressures due to Alpine traffic and should include information on both concentrations of air pollutants (immissions) as well as emissions of vehicles (modelling results). Also, as many regions have already implemented a monitoring of noise levels, a noise indicator should be included in the MONITRAF monitoring system.
- With respect to existing practices and the findings of MONITRAF, the following indicators should be monitored:

INDICATORS FOR THE MONITRAF MONITORING SYSTEM			
Indicators /pollutants	**State/Quality**	**Impact**	**Response/objective**
NO2	› Daily variations (Tagesganglinie) › Average daily concentrations › Average yearly concentrations › Number of days of daily limit value exceedance › Exceedance of annual limit value [3] › Specific emissions per km separated for main vehicle categories (passenger cars, heavy duty vehicles) for NOx and PM10 (modelling results)	Human health	› Comparison of environmental quality › Evaluation of measures › Triggering intervention measues
NOx		Human health, necessary for modelling	
PM10		Human health	
Noise	› Day-evening-night level Lden in dB › Night-time noise level Lnight in dB › Number of exposed people in the Alpine valleys (modelling results)	Human health	› Comparison of environmental quality › Evaluation of measures

Table 2

- For the interpretation and comparison, the following additional information is necessary:
  - Information on the characteristics of monitoring stations:
    1. Differentiation into stations in central valleys (higher share of internal and import/export traffic) and upper valleys close to the Alpine crossing (higher share of transit traffic)
    2. Differentiation into stations close to the road (some metres), background stations and stations in settlement areas
    3. Information on types of monitoring stations and measurement equipment (necessary for the interpretation of data)
  - Specific climatic conditions in the different valleys, which give information about specific weather conditions influencing dispersion of emissions and ventilation of the valley (wind speed and wind direction, temperature, temperature profiles/inversions)
- Corresponding traffic developments can be obtained through ongoing activities for the transport observatory.

Data collection and processing:

The data collection and processing for the MONITRAF monitoring system includes five tasks conducted through the MONITRAF regions and lead partner. As experiences within the existing MONITRAF activities have shown, an institutionalised approach needs to be implemented in order to obtain data from all regions.

[3] When analysing the exceedance of limit values/threshold values it has to be considered that different limit values are effective in the EU and Switzerland. For the EU, the limit values of EU Directive 1999/30/EC are relevant, for Switzerland the limit values of the ordinance on Air Pollution Control need to be taken as basis:
http://www.bafu.admin.ch/luft/00632/00634/index.html?lang=en

TASKS AND RESPONSIBILITIES WITHIN THE MONITRAF MONITORING SYSTEM			
		Tasks	**Responsibilities**
1	**Development of interface and definition of standard operation procedure**	› Development of an easy usable data interface for the collection of data which allows the presentation of time-series and comparative illustrations › Definition of a standard operation procedure (quality measurement standards) to ensure the comparability of data › Development of a criteria list for the evaluation of Best Practices on which experiences are exchanged on a yearly basis	› Expert on data handling › For definition of measurement standards: all project partners › For evaluation of Best Practices: expert on measures
2	**Data collection**	› Collection of data › If necessary: adjustment of monitoring periods/intervals › Entry of data into the interface › Quick response action: If threshold values are exceeded, the relevant authorities responsible for the implementation of intervention measures are alerted › Collection of information on Best Practices	› MONITRAF regions
3	**Data processing**	› Verification and harmonisation of data in order to obtain comparable information › On the basis of additional information on the situation of monitoring stations and climatic/meteorological conditions	› Data expert with help of MONITRAF regions on additional information
4	**Modelling of emissions**	› Modelling of emissions on the basis of air quality data and traffic data from transport observatory (differentiation acc. to vehicle categories and emission concepts/Euro classes) › Information on share of traffic on concentration levels and on population exposure › Modelling of noise emissions and population exposure	› Air pollution and noise expert
5	**Interpretation**	› Illustration of monitoring data in comparative way (concentrations, numbers of exceedances of threshold values, share of traffic in total emissions, noise levels) › Interpretation of data on basis of additional information and modelling results › Interpretation of data with regards to effectiveness of implemented measures	› Data expert › Expert on measures › With comments/ verification from MONITRAF regions

Table 3:

Evaluation of Best Practices:

On the basis of monitoring data and the additional information on Best Practices (collected through MONITRAF regions along the criteria list), an overview on effectiveness of Best Practices is provided by the expert on measures which allows a comparison between corridors. This can be done for specific situations and events (such as the introduction of new measures or exogenous events like closures of specific routes).

Based on a meta-evaluation of the information from the different regions, the expert on measures together with the MONITRAF partners suggest an improvement of the instrument mix for regional measures.

Communication/exchange between partners/common voice:

- Data and monitoring results could be presented in annual reports which could in their frequency be linked to the publications of the Transport Observatory or AlpInfo on traffic development. The presentation of results could be structured along the very comprehensive and illustrative MONITRAF report of WP 5 prepared by oekoscience AG which provides information on the environmental situation in 2004 (Thudium et al. 2005). All in all, the reports should include:
  - Yearly average of air pollution and noise levels
  - Monthly concentrations of air pollutants
  - Long term series of air pollution and noise levels
  - NOx and PM10 emissions in central valleys and upper parts of valleys
  - Numbers of days on which threshold values have been exceeded
  - Numbers of days during which intervention measures have been taken and information on the intervention measures.
- The publication should include information on the effectiveness of implemented measures. The effectiveness is evaluated by means of monitoring data and additional information on Best Practices which is provided by MONITRAF regions on the basis of the common criteria list.
- Communication via MONITRAF homepage and/or specific own reports.
- It is very important to use the platforms and the working groups within the Alpine convention in order to create synergies and to extend the network (also to other regions not yet involved in the MONITRAF project).
- It is useful to transfer periodically the data obtained to the observatory Switzerland-EU.
- The annual report with monitoring data and the recommendations on improvements of measures are presented and discussed on an **annual MONITRAF conference**. This annual conference (connected with undertakings of the Alpine Convention) should be open to politicians in order to enable a broad communication of results (e.g. via a press conference, TV interviews, etc.)
- The yearly publication which is supported by all MONITRAF regions also serves as common voice of the Alpine regions towards higher authorities. For example, it will be easier to achieve acceptance of political claims if their necessity can be illustrated on the basis on the monitoring information.

Responsibilities:

The development of a common monitoring system focussing on the periodical presentation of the environmental burden of transalpine traffic is subject of a possible second phase of the MONITRAF project ("MONITRAF 2"). In this phase, the monitoring information should be transferred to other institutions such as the Alpine convention (see Chapter 8 for further suggestions).

The following table presents a first idea of responsibilities.

RESPONSIBILITIES WITHIN MONITRAF 2/MONITRAF MONITORING SYSTEM	
Actor	**Responsibilities**
Administrative Lead Partner	› Current MONITRAF lead partner: Work towards a prolongation of the project with focus on developing the common monitoring system. › For MONITRAF 2: All administrative issues, coordination of project partners, etc. › Publication of annual monitoring report with information on Best Practices (maybe including layout), communication via internet › Organisation of annual MONITRAF conference
Air pollution / noise experts for data handling and processing	› Development of data interface › Data processing, verification/harmonisation, modelling, illustration › Internal reports with mostly quantitative information
Expert for evaluation of measures	› Development of criteria list for the evaluation of Best Practices which is easy and fast to use on regional level › Collection of evaluations on Best Practices and meta-evaluation › Recommendations on further development of Best Practices and common measures
MONITRAF regions	› Collection of monitoring data and evaluation of Best Practices › Commenting of reports especially on the further development of common measures › Active exchange via yearly MONITRAF conference and other institutions

Table 4:

5 MAIN DIRECTION 2: COMMON PROPOSALS FOR TRAFFIC REGULATION ON TRANSIT CORRIDORS (FURTHER DEVELOPMENT OF BEST PRACTICES)

Main features:

- **Recommendation:** The transit regions shall use their possibilities and obtain a stronger voice to implement effective immediate measures to reduce excessive environmental burdens. These measures can build on existing programmes of measures in the regions and systems for interventions.
- **Objectives and desired effects:** MONITRAF objective is to coordinate the measures and claim for a stronger voice of the regional level. The implementation of regional measures could lead to a reduction of environmental pressures (in general and especially in times of high concentrations).
- **Short description of measures:**
  - Speed limits for all types of traffic
  - Driving bans (for specific motorway stretches, for specific Euro-categories, temporal limitations e.g. in times of critical smog-situations or inversions
  - Extension of night driving bans
  - Dosing systems on critical stretches and a ban for dangerous goods on the road
- **Responsibility:** Different per region, in some countries the MONITRAF regions have the responsibility for introducing immediate measures.

5.1 Experiences with Best Practices for regulating traffic flows on regional level

Most MONITRAF regions have introduced regulating measures for HGV road transport which aim at reducing air pollution and noise (see box below). All countries have introduced Sunday or weekend driving bans, Switzerland and Austria have in addition introduced a night driving ban (in Switzerland on national level, in Austria for specific motorway stretches in Tyrol). Austria, South Tyrol and France have banned high-emission vehicles from the Alpine passages (Euro 0 and 1 are banned from Brenner, Euro 0 from Fréjus and Mont Blanc tunnels), in Italy the municipal administrations can decide on a temporal and/or regional ban of high-emission vehicles.

In most of the tunnels – especially for safety reasons – some sort of dosing system or regulations on minimum spaces between vehicles have been implemented which set a limit to passages. In Austria, the speed on the Inntal motorway is limited during winter times and the air quality plan for South Tyrol suggests a speed limit for months with high air pollution. Tyrol has furthermore suggested a sectoral driving ban for goods that can easily be transported per rail which is however under discussion with the European Union.

Impacts of regional regulating measures on air pollution and noise can be summarised as follows:

- A regulation of road transport with a reduction of traffic leads to an improvement of air pollution, however not for all relevant substances as other sources of emissions need to be considered.
- Especially, primary pollutants like soot react quickly with a reduction of emissions from road transport. As soot is a cause for cancer, its reduction is an important objective of regulating measures.
- If there are other emission sources like heating with wood, particulate matter react less sensitive to a reduction of road traffic and measures aiming at the other emissions sources need to taken.
- Noise levels react quickly to a reduction of road transport if there are no other relevant sources. Especially night driving bans at sleeping/resting hours lead to a reduction of health problems from noise.

5.1.1 Experiences with regional Best Practice measures in Tyrol

a) Speed limit 100 on Inntal motorway

During wintertime 2006/2007 the government of Tyrol has introduced a speed limit of 100 km/h on the Inntal motorway to reduce NOx concentrations and further air pollutants in this sensitive time of the year (wintersmog). This measure should ensure that also passenger traffic contributes to the reduction of NOx in Inntal. First results of this measures are presented in the annual report on traffic in Tyrol (Amt der Tiroler Landesregierung 2007).

The monitoring of air pollution and modelling of its impacts has shown that emissions and concentrations of NOx, PM10 and other air emissions have been reduced through the speed limit. Emissions of NOx could be reduced by 23% (82 t) and emissions of PM10 by 27% (3.4 t) in comparison to a situation without speed limit. The concentration of NO2 at all six monitoring stations was considerably lower than during winter times in 2004/2005 and 2005/2006. For example, at Vomp monitoring station the concentration decreased from over 90 µg/m^3 in 2005/2006 to about 70 µg/m^3 in 2006/2007 and in Innsbruck it decreased from over 60 to about 50 µg/m^3.

INNTAL MOTORWAY: CONCENTRATION OF NO2 WITH SPEED LIMIT 100 IN COMPARISON TO PREVIOUS YEARS

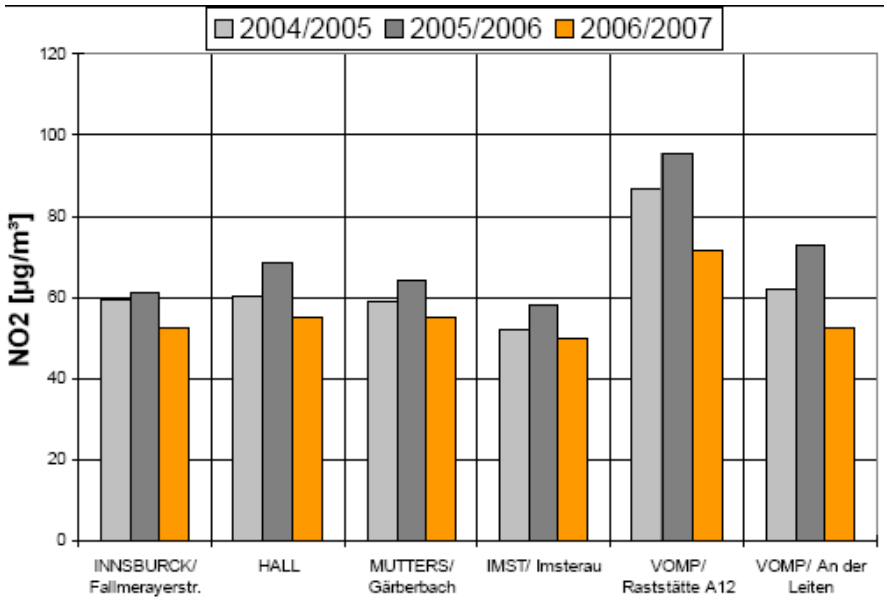

Figure 7: *Office of the Tyrolean state government*

The speed limit could furthermore save 14.000 t of CO_2 emissions and 4. Mio. litres of fuel. The speed limit also led to a harmonisation of traffic (speed difference between fast and slow vehicles was reduced from 50 km/h to 20 km/h) and thus led to a reduction of 61% of accidents with injured persons. In the next winter season, the speed limit is used in a flexible way at times of high air pollution (with the help of automatic traffic control systems).

b) Night driving ban on Inntal motorway

In 2002, Tyrol has introduced a night driving ban for HGV on motorways from 22:00 in the evening until 5:00 in the morning. An evaluation of this night driving ban has analysed the effects of traffic shifting to other times of the day and from motorway to subordinate routes. Also, the environmental impacts of the night driving ban have been analysed (Landesverwaltung Tirol 2003).

It has been shown that the night driving ban leads to a shift in traffic to the early morning hours while traffic volume in the evening hours does however not rise. Between 5:00 and 6:00, the traffic volume has increased from

300 HGV per hour (both directions) without the regulation to a maximum volume of 410 HGV/hour. On Mondays, when the effects of the weekend and night driving bans accumulate, the volume of HGV per hour has reached maximum amounts of 500 to 550. Also, a shift in traffic to subordinate roads could be seen with which drivers were able to avoid the night driving ban. However, this effect of traffic shifting was very small in absolute numbers on most alternative routes. The greatest impact of the night driving ban could be seen at Fernpass where HGV traffic increased by 17-25% in comparison to the previous year without night driving ban with a high increase of traffic during night time.[4]

An analysis of air pollution has shown that the end of the night driving ban at 5 am is not optimal as this is an unfavourable time of the day from a meteorological point of view. The peak in traffic in the early morning hours and the corresponding increase of NO2 concentration is only slowly reduced over the day in late autumn and winter due to the lower position of the sun. Thus, the night driving ban and the increase of traffic in the early morning hours lead to a peak of NO_2 concentration which can climb above threshold values in the case of stable weather conditions. The reduction of NO2 concentrations after 22:00 with the beginning of the night driving ban is not as prominent as the increase in the early morning hours.

c) Ban of high-emission vehicles

According to the regulation on high-emission vehicles which has been implemented by the Tyrolean state in 2006, vehicles of Euro classes 0 and 1 are banned from the Inntal motorway. A parallel decree has been implemented by South Tyrol so that the ban on high-emissions vehicles is in fact implemented for the whole Brenner axis. The regulation already foresees an adjustment of this ban of high-emission vehicles with an inclusion of Euro 2 from 2008 on. An evaluation of this measures is not yet possible, however it is already clear that the current ban of Euro 0 and 1 is only relevant for about 1% of the vehicle fleet and that the total traffic volume is thus not influenced through the ban.

However, a modelling exercise of Jürg Thudium (2003) shows that the concentration of NO2 can be reduced by 0.4 µg/m³ with an introduction of Euro 0 and 1 vehicles and by 1.6 µg/m³ with an inclusion of Euro 2 vehicles.

5.1.2 Experiences with regional Best Practice measures in Switzerland

a) Dosing system Gotthard tunnel

While the traffic volume at the Gotthard tunnel was 4'498 HGV per day before the incident in 2001, it was reduced to 2'850 after the reopening of the tunnel with the one-way traffic. This has led to a steep increase of traffic at the other passages, especially at San Bernardino (increase from 500 to over 800 HGV per day) and Simplon (increase from 100 to 400 HGV per day). In order to improve the traffic situation at the Gotthard tunnel, it was decided to readmit traffic in both directions regulated by a dosing system. With the introduction of this dosing system, HGV traffic at Gotthard tunnel reconverged to its level before the incident and the daily volumes at the other passages could have been reduced significantly (-35% at San Bernardino, -44% at Simplon).

After the introduction of the dosing system, the amount of HGV passing the Gotthard tunnel has not yet reached the number of daily HGV before the Gotthard incident. This could however also be due to the lower economic growth in the years after 2001 (ASTRA 2003).

[4] It has to be noted that traffic has already increased before the introduction of night driving ban on all Austrian alpine passages.

DEVELOPMENT OF FREIGHT TRAFFIC IN 2001 (GOTTHARD INCIDENT)

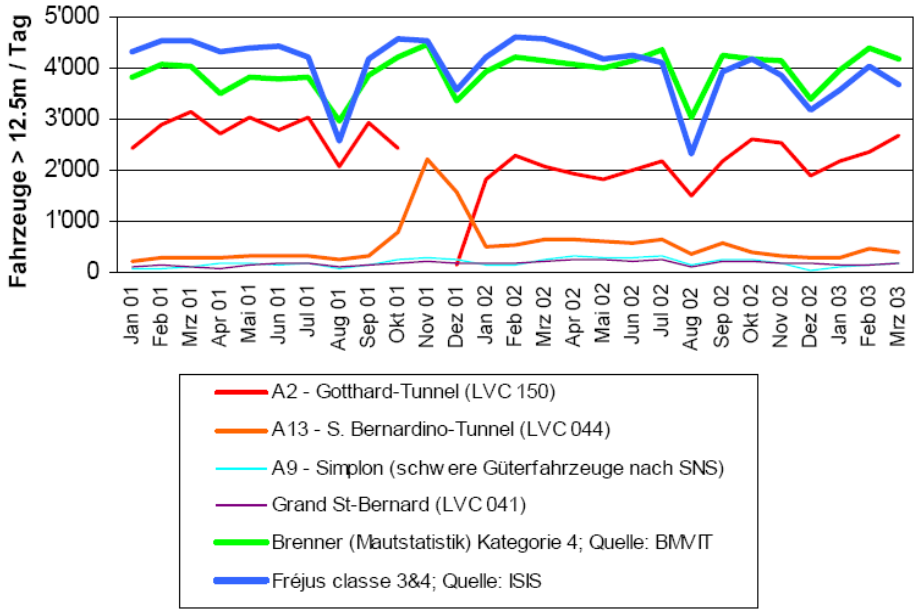

Figure 8: *Source: ASTRA 2003.*

The dosing system at Gotthard tunnel also leads to environmental impacts as it changes the traffic volume and crucially influences the situation of congestions. The dosing system with the waiting areas is a first step to a management of freight traffic. Before using the tunnel, HGV have to stop at the waiting areas and can then in a fluent traffic flow pass through the tunnel. This means that high concentrations of air pollutants due to congestions can be reduced. On the other hand, air pollutants can increase close to the waiting rooms where HGV restart before passing through the tunnel.

When evaluating different dosing systems in Switzerland, it became especially clear that dosing systems can lead to a shift of air pollution towards the location where the dosing system starts. The initial dosing system at the Gotthard with alternating one-way traffic has lead to congestions of HGV approaching the Gotthard which often had their engine running. A modelling exercise showed that air pollution at all monitoring stations in between the starting point of the dosing system has reduced while NOx emissions increased by about 8% at places of congestions.

DAILY NOx EMISSIONS WITHOUT AND WITH DOSING SYSTEM

	Without dosing system	**With dosing system**		**Difference**
		When moving	**When congested**	
Bellinzona-Airolo	1482 kg/day	1130 kg/day	36 kg/day	-316 kg/day (-21%)
Congestion area approaching dosing system	112 kg/day	85 kg/day	36 kg/day	+9 kg/day (+8%)

Table 5: *Source: Kantonale Umweltschutzämter GR, TI und UR sowie BUWAL (2001)*

b) Closing of an Alpine passage for road traffic

Although the closings of the Gotthard tunnel in 2001 and 2006 were due to incidents and thus cannot be seen as measures, they give interesting information on the impacts of the traffic shifts to other Alpine passages. The impacts of traffic shifts need to be considered when implementing unilateral measures and are thus relevant for regional MONITRAF measures and Best Practices.

Experiences with the Gotthard closings have shown that the effects of traffic shifts between Alpine passages are partly undesirable as they do not fully reduce the pressure from the corridor with less traffic but lead to higher pressures in the region to which the traffic is shifting. During the closings of the Gotthard tunnel in 2001 and 2006, the monitoring of air pollution has shown that concentration of primary pollutants like nitrogen oxide shifted from the Gotthard axis (Erstfeld) to the San Bernardino axis (Rothenbrunnen). While it went down by more than 60% in Erstfeld it increased by about the same amount at Rothenbrunnen. While the concentration of soot reacted similarly, the concentration of PM10 as secondary pollutant behaved in a different way. While it increased by more than 40% at the San Bernardino axis, it was only slightly reduced at the Gotthard axis (BAFU 2007).

SHIFTING OF CONCENTRATIONS OF NITROGEN OXIDE AND PARTCULATE MATTER THROUGH THE CLOSING OF GOTTHARD TUNNEL IN JUNE 2006

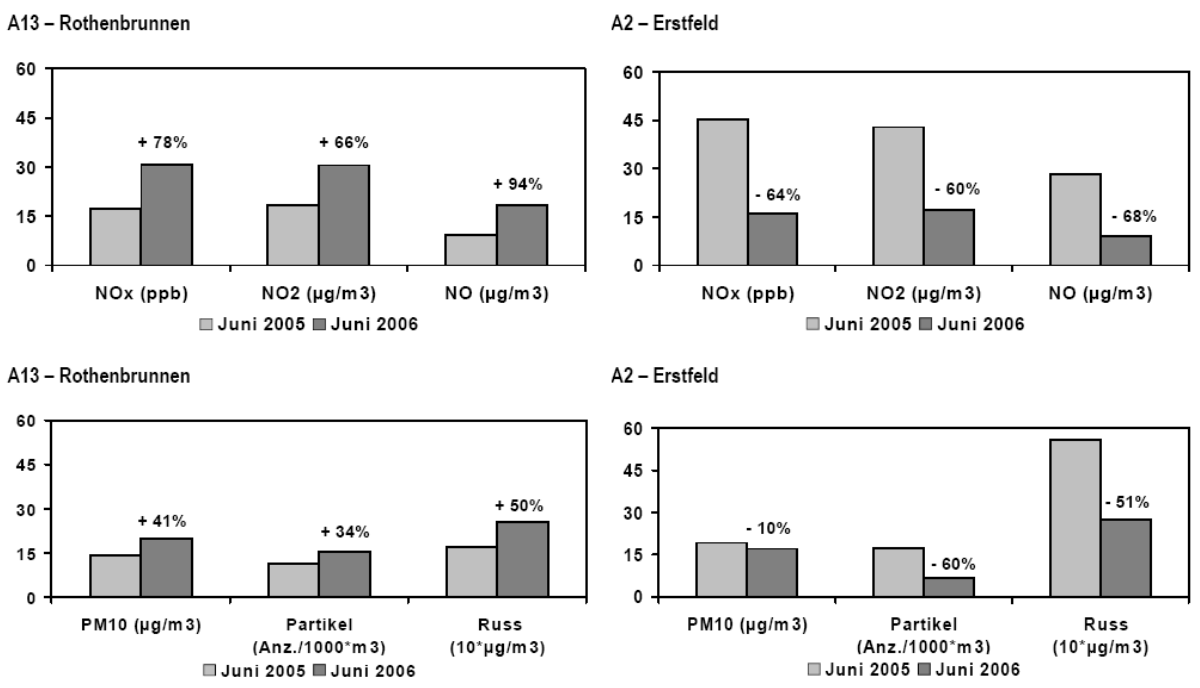

Figure 9: *Traffic has shifted from A2 (Erstfeld, Gotthard corridor) to A13 (Rothenbrunnen, San Bernadino). Source: BAFU 2007. "Partikel": number of particles per 1000 m^3, "Russ": black carbon (BC) in 10 µg/m^3.*

The "dosing system" for the Mt. Blanc tunnel with a regulation on minimum intervals between HGVs of 150m is in fact also a limitation of HGV traffic similar to the regulation on the Gotthard axis. The regulation on minimum intervals has been introduced as safety measure when the Mt. Blanc tunnel has been reopened after the incident in 1999. In addition, the traffic regulation for the Mont Blanc tunnel defines the maximum amount of HGV which can pass through the tunnel in one hour (220 per hour per direction or 240 per hour in both direction).[5] The environ-

[5] Traffic regulation for the Mont Blanc tunnel 2005 (English and German translation), http://www.tunnelmb.net/v3.0/pdf/Ordinanza_GB_DE.pdf

mental impacts of these regulations of the Mont Blanc tunnel have not yet been assessed as the measures have been implemented due to security concerns.

Regarding environmental impacts, also the introduction of the Swiss HGV fee needs to be mentioned as a basis for further developing regional measures. Evaluations of the HGV fee have shown that the fee has additional incentives to realise productivity increases and to use low-emission vehicles which also led to a reduction of PM10 and NOx emissions (Federal Council of Switzerland 2004). Thus, also road charges can be used as regional measures to reduce environmental burdens of freight traffic significantly (for further information on evaluations of the Swiss HGV fee refer to chapter 6.1).

5.1.3 Conclusions on Best Practice Measures

- An implementation of speed limits during the winter time could lead to significant reductions in NOx and PM10 emissions and to a reduction of the concentration of NO2. However, in Tyrol it has become clear that a general speed limit is not fully necessary but that it is sufficient to introduce the speed limit at times of high concentrations which are identified and communicated through the help of automated traffic control systems.[6]
- The evaluation in Tyrol has shown that a night driving ban needs to be designed carefully in order to reach the envisaged effects (no building up of high NO2 concentrations during nightime). A too early end of the night ban in the morning can lead to an unwanted building up of NO2 concentrations which only slowly reduce over the day during stable weather conditions. However, the night driving ban clearly leads to a reduction of noise levels along the relevant roads. The case of Tyrol also made clear that a night ban for motorways can also lead to a shift of traffic to subordinate routes.
- There are no ex-post evaluations of driving bans for high emission vehicles as introduced by Austria, Italy and France in general or for specific stretches of motorways or tunnels. However, the impact of this measures seems obvious as Euro 0 and 1 vehicles emit high amounts of soot particles and thus lead to high PM10 concentrations. A ban of this vehicles reduces air pollution and thus the impacts of freight traffic on human health. As vehicles fleet switches to ever more efficient and thus cleaner vehicles over time, it needs to be discussed how the ban of high emissions vehicles can become dynamic in the sense of a first best approach (with an orientation of the driving ban at the best available vehicles).
- Experiences with the closings of the Gotthard tunnel in 2001 and 2006 show the effects of traffic shifts between different Alpine passages. It becomes clear that such shifts lead to undesired distributional effects especially with concentrations of PM10. This makes clear that a common approach is necessary in order to prevent from traffic shifts and the corresponding environmental effects.
- Dosing systems, speed limits and permanent or part-time bans of high-emission vehicles in tunnels can lead to a better management of traffic volumes and reduce overall air pollution as HGV have to stop at waiting areas and turn off their engine. However, local concentrations around the waiting areas can increase due to the high traffic volumes around the waiting stations. When designing new dosing systems it needs to be ensured that these systems do not lead to higher congestion as they increase air pollution considerably.
- As alternative or in addition to regulating measures, road tolls or charges (especially the differentiation according to Euro classes) can set incentives for better capacity utilization and for using low-emission vehicles so that environmental impacts are reduced.

[6] An immission regulated traffic control system has been developed by the Austrian motorway operator ASFINAG and will be used on the Inntal motorway starting in autumn 2007 (Amt der Tiroler Landesregierung 2007, p. 16).

5.2 A common set of regional MONITRAF measures for the Alpine region

5.2.1 Design of regional MONITRAF measures

A set of permanent and intervention measures: Night bans, bans of high-emission vehicles and speed limits

The experiences with speed limits, temporal driving bans and bans for high-emission vehicles have shown that a carefully designed set of these measures can lead to an improvement of air quality. However, there are a number of potentially unwanted effects which need to be considered when designing a set of regional measures.

A common MONITRAF set of regional measures should be differentiated into general and intervention measures and could be designed in the following way:

- **Night and Sunday driving bans** as well as a **ban of high-emission vehicles** should be implemented as general and permanent measures. The ban of high-emissions vehicles leads to a reduction of NO2 concentrations and soot emissions. Night driving bans can also improve air quality and are crucially for an improvement of noise exposure during resting hours.
    - When introducing bans of high-emissions vehicles it has to be ensured that the impact does not get lost when the vehicle fleet is shifting to more efficient vehicles. Similar to the example of Tyrol, a dynamic adjustment of the ban of emission categories needs to be implemented (e.g. one year after the introduction of a new Euro category, the next lowest category is banned (Euro 5 displaces Euro 2, Euro 6 displaces Euro 3, etc.)).
    - The design of night bans needs to be carefully explored under the consideration of meteorological effects. If necessary, the night ban can begin and end at different hours during different times of the years. It also needs to be closely examined if night bans are only applied on motorways or on the complete road system. The experiences with night driving bans in MONITRAF regions need to be communicated in order to have a learning-process (e.g. through the MONITRAF platform or a Best Practice handbook).
- A set of **intervention measures** which are implemented at times of high concentrations/pollution peaks can supplement the permanent measures. Intervention measures could include a flexible use of speed limits as well as an extension of the ban of high-emission vehicles.
    - As the example from Tyrol has shown, **speed limits** can lead to a reduction of air emissions in times with high concentration. A flexible approach to speed limits would require a well-functioning automated traffic control mechanism connected to air monitoring systems. The air monitoring system would need to include an "early warning" function, in order to prevent the building of peaks. The speed limit should already be applied at a critical concentration and not only after exceeding threshold values.
    - In addition to the flexible use of speed limits, an **extension of bans of high-emission vehicles** might be implemented as intervention measure. For example, during times of critical compensations, the next highest emissions class would also be banned. This however includes a quick and clear communication (similar to "Phase rouge") so that operators can react to this measure.

All regulations on regional level need to be closely coordinated with measures for improving the competitiveness of rail (see main direction 3) in order to prevent a shift of traffic (to other roads, to other times of the days) and to prevent unwanted effects on air pollution. A direct support of the regional measures on the road could be reached through additional supply of rolling motorways and a subsidy for their usage. Through the interaction of road and rail measures, operators would then have a clear incentive to switch to the rolling motorway.

Maintaining and expanding dosing systems to other Alpine passages

The experience with the regulation on minimum intervals for HGV in both tunnels in France and with the Swiss dosing system of the Gotthard tunnel have both shown that a limitation of HGV traffic does not lead to unwanted congestion if it is accompanied by an appropriate management (holding areas). Dosing systems rather lead to reduction of HGV traffic in tunnels and thus increase tunnel security. At the same time, they give an additional incentive for freight transport to switch from road to rail.

In their claims to higher authorities, MONITRAF regions should insist on the further use of such dosing systems. Especially, an increase in traffic and a reaching of maximum tunnel capacity should not lead to a loosening of

regulations due to economic considerations. With the positive experience on dosing systems in mind, it could also be discussed how traffic regulations on Alpine passages without tunnels could be designed and implemented.

5.2.2 Ideas for implementing and communicating the MONITRAF set of regional measures

Implementation

Due to different divisions of competences between national states and the regions in the Alpine countries, the MONITRAF regions have different responsibilities for implementing regional measures. With regard to the set of regional measures, especially the individual competences for implementing driving bans and speed limits need to be considered but also the responsibilities on motorways are relevant. The overview of regional competences in table 6 makes clear that in nearly all countries, the responsibilities for motorways and national roads lie with the federal state or the operator. Only in Austria, Tyrol has the competence to implement measures on their regional motorway stretches.

OVERVIEW: COMPETENCES OF REGIONAL AUTHORITIES IN THE MONITRAF REGIONS (AS OF AUGUST 2007)					
	Adjusting road tolls/charges (rate)	Adjusting road tolls/charges (structure)	Regulation/driving bans (low emission standards, night/weekend bans, etc.)	Speed limits	Road management (Dosing systems, other traffic management)
Tyrol	Pricing of motorways lies within the responsibility of national authorities and is transposed by the operator ASFINAG	Pricing of motorways lies within the responsibility of national authorities and is transposed by the operator ASFINAG	The law on immission control (IG-Luft) transfers the competence for enacting driving bans or speed limits to the regional level.		Management of motorways lies within the responsibility of the operator (ASFINAG)
Rhônes-Alpes	Pricing of motorways lies within the responsibility of the operator.	Pricing of motorways lies within the responsibility of the operator.	All regulations/bans on national roads outside agglomerations lie within the competence of the national government/the préfet. The local governments/mayor can implement measures within the area of the agglomeration on local roads and roads with low traffic volumes. For highly frequented roads in the agglomeration, the local government needs to get the approval of the préfet.		
Piemonte & Valle d'Aosta	For the VAT the competence is of the Ministry of Economy, a second charge is for A.N.A.S (administration of national roads).	The relation price-vehicle type is managed by A.N.A.S.	The owner of the street controls the driving bans with the approval of A.N.A.S.	The owner of the street controls the speed limits with the approval of A.N.A.S.	A.N.A.S.

OVERVIEW: COMPETENCES OF REGIONAL AUTHORITIES IN THE MONITRAF REGIONS (AS OF AUGUST 2007)					
	Adjusting road tolls/charges (rate)	Adjusting road tolls/charges (structure)	Regulation/driving bans (low emission standards, night/weekend bans, etc.)	Speed limits	Road management (Dosing systems, other traffic management)
Southern Tyrol	The owner of the street is responsible for pricing (under consideration of Eu guidelines). As the owner of the motorway is the national state, the region has no competence. Pricing on regional and local roads lies within the responsibility of the region.	The region can implement mark-ups on their stretches of the motorway according to the Eurovignette Directive. These mark-ups need however be enacted through the national transport minister.	All regulations/bans on national roads are implemented through the national government. The region can make proposals for measures. The provinces can implement measures on regional roads or in cities/villages lying on these roads. On local roads, the local administrations can implement measures in coordination with the region.	Speed limits on motorways lie within the responsibility of the operator.	Bans on passing can be implemented through the motorway operator.
Central Switzerland/Ticino	All issues with respect to national roads lie within the responsibility of the Federal Roads Office. New regulation beginning from 2008. HGV charges on motorways are currently defined by the ordinance on the HGV fee.	See tolls/charges rates.	The night driving ban has been implemented by national law. There is no regional competence	Speed limits on national roads lie within the responsibility of the Federal Roads Office. Regional bodies are responsible for implementation.	The dosing system of the Gotthard tunnels lies within national competence. Regional bodies are responsible for implementation..

Table 6:

The different division of competences implies that a closer involvement of the national authorities is necessary for the implementation of regional measures with a possibility for quick reactions between the regional and national level.

- The general measures with night and Sunday driving bans and bans of high-emission vehicles can be implemented either through regional or national authorities. If the competence lies on the national level, MONITRAF regions need to prepare a clear communication of the necessity of the regional measures in order to initiate a quick implementation of the general measures.
- The responsibility for the intervention measure should be shifted to the regional level. This is especially important for triggering the speed limits which requires a quick reaction of authorities if the system is not fully automated. If the responsibility for speed limits currently lies with the national authorities or street operators, a general approval of the higher authority is necessary (something like a framework ordinance or decree which generally allows the implementation of speed limits but shifts the responsibility for the specific application to the regional level).

Communication of the MONITRAF set of regional measures

As the implementation of the set of regional MONITRAF measures is a major shift in current policies in some regions, the implementation needs to be supported by a broad and clear communication. This communication refers to four different levels of the implementation process and thus needs to be addressed to different actors:

1. Communicating the needs: with respect to the limited competences on regional level, most regions need to communicate the need for the implementation of the set of regional measures to the relevant national authorities. Either national authorities need to implement the measures or they have to shift responsibilities for the specific road stretches to the regional authorities (as was the case in Austria/Tyrol). The MONITRAF resolution should include a corresponding claim to national authorities.
2. Communicating the general policy context: In order to guarantee a smooth adjustment of operators to the new measures and to prevent an inefficient use of infrastructure or traffic shifts to other roads, the implementation of the regional measures needs to be widely communicated. If the set of road measures is supported through an increase of rolling motorway supply, especially this additional supply and the amount of subsidies needs to be communicated in order to reach the envisaged reduction of traffic volumes.
3. Communicating intervention measures to traffic users and to the public: Speed limits are in terms of communication not critical, as they do not require an adjustment within logistical processes. An on-site communication via automated traffic management systems seems sufficient. On the other hand, a flexible extension of driving bans requires a clear communication process as the constitute an interference with regular traffic flows and require a quick reaction/adjustment of operators. Similar to the Swiss "phase rouge", a quick information of operators needs to be established if this intervention measure is taken.
4. Communicating the effectiveness of measures: The impacts of general and intervention measures should periodically be communicated to higher authorities in order to verify the necessity of the regional measures. This communication is part of the MONITRAF monitoring system as described as main direction 1.

6 MAIN DIRECTION 3: MODAL SHIFT AND INTERNALISATION OF EXTERNAL COSTS

Main features:

- **Recommendation:** Measures supporting the modal shift from road to rail and the internalisation of exernal costs shall be implemented rapidly and harmonised between the alpine countries. This implies mainly the consideration of external costs in sensitive alpine areas in the EU Eurovignette Directive, the rapid realisation of the TEN-corridors at Mont Cenis and Brenner as well as a strengthened support of combined transport and a reduction of road trafic. An important element is also the possibility of cross financing road-rail. These measures can build on exisitng rail infrastructure projects and the Council regulation on Community financial aid as well as on current discussions for further developing the Eurovignette Directive.
- **Objective and desired effects:** From the MONITRAF point of view, regional demands should be adressed towards higher authorities. The proposed measures are supposed to set an incentive towards a more efficient use of vehicles and towards a modal shift from road to rail without risking additional environmental burdens for the MONITRAF regions.
- **Short description of measures:**
  - Harmonised surcharges on HGV tolls for higher emissions, noise and accidents in sensitive regions (first step: 25% surcharge according to the exisiting Eurovignette regulations, second step: consideration of further external costs)
  - Rigorous enforcement of exisitng regulations for road traffic (e.g. speed limits, working time of drivers)
  - Rapid realisation of rail base tunnels with additional measures, rail-friendly transport policy
  - Inclusion of passenger traffic
- **Responsibility:** EU and alpine countries, MONITRAF can propose recommendations and ideas for a common approach.

6.1 Experiences with modal shift from road to rail

Since 1994, with the new constitution article on modal shift for transalpine freight traffic, Switzerland has implemented a comprehensive set of measures for increasing the importance of rail traffic. The law on diverting road to rail traffic "Verlagerungsgesetz" of 1999 specifies the constitution article and sets a limit for transalpine road traffic of 650'000 HGV which has been initially envisaged for two years after the opening of the Lötschberg basetunnel at the latest. For reducing freight traffic on the road, several instruments and supporting measures have been introduced which have led to a reduction of transalpine HGV traffic already in 2005 (from 1.4 Mio. crossings in 2000 to 1.2 Mio. crossings in 2005). At the same time, the share of rail has been stabilised at a high level. In fact, growth in transport has been coped with on rail.

This development in Switzerland is mostly due to the introduction of the distance related heavy vehicle fee in 2001 which sets a financial incentive for shifting from road to rail. The night driving ban, the measures supporting the competitiveness of rail (modernisation, reform) and the supporting measures (see Annex of input paper Innsbruck) strengthen this effect. A central characteristic of the Swiss modal shift policy is the cross financing of rail infrastructure from revenues from HGV fee. The new base tunnels (Lötschberg and Gotthard) will then again lead to an increase of rail capacity. Especially first evaluations of impacts of the HGV fee can give important insights for the further development of a common MONITRAF approach on charges/tolls. The following aspects show the positive effects of the Swiss HGV fee (Federal Council of Switzerland 2004):

- In Switzerland, the introduction of the HGV fee (LSVA) in 2001 and the increase of the HGV weight limit from 28t to 34 (and to 40t in the year 2004) has led to a productivity increase of road freight traffic. The productivity increase due to the increase of weight limits was however more important than the productivity increase due to incentives of the HGV fee (LSVA).

- As the HGV fee is transport related it has increased the trend to prevent empty trips and has increased the incentive for optimising logistic processes.
- Although freight volume (in mio. t) transported in Switzerland has continuously increased since 2000, the absolute number of vehicle kilometres could be stabilised. Within the first three years after introducing the HGV fee, the number of vehicles kilometres could be reduced by 7% per year.
- Due to the productivity effect, operators could partly compensate the additional costs of the HGV fee. However, the increase of the HGV fee in 2005 has with high probability let to net costs for operators as only few possibilities for productivity increases were available after the first incentives of the introduction of the new regime.
- The HGV fee has furthermore increased the incentive to use low-emission vehicles. The additional financial incentive due to lower fees for low-emissions vehicles supports the general profitability of such vehicles due to lower operation costs.
- Thus, the HGV fee and the increase of weight limits also had positive environmental effects with reductions of PM10 and NOx emissions

Although Austria has introduced subsidies for combined transport as measures for supporting modal shift, road freight traffic has grown rapidly within the last years. The focus of measures has been put on regulating measures for road freight transport (night driving ban, speed limits, sectoral driving ban) to reduce environmental impacts of road transport. The construction of a Brenner base tunnel together with the southern and northern access routes would be necessary to improve the attractiveness of rail.

In France and Italy, rather high charges for the use of transalpine tunnels have been implemented which aim at covering the full infrastructure costs. The charges are currently differentiated for different emission standards of vehicles and for the number of axles of vehicles. The charges for vehicles with high emissions are about 5% higher than charges for low-emission vehicles. Furthermore, the transport of dangerous goods is prohibited in Fréjus and Mont-Blanc tunnels.

6.2 Getting the prices right on roads: internalisation of external costs in sensitive areas and supporting measures

6.2.1 Background on external costs in sensitive areas

Due to topographical and meteorological conditions, external costs in sensitive mountain regions differ from "insensitive", flat areas. Due to gradients and altitude, emissions of air pollutants are higher than in flat areas. Noise exposition is increased through inversions, the amphitheatre effect and reflections. Also, the risk of accidents of passenger cars is higher due to longer braking distance on steep roads and the fatal effects of accidents in tunnels.

However, a definition of sensitive areas and a distinction between insensitive regions has not yet been set at European level. Within the framework of the EU FP6 project GRACE a pragmatic definition for sensitive regions is chosen as basis for the calculation of external costs which seems appropriate for the objectives of MONITRAF (Lieb et al. 2006).

In sensitive regions:

- The environmental pressures are in general higher than in insensitive regions
- The same level of pressures leads to higher damages than in insensitive regions
- Environmental pressures endanger unique natural resources or cultural heritages

Within the GRACE case study, the external costs in sensitive areas are depicted as differences in external costs with respect to insensitive, flat regions. For the different categories of external costs, the relationship between emissions, concentration and impacts is isolated. For each part of the relationship a factor is analysed which

shows the magnitude of higher external costs in sensitive areas. In the end, the different parts are recomposed to derive a total markup factor for external costs in sensitive areas. These markup factors are differentiated for road and rail traffic as well as for freight and passenger transport and depicted for the indicators air pollution, noise, accidents as well as further aspects (visual intrusion, recreational value, etc.).

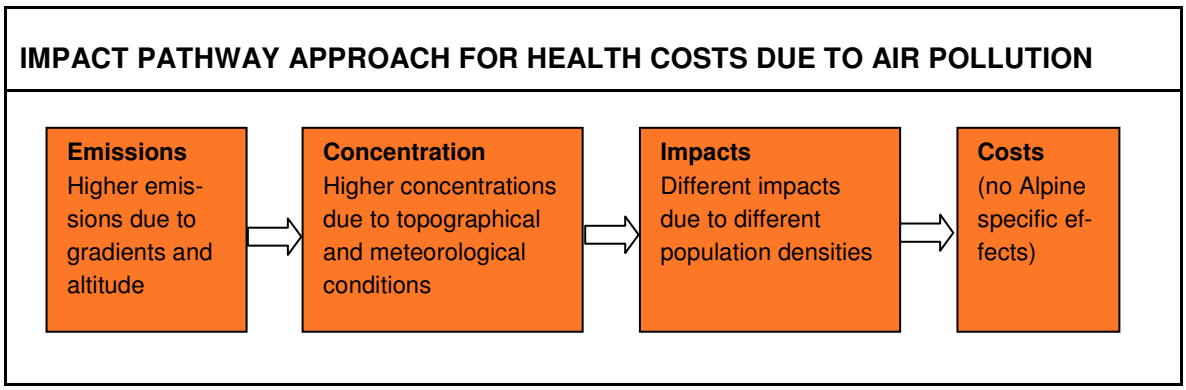

Figure 10: *Source: Lieb et al. 2006.*

MARK-UP FACTORS FOR EXTERNAL COSTS IN SENSITIVE REGIONS

	Cost driver	Total mark-up factor
Local air pollution Road	› Gradients lead to higher emissions (more pronounced for cars) › Higher emissions due to 1000m higher above sea level › Topographical and meteorological conditions: inversion leads to higher concentrations › Because of lower population density in permanent settlement area, impacts are lower than in densely populated areas.	5.25
Local air pollution Rail	› Local emissions are similar, higher emissions through gradients are generated at the place of electricity generation › Inversion leads to higher concentrations due to abrasion and whirling up › Lower population density	3.5
Noise Road	› Higher motor noise emissions due to gradients (more pronounced for HGV) › Higher noise propagation due to inversions, amphitheatre effect and reflections › Lower population density	5.0
Noise Rail	› No quantification for difference in noise emissions › Lower population density	4.15
Visual intrusion	› Visual intrusion is much higher than in flat areas › Higher traffic volume in mountainous areas intensifies this effect	10.7 (Road) 5.3 (Road)
Recreational value/ tourism	› Recreational value is highly reduced, added value of Alpine tourism is endangered	No quantification possible
Accidents	› Longer braking distance on descending slopes › Fatal effects of accidents in tunnels	1.22 (Road)

Table 7 *Summary of results of Lieb et al. 2006.*

The summary table shows that external costs in sensitive regions are considerably higher in sensitive Alpine regions than in flat regions. Despite the lower population density which has the effect of a downward adjustment, higher emissions and concentrations lead to external costs that are up to five times as high as in flat regions. A weighting with vehicle kilometres and thus the consideration of regional air pollutants reduces the factor for air pollutants by more than half. **Within a comprehensive view of all indicators, the mark-up factor for road traffic in sensitive areas is about 2** (passenger cars slightly below, HGV slightly above).

MARK-UP FACTORS FOR ADJUSTMENT OF EXTERNAL COSTS

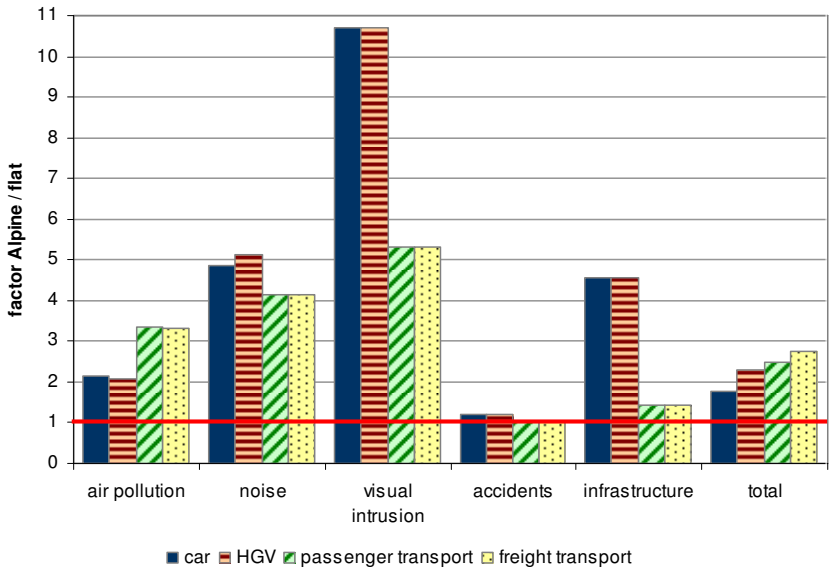

Figure 11: *Source: Lieb et al. 2006.*

6.2.2 Working towards harmonised corridor tolls

Existing tolls/charges on Alpine Corridors

The Eurovignette Directive is restricted to motorway charges for heavy good vehicles. However, it allows for additional tolls for bridges, tunnels or Alpine passages (see next paragraph). Some member states make use of this possibility of charging additional tolls for HGV for tunnels or specific stretches of Alpine passages and have also implemented tolls for passenger cars on motorways. Similar to the general motorway charges, the special tolls for tunnels and Alpine passages also have to be calculated along the principle of infrastructure cost charging and there is no flexibility for the inclusion of external costs.[7] Thus, the tolls for main relations on the different Alpine corridors vary widely. For example, total tolls for the passage from Dijon to Turin are about 324 € for an 40 t HGV while the same vehicle is charged only 110 € from Munich to Verona which is about the same distance (see Figure 12).

[7] See Eurovignette-Directive 1999/62/EG, Article 7 (9).

TOLLS FOR MAIN ALPINE ROUTES FPR STANDARD HGV

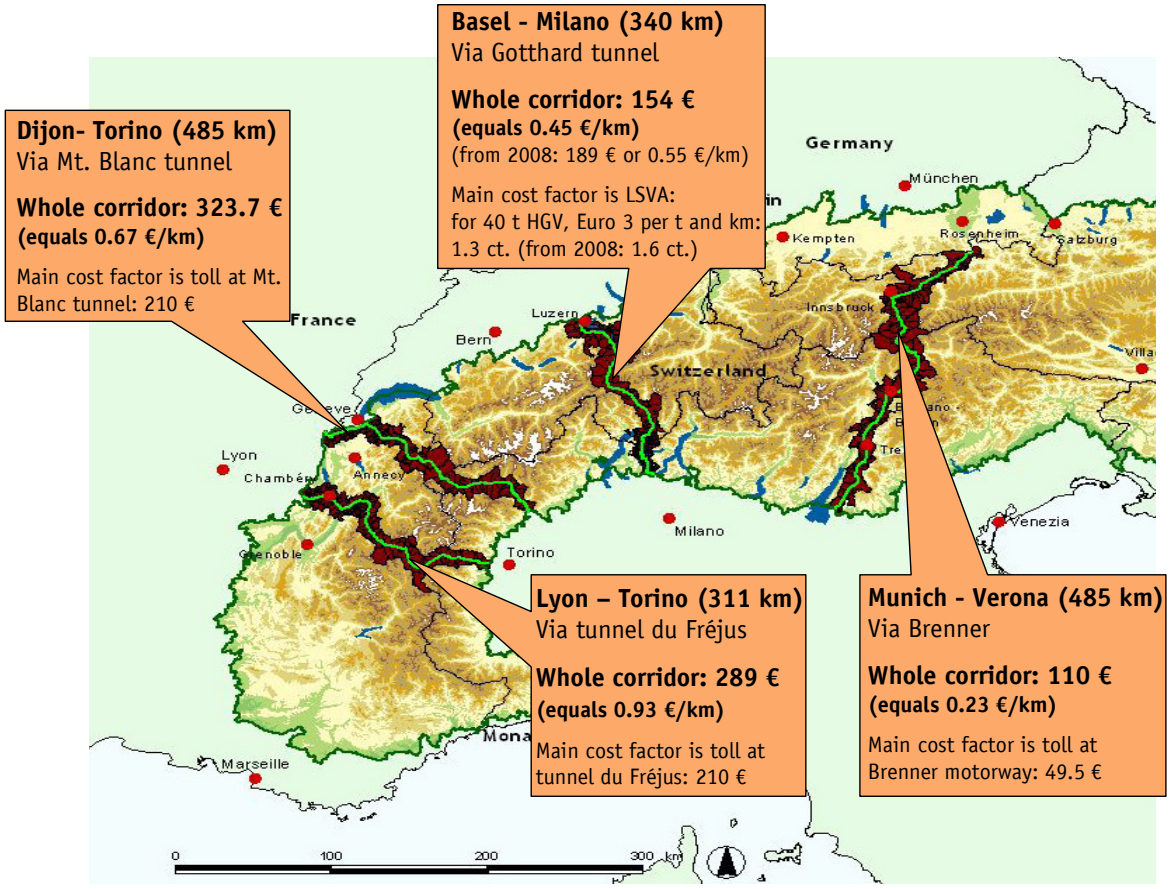

Figure 12:.The information shows tolls for a standard HGV (Euro 3, 40 t, 5 axles) as of 01.01.2008. All information excludes value added tax.

These differences in tolls can lead to an inefficient use of road infrastructure and to diverted traffic which leads to higher CO_2-emissions. From a MONITRAF point of view, a common approach in charging additional tolls would be advisable. This could be realised as a common "corridor toll" based on external costs in sensitive regions which is differentiated from general charges for infrastructure use. This would however require a greater flexibility of the Eurovignette-Directive, especially of the calculation principle for tolls.

New studies (Progtrans) concerning the construction of the Brenner base tunnel also make clear that a harmonisation of HGV charges towards the Swiss level will be necessary in Austria to realise the envisaged shift from road to rail.

MOTORWAY CHARGES AND ADDITIONAL TOLLS FOR HGV AND PW				
	F **Rhône-Alpes**	**I** **Brenner and Aosta Valley**	**CH** **Gotthard**	**A** **Brenner**
Motorway charges (according to Eurovignette-Directive in EU countries)	Motorway charge (differentiated for motorways, no general fee) A trial for the implementation of the Eurovignette Directive is currently conducted in Alsace.	Motorway charges (not differentiated per verhicle types)	HGV fee 1.3 – 1.7 €ct/km and ton of weight	Motorway charge for HGV > 3.5 t 15.5 – 32.5 €ct/km according to vehicle type (not differentiated into emission classes)
Additional tolls for tunnels and Alpine passages	Tolls for tunnels (differentiated for Euro classes and size of vehicle,) e.g. Fréjus and Mont-Blanc: 96.5 – 205 €	Tolls for tunnels (differentiated for Euro classes and size of vehicle), e.g. Fréjus and Mont-Blanc: 96.5 – 205 € Special charges on the Italian side of the Brenner motorway differentiated into stretches of the motorway.	-	Additional tolls for specific stretches of Alpine routes, e.g. Brenner: 22.8 – 49.4 € according to number of axis of vehicle.
Charges for passenger vehicles	General motorway charges according to type and stretch of motorway. Additional tolls for Fréjus and Mont-Blanc tunnels: 27 € single trip	General motorway charges according to type and stretch of motorway. Additional tolls for Fréjus and Mont-Blanc tunnels: 27 € single trip	Vignette/sticker: Ca. 25 €/year	Motorway charge in form of stickers: 10 days: 7.6 € 2 months: 21.8 € 1 year: 72.6 €

Table 8 All information on charges/feed excludes VAT.

In comparison to the Alpine Crossing Exchange (see chapter 5) which can only be implemented in the longer term, a common "corridor toll" could be easily implemented. Once the Alpine Crossing Exchange is implemented, it would replace the "corridor toll".

Further development of the EU Eurovignette Directive

Currently, total charges for HGV traffic differ considerably between the different Alpine corridors. The differences between the French passages and the Brenner are mostly due to the fact that the Eurovignette Directive does at the moment focus on the charging of infrastructure costs which are much higher for a passage with tunnel than for a passage without tunnel. According to the Eurovignette Directive 1999/62/EG, general motorway charges can only include infrastructure costs, external costs are not mentioned.

Until the revision of the Directive in 2006, the exclusively principle of the charging of infrastructure costs was also applied for tolls for tunnels, Alpine passages and bridges.[8] With the revision of the Directive 2006/38/EG, the principle was however opened for the charging of tolls. The revised Directive allows both for a differentiation of tolls

[8] According to the Directive, it is not possible to charge both general charges and tolls on the same road stretch.

according to emission classes and vehicle types and a mark-up in sensitive areas which suffer from a) acute congestion affecting the free movements of vehicles or b) significant environmental damage due to road traffic.[9] The mark-up of up to 25% in mountain areas can however only be charged, if the revenue generated from the mark-up is invested in priority projects of European interest which contribute directly to the alleviation of the congestion or environmental damage in question and which are located in the same corridor as the road section on which the mark-up is applied (see *Figure 13*). This binding provision on using the revenues is however rather problematic if no priority project on the same corridor is available/possible so that the actual use of the mark-up is limited.

In order to reduce the cost differences between the Alpine passages and the corresponding shift of traffic, the EU legislation needs to offer more flexibility in setting charges or specific tolls which also include the external costs of freight traffic in sensitive regions. In the short-term, a more flexible use of the mark-up factor should be allowed with less stringent provisions on the revenue recycling. In the medium to long-term however, only an inclusion of external costs and not only the charging of infrastructure costs would allow for a convergence of charges between the different Alpine passages.

In the amended EU Eurovignette Directive 2006/38/EG, HGV charges are determined along the approach of charging infrastructure costs. At the same time, it is laid down that the European Commission should until June 2008 "work on developing a generally applicable, transparent and comprehensible model for the assessment of external costs" which shall serve as basis for future calculations of infrastructure charges. This model shall be accompanied by an impact analysis of the internalisation of external costs for all modes of transport and a strategy for a stepwise implementation of the model for all modes of transport. As the Eurovignette Directive already allows a mark-up of 25% for HGV tolls in sensitive regions, the inclusion of all external costs would be an advantage for Alpine regions and would give them more flexibility in determining charges, especially if the revenue can be used for cross-financing road-rail (see chapter 4.3).

From a MONITRAF point of view it is crucial that the model developed by the European Commission takes account of the higher external costs in sensitive regions. As depicted above, the external costs in sensitive regions (air pollution, noise, visual intrusion, accidents) are about twice as high as in flat areas.

[9] In the view of the European Commission the toll for the Brenner motorway is even at the moment not conformable with EU legislation as it differentiates between different vehicle classes according to the number of axles and thus leads to higher costs for foreign operators than for Austrian operators (and thus breaks the principle of non-discrimination).

EUROVIGNETTE-DIRECTIVE: GENERAL CHARGES AND TOLLS

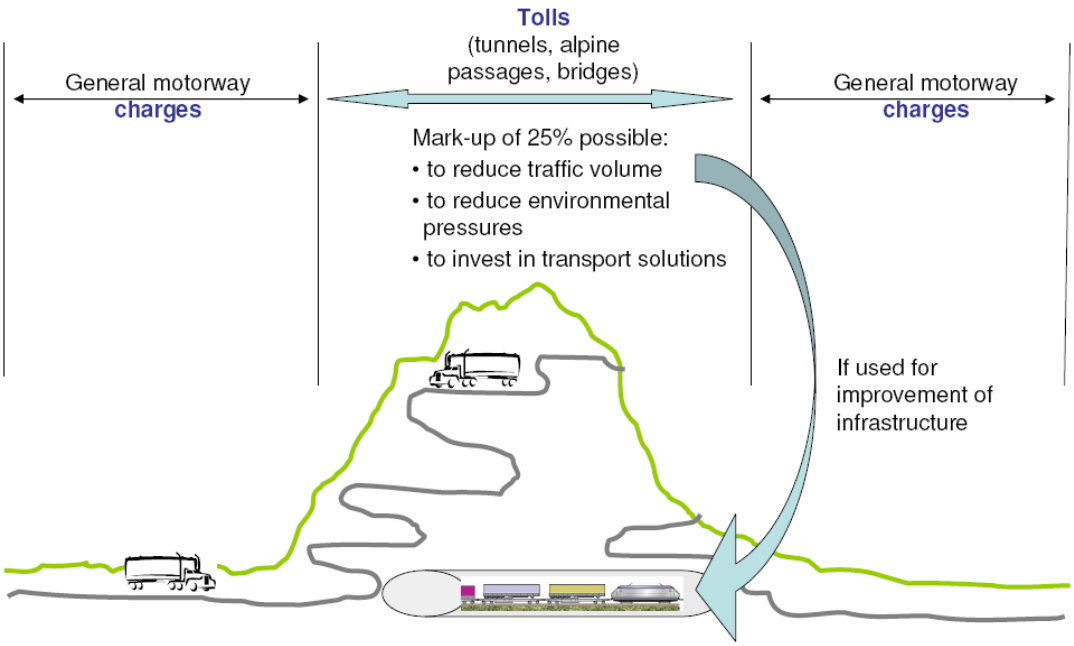

Figure 13:

MONITRAF recommendations for the further development of the Eurovignette Directive

- Along the existing possibilities of the Eurovignette Directive, motorway charges should be raised in all sensitive regions (at the moment it is possible to have 25% higher charges in sensitive regions).
- MONITRAF should call on the European Commission to ensure that external costs in sensitive regions are adequately considered in the currently developed model for the calculation of external costs, considering the sensitivity factors proposed by European research.
- In a longer term, the Eurovignette Directive should differentiate between charges for the financing of infrastructure (including external costs in insensitive regions) and additional tolls that can be imposed in sensitive regions (e.g. Alpine corridors) to make up for the higher external costs. The revised directive should give the possibility to have total charges in sensitive areas which are twice as high as in flat regions to fully implement the polluter pays principle.
- The Eurovignette Directive should give a broader possibility for cross financing road-rail (currently it is only possible on the same corridor).
- In order to prevent distributional effects of HGV traffic between the different Alpine passages and the diversion of traffic, MONITRAF recommends the harmonisation of tolls towards a common "corridor toll" reflecting the external costs of Alpine traffic. The Eurovignette Directive either needs to give a broader flexibility to implement such a common "corridor toll" or should include a special provision on this aspect.

6.2.3 Supporting measures for road transport: Rigorous enforcement of regulations (speed limit, driving times)

In Switzerland, the "Verlagerungsgesetz" lays down that the instruments for modal shift regarding the reduction of road traffic need to be supported by a strict enforcement of all relevant regulations. An intensification of HGV controls has been defined as supporting measure in the "Verlagerungsgesetz" and is financed through revenues from the heavy vehicle fee (about 20 Mio. CHF per year). In a first phase, mobile controls are increased so that a higher percentage of HGV can be controlled. For a second phase, the implementation of so-called control centers is planned which allow an automation of some aspects of HGV controls (e.g. weight) (ASTRA 2003).

For the other Alpine countries, a crucial aspect which influences the cost of freight transport on road is the compliance with driving times, rules on breaks and rest periods as laid down in the Council regulation 3820/85 of the EU. A study by Prognos for German Railways has shown that non-compliance of regulations in road transport can lead to savings in transport costs which lead to competitive disadvantages for rail transport. The study shows that speed exceedances are the most common violation which can lead to cost savings of up to 6.6%. Violation of driving and resting times have the second highest frequency and can lead to cost savings of up to nearly 2%. Also, early starts after Sunday driving bans of half an hour can save transport costs of up to 0.5%. The greatest saving potential can be realised by a combination of illegal employment of drivers in combination with wage dumping and the exceedance of driving times with savings of up to 50%. Especially, if several regulations are violated at the same time, the costs of road transport are considerably distorted and other positive incentives for shifting to rail transport could be overcompensated. The study makes clear that a rigorous enforcement requires a higher control intensity and that it can only be effective if fines for breaking the regulations on driving times, speed limits, illegal employment, etc. are higher than the potential savings from breaking these rules (Prognos 2003).

A higher control and enforcement intensity combined with higher fines for non-compliances is thus necessary to ensure that rail transport can reach a competitive advantage over road transport.

6.3 Improving the competitiveness of rail transport: new infrastructure and support of combined traffic

In order to achieve a modal shift from road to rail, the attractiveness of rail needs to be increased so that it can become cost competitive over road transport. This includes the building of new infrastructure (especially the new base tunnels in Switzerland, at the Brenner and Mont Cenis) and financial support of combined traffic to set additional incentives for modal shift. Especially the rolling motorway is an attractive alternative to road transport which could help to reduce environmental pressures in sensitive Alpine regions.

In this area, MONITRAF common measures can build on existing approaches in the Alpine countries. Austria and France have already implemented subsidies for combined transport, especially the rolling motorway. In Switzerland, a comprehensive policy approach for increasing the attractiveness of rail has been implemented within the "Verlagerungsgesetz". All countries plan the building of new infrastructure, one of the new tunnels (Lötschberg) in Switzerland is already finished, the other (Gotthard) will be finished in 2017. In Austria, plans for a Brenner base tunnel are progressing and France and Italy plan to build a new base tunnel at Mont Cenis.

Experiences from the Swiss modal shift policy

In Switzerland, it has become clear that the modal shift from road to rail and the efficient use of new rail infrastructure (with two basetunnels) can only be achieved with a targeted promotion of rail transport through granting of subsidies. Thus, two accompanying measures have been introduced with the modal shift policy, a reservation system for combined transport and a subsidy scheme for the reduction of track charges for all types of rail transport.

The support of rail transport has led to an increase of both total freight and share transported by unaccompanied combined transport and the rolling motorway. The share of unaccompanied combined transport increased from 28 to nearly 35% between 2001 and 2004, the share of the rolling motorway from 3 to 5%. The loss of importance of complete wagon load as seen in the 1990s could however not be stopped and the share of this transport type was further reduced (Progtrans 2006).

DEVELOPMENT OF NUMBER OF HGV ON THE ROAD AND TONS TRANSPORTED BY COMBINED TRANSPORT IN SWITZERLAND (INDEX)

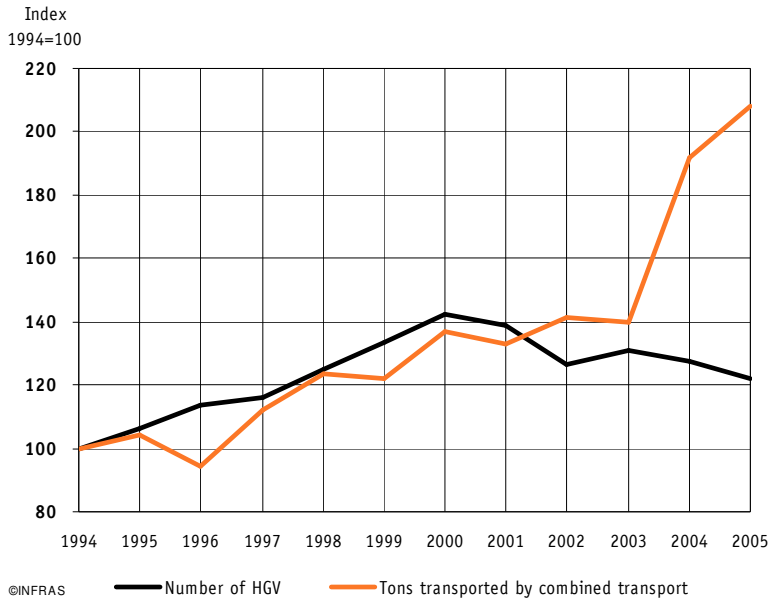

Figure 14: *Source: ARE 2005 Güterverkehr durch die Schweizer Alpen 2004.*

In the **reservation and subsidy system**, operators develop proposals for their supply of combined transport for which the Federal Office of Transport then decides the amount of subsidies (per train and shipment). This system has led to an increase in combined traffic since its introduction and is seen as important part of the modal shift policy. The reservation system has seen several improvements within the last years so that the total amount of subsidies could be reduced by about 30% while guaranteeing the same standard of combined transport.

The evaluation of the reservation system in Switzerland in 2006 has provided some interesting results for the design of efficient subsidy schemes (Interface and RappTrans 2006):

- When subsidising rail transport it needs to be ensured that subsidies focus on transport of goods which are transported on both road and rail and are not exclusively transported by rail in order to prevent windfall gains. The same is true for goods that have a high road affinity and will hardly be shifted to rail. Table 9 gives an indication on the road affinity of different types of goods. Although these factors have been derived for Switzerland and might be slightly different for other countries due to different logistic structures, the table gives a good overview on the classification of different goods.

AFFINITY FOR COMBINED TRANSPORT OF DIFFERENT GOOD TYPES	
Commodity group/types of goods	Affinity factor (= highest possible share of traffic volume which can be shifted to rail)
Stones, earths, building materials	25%
Ores and scrap metal Iron, steel and non-iron metals	37%
Agricultural and forestry products	40%
Solid mineral fuels Mineral oil, mineral oil products	40%
Fertilizers, chemical products	62%
Other aliments and animal food	75%
Vehicles, machines other semi-finished and finished products	80%

Table 9: *Values have been derived for Switzerland and might be slightly different in other countries. However, the classification of goods should hold for other countries as well; source: Ruesch M., Paras M., Kettner S. (2000) as cited in Interface and RappTrans (2006)*

- According to the good and the distance of combined traffic the cost structure differs considerably so that different subsidy schemes would be necessary. The Swiss experience has shown that for combined traffic a direct subsidy of operators is the most efficient subsidy scheme as it minimised administrative costs.
- The compensations within the Swiss reservation system are currently based on a mixed indicator of trains and shipments. If it focused only on the number of trains there would be no incentive to increase the efficiency of existing infrastructure.

At the same time, subsidies are granted for operators of infrastructure to **reduce track charges** which is profitable for both combined transport and complete wagon load. The analysis of subsidy schemes for unaccompanied combined traffic and complete wagon load had the objective to analyse potential unwanted effects of these subsidies (Ecoplan and MDS Transmodal 2006). A more pronounced subsidy for unaccompanied combined traffic could lead to a competitive advantage over complete wagon load and a shift of shipments to unaccompanied combined traffic. Such a shift would bring along an efficiency loss of rail transport as some goods can especially over long distances be transported much more efficiently by complete wagon load as this includes the lowest deadweight.

A modelling of seven different subsidy scenarios made clear that higher subsidies for combined transport do not lead to a systematic shift with negative effects for complete wagon load. The analysis made much more clear that the higher importance of unaccompanied combined traffic is not due to higher subsidies but much more to structural advantages of this rail type:

- An analysis of data shows that the logistical process of unaccompanied combined traffic is favourable as there is a higher use of containers and swap bodies.
- The demand for goods that are typically transported with complete wagon load decreases while the demand for goods with a close affinity to unaccompanied combined traffic rises (especially chemical products).
- The importance of maritime transport as direct competitor to complete wagon load has risen in the last years.
- An important factor for a higher use of unaccompanied combined transport is due to quality aspects (fewer delays, more reliable, easier to plan).

Summarising these experiences, it becomes clear that a well-designed subsidy scheme for rail transport can support modal shift from road to rail (BAV 2007). Especially, combined transport can be seen as direct alternative to road transport, a shift from road to complete wagon load is less realistic as complete wagon load is mostly used for long distance transport and bulk commodities. Thus, subsidies should put more importance on the promotion

of combined transport, where especially the rolling motorway offers an attractive alternative to road transport as it leaves the highest flexibility to operators.

Link 1: Council regulation on Community financial aid

To increase the attractiveness of rail and to set further incentives for modal shift from road to rail, the fast construction of the planned base tunnels is necessary. This is especially the case for the two base tunnels at Brenner and Mont Cenis for which the beginning of construction partly depends on clarifications of financing. Both base tunnels are already considered as priority projects in the proposal of the revision of the Council regulation on Community financial aid which states that 20% of investments for building the base tunnels are supplied by Community funds. It has to be made sure that the largest possible funding which is allowed under the Council regulation is effectively guaranteed for the building of Brenner and Mont Cenis base tunnels.

Link 2: Ensuring the possibility of cross-financing

A crucial aspect for the financing of rail infrastructure and the construction of new base tunnels would be a broader possibility of cross-financing road-rail. In Switzerland, the LSVA brought a revenue of 1.2 Mrd. CHF in 2005, with the increase of LSVA fees in 2007 the revenue will even increase. Two thirds of this revenue go to the national level and are used for financing of new rail projects, especially the construction of the new base tunnels. The cross-financing is thus an important element of the infrastructure financing. A similar possibility for cross financing would be important for the other Alpine countries, it has to be made sure that the revision of the Eurovignette Directive leaves this possibility open.

Possible enhancement of existing measures: Financial support for combined transport

A shift from road to rail and an efficient capacity utilisation needs to be supported through well-targeted subsidies for combined transport. Building on the Swiss experience and the existing initiatives in France and Austria for the promotion of combined transport, MONITRAF partners should join forces to ensure the competitiveness of this transport type over road transport. It has become clear that unaccompanied combined transport (trailers, containers) has the greatest possibility for becoming competitive over road transport as it leaves greater flexibility to operators. In addition, the rolling motorway could become an alternative to road transport on shorter distances as it involves the smallest time losses with loading and unloading. Thus the financial support of combined transport has two dimensions:

1. The support for a long term sustainable and competitive transport alternative (unaccompanied combined transport)
2. The support of a short term flanking measure and alternative to road transport oriented measures (Rolling motorway).

In designing a common support for rail transport, MONITRAF should use synergies with other activities on European level, especially the Marco Polo programme which offers financial support for operators that are willing to shift transport from road to rail.[10] The second phase of the Marco Polo Programme started in 2007 with calls for the upcoming year already finished. The next call for proposals will take place in the last quarter of 2007. MONITRAF partners could use the common internet platform for communicating information on Marco Polo and its possibilities. A direct link to MONITRAF activities is however not directly obvious as Marco Polo supports operators from all over Europe as well as neighbouring countries on which MONITRAF has only little influence.

[10] http://ec.europa.eu/transport/marcopolo/index_en.htm

7 MAIN DIRECTION 4: INNOVATIVE INSTRUMENTS FOR CONTROLLING ALPINE FREIGHT TRAFFIC (ALPINE CROSSING EXCHANGE)

Main features:

- **Recommendation:** Within the process of the "Suivi de Zurich" and support of the transport ministers of the alpine countries a common study on an Alpine Crossing Exchange as a new and innovative instrument for controlling the impacts of alpine freight traffic is elaborated. The transit regions support this idea of an Alpine Crossing Exchange as a market-based instruments which sets incentives into an efficient use of vehicles and infrastructure and reduces the overall impacts of alpine freight transport. This study however needs to consider specific requirements that arise from a regional point of view.
- **Objectives and desired effects:** MONITRAF regions specify the regional requirements which need to be considered within the international study. It is crucial, that the Alpine Crossing Exchange is introduced in all alpine countries in order to prevent traffic shifts between the different alpine passages. In needs to be ensured that short-distance traffic between the regions which cannot be shifted to rail is not discriminated under the Alpine Crossing Exchange.
- **Short description of the Alpine Crossing Exchange:**
  - The total number of HGV is regulated or a reduction path for air emissions is defined
  - The number of transit allowances is reduced in pre-defined steps
  - Regional short-distance traffic is treated preferably in order to prevent a discrimination
  - The Alpine Crossing Exchange is supported by regional measures as described in main direction 2.
  - MONITRAF regions should be involved in the elaboration of the study
- **Responsibilities:** EU und alpine countries, MONITRAF specifies regional requirements which need to be considered in the study under the "Suivi de Zurich".

7.1 The need for a new and innovative instrument on international level

The development of transalpine freight traffic over the last years has made clear that regulations or moderate increases of charges or tolls alone are not sufficient to reduce the volume of HGV freight traffic on the road and its environmental impacts. Rather, the further integration of the European Union as well as an ever higher specialisation of production processes will further increase the freight traffic transported over the Alps. It also becomes clear that costs alone are not the only factor to determine the choice of operators for a transport mode: even if rail is less expensive on some relations, operators still choose the road solution as it leaves greater flexibility. Thus, several institutions which lobby for a sustainable development in Alpine regions like the Alpine Initiative as well as politicians call for an absolute limit to HGV traffic in the Alps.

The Austrian ecopoint system was the first instrument to take up the idea of limiting Alpine freight traffic. Introduced in 1993, the ecopoint system has set an absolute limit to transport NOx emissions. In an agreement with the European Union, it was agreed that absolute emissions of NOx should be reduced in yearly steps so that up to 2003 a total reduction of 60% of emissions could be reached. The total amount of ecopoints was distributed to EU member states according to a pre-defined allocation mechanism but could not be traded between countries or operators. In order to prevent that technical improvements could lead to a further increase of traffic volumes, the ecopoint system included a second mechanism which regulated the absolute number of vehicles: if the number of vehicles grew by more than 8% over the 1991 volume, the number of ecopoints for the coming year were to be reduced by 4%. Thus, the ecopoint system was the first instrument to effectively limiting the number of HGV and their environmental impacts to a pre-defined limit (Herry/Infras/Prognos 1997). Due to pressure from the EU, the ecopoint system has been stopped in 2003 as it did not comply with legislation on free competition.

Following the experience with the Austrian ecopoint system, the discussion on a new instrument has turned to a cap-and-trade solution. Such a cap-and-trade solution could effectively limit the number of transalpine traffic in an efficient way as only trips with high avoidance costs would be transported. Under the name Alpine Crossing Exchange this instrument was for the first time presented by the Alpine Initiative and quickly taken up by politicians from Switzerland and European countries. The mid-term review of the transport White Paper of the European Commission does also include the Alpine Crossing Exchange as possible measure.

The idea of the Alpine Crossing Exchange has officially been taken up in the Swiss modal shift policy in the draft law on further developing the modal shift policy (Güterverkehrsvorlage) which is currently discussed by parliament. This draft law states that Switzerland will work towards an international introduction of an Alpine Crossing Exchange as this system can effectively manage the growing number of HGV traffic without leading to distributional effects between the Alpine countries. However, a unilateral introduction of the Alpine Crossing Exchange is not deemed possible. The draft law builds on the results of two comprehensive studies which have analysed different options as well as practicability of an Alpine Crossing Exchange (Ecoplan and RappTrans 2004/ Ecoplan, RappTrans and Moll 2007).

The first study of Ecoplan and RappTrans (2004) analyses two basic models for an Alpine Crossing Exchange. The first model is a mandatory cap-and-trade system which provides the implementation of a volume-based restriction of transalpine, road-based freight traffic. The crossing rights could initially be awarded either free of charge, sold at a fixed price, or auctioned off and could later on be freely traded to ensure the most efficient allocation of crossing rights. Another option would be a voluntary slot management with dynamic pricing which would authorise the passage of an Alpine crossing point during a specific time window or slot. The aim is to improve the utilisation of road capacity and to reduce traffic queues and waiting time. The first study also makes clear that both forms for the Alpine Crossing Exchange would be technically and operationally feasible. Concerning the impacts of the two models, it is stated that the cap-and-trade model would lead to an increase in the cost of road transport and to a reassignment of freight traffic from road to rail. The slot-management system would allow more rapid journeys for time-critical shipments, however these time gains would only be substantial on 30 days at today's traffic volumes.

On the basis of the first study, it has been decided that the first option with the cap-and-trade solution has a greater potential to support the Swiss modal shift policy so that a second study provides an in-depth feasibility study of this approach (Ecoplan, RappTrans and Moll 2007). It defines the spatial scope of the Alpine Crossing Exchange as well as quantitative targets and provides a possible solution for the treatment of short-distance traffic. Concerning short-distance traffic, the feasibility study makes clear that the Alpine Crossing Exchange may not lead to an obstruction of traffic between neighbouring economic areas on both sides of the Alpine crossings and proposes a reduction system for local and short distance traffic. For the initial allocation process, the study argues for a full auctioning of crossing rights as this allocation mechanism ensures the greatest incentives to shift from road to rail. Furthermore, the study shows that an Alpine Crossing Exchange would be fully operational via the use of on-board units and the installation of points of sale. Investigating the costs of introducing an Alpine Crossing Exchange, the study makes clear that the system would become most cost-efficient if implemented on the whole Alpine arch.

Also in Austria new attempts to study possible models of tradeable permits for Alpine crossings, commissioned by the Scientific Academy (Herry et.al. 2006). The prestudy has focussed on the reduction of air pollutants (NOx) and CO_2 and recommends to analyse the model more in-depth, especially with regard to implementation and international harmonisation.

On an international level, the process of 'Suivi de Zurich' has taken up the idea of an Alpine Crossing Exchange and has decided to commission a study for analysing options and practicability of an international introduction of a cap-and-trade system. This study will be commissioned by the Austrian ministry of transport, innovation and technology in 2007. MONITRAF partners have decided on the governmental conference in Innsbruck in April 2007 that MONITRAF does not elaborate its own approach and recommendations for an Alpine Crossing Exchange but that much more the activities under the Suivi de Zurich should be supported. Thus, MONITRAF has send a proposal with MONITRAF inputs for the description of work to be considered for the Suivi de Zurich study, also stating the wish to participate in discussions within this project. Background information on the major aspects of an Alpine Crossing Exchange which has been analysed for the development of this proposal is documented in Annex 2.

7.2 Conditions from the viewpoint of the regions

The MONITRAF regions support the elaboration of a common study under the Suivi de Zurich. In order to consider regional needs in a comprehensive way, the study should analyse the following issues properly.

General approach of an Alpine Crossing Exchange

- The study should focus on a balanced international cap-and-trade system as a central measure to reduce environmental nuisances within transalpine corridors. It is useful to evaluate different options in order to have a decision platform for future steps.
- As the study will support the decision making process on a European scale, it should take into account regional characteristics and existing national and regional approaches to Alpine transit traffic. The cap-and-trade system should use maximal synergies with existing measures.
- The Swiss government has already commissioned several studies for an Alpine Crossing Exchange in Switzerland. The European study can build on this work however it should not constrict the project team to approaches considered in these studies.
- The options may not lead to distortions of transalpine traffic between different corridors. Its implementation should be feasible and may not lead to additional costs at regional level.

Setting the reduction aim/the absolute cap

Within a cap-and-trade system, an indicator with an absolute value needs to be taken as basis. According to specific pressures and policy aims, the cap/reduction aim can be formulated on the basis of different indicators:

- Number of Alpine lorry crossings: According to the Swiss objective of reducing the number of Alpine transits, a maximum number of Alpine transits could be defined for all Alpine passages. Within an approach linked to the number of crossings, the study should specifically focus on the question if and how the cap should be differentiated for the main Alpine passages without leading to efficiency losses (inefficient use of road infrastructure).
- Environmental indicator: Alternatively, the cap/reduction aim could be linked to one or several environmental indicators NOx, CO2, noise, etc.). If the cap is based on one single environmental indicator, possible trade-offs need to be considered.
- Mixed indicator: In order to realise the advantages of both alternatives, the cap could also be based on a mixed indicator considering incentives to use the railway alternative. For discussing such a system, the project team can build on the experience with the Austrian ecopoint system.

The project team should analyse feasible approaches for the different possibilities and present advantages and disadvantages as input for policy discussion on a European scale. The following criteria should be included in this analysis:

- Possibility/risk of distributional problems between Alpine countries/Alpine passages,
- Efficiency aspects: The system should lead to an efficient use of existing road and rail infrastructure,
- Setting a clear and transparent reduction path: In order to allow a sufficient adjustment time for operators, the cap/reduction aim should be introduced/tightened in several steps without producing ‘hot air’ in the initial state.

Initial allocation and trading platform

Although the initial allocation of allowances does not influence the efficient functioning of the system, it is a central question from a distributional point of view. Thus, the study should take into account the following aspects/questions:

- Differences between an allocation system according to the initial state (so-called grandfathering) and an auctioning system,
- On which basis/baseline period can the allocation be based? How can new market players be included in the system?

- Possibility of introducing the system with a grandfathering allocation and a stepwise shift to auctioning.

Although the study should focus on different design options for a European Alpine Crossing Exchange, it also needs to consider some operational issues as these can crucially influence the feasibility of the system:

- Trading of allowances: How will the (international) trading be organised in order to allow the greatest flexibility to market players?
- Evaluation of simple approaches in order to treat big and small operators equally.

Short-distance regional traffic

A crucial question for the acceptance of the ACE for the MONITRAF partners will be the treatment of short-distance traffic. With an undifferentiated treatment, the cost of the Alpine Crossing Exchange would be disproportionally higher for regional transport compared to long-distance transport. Thus, mechanisms need to be implemented in order to avoid additional regional burdens. Regarding this issue, the following aspects should be considered:

- Which approaches are possible for short-distance traffic within different allocation systems?
- How can strategic behaviour of operators be avoided (reloading of freight etc.)?

Based on existing knowledge, the following variants to treat short distance regional transport should be considered in the study:

- Exemptions of regional traffic (in general, for several lorry categories, for specific segments)
- KM-Dependency of allowances
- Rebates for high frequent users
- Redistribution of Exchange income to the regions
- Supply of important alternatives (such as Rolling Motorway) and incentive systems to use the railway alternative.

As a follow-up to the letter with MONITRAF requirements, MONITRAF partners should try to participate in the process of elaborating the international study, e.g. as participant of the project steering group.

8 IMPLEMENTATION OF COMMON MEASURES: SUGGESTIONS FOR FURTHER STEPS

Institutionalisation of MONITRAF and further development of the exchange platform

An effective as well as efficient set of measures will have to be adjusted over time according to monitoring results and new developments on regional, national and European level. MONITRAF currently acts as a common voice for the most affected Alpine regions but the voice will be lost if MONITRAF is not institutionalised to live on after the official project end.

It needs to be ensured that the existing MONITRAF platform is further developed to serve as exchange platform for the regions. The platform should not be restricted to the monitoring data base but should much more serve as Best Practice forum and for an active exchange with experiences on measures. Also, it could be used to formulate common positions, strategies and claims to higher authorities. In order to ensure that the platform does not exclusively exist as virtual space, a yearly conference or workshop could be hosted (rotational in MONITRAF regions). The yearly meeting would produce a MONITRAF year book including monitoring information and the evaluation of measures.

A common MONITRAF resolution

The recommendations on common measures shall be transported to politicians and European institutions via the common voice of MONITRAF regions. The main proposals of the common measures are summarised in a political resolution which has been signed by official representatives from all MONITRAF region on the final MONITRAF conference. This political resolution includes:

- The common view of MONITRAF regions that transalpine freight traffic leads to high environmental burdens for the local population as well as nature and environment.
- The perception that unilateral measures cannot effectively reduce traffic volumes and its environmental impacts and that a common approach of all Alpine countries and regions is necessary.
- Recommendations on common measures including a common monitoring system, regional measures for reducing environmental impacts of freight traffic, proposals for improving the modal shift policy as well as the introduction of an Alpine Crossing exchange as innovative market-based instrument.
- A proposal for the continuation of MONITRAF activities in a second phase with a focus on institutionalising the common monitoring system.

As up to now common efforts to tackle the growing pressures from freight traffic were limited, the signing of the common resolution can be seen as a crucial milestone within Alpine freight traffic policy and lays the basis for a future cooperation between the Alpine regions.

Aim and elements of a second MONITRAF phase

Activities within the MONITRAF project have made clear that the exchange of Best Practices, ideas and data on transalpine traffic and its impacts between the different Alpine regions is a crucial precondition for developing a common approach. Also, the needs and problems of the Alpine regions can be easier and more effectively communicated with a common and strong voice in order to accelerate political processes. Thus, MONITRAF aims at continuing its activities after the official end of the project and works towards a MONITRAF 2 project.

The following specific objectives are the basis for this prolongation of MONITRAF acitivities:

- Implementation of the common monitoring system which is proposed as common measure within this report. MONITRAF regions will be responsible for delivering data on environmental indicators in order to obtain a continuous and comparable data set.
- Publication of monitoring data in a yearly report as basis for further developing and improving common measures.
- Further developing the MONITRAF network and extending the network to the Alpine Convention as well as further Alpine regions.
- Establishment of a regional platform to exchange idea and experiences with Best Practices with annual conferences.

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ANNEX 1: OVERVIEW OF CURRENT PRACTICE

INSTITUTIONAL ASPECTS

The provision and maintenance of road infrastructure is organised in different ways in the MONITRAF partner regions. If infrastructure is provided by public authorities, it is highly possible that it is financed with the help of public funds (e.g. revenue from mineral oil tax) or subsidies. On the other side, if road infrastructure is privatised, it does not obtain any public funds and the revenue from tolls or other pricing mechanisms needs to cover the expenses for building and maintaining roads.

- **Switzerland:** The federal constitution states that the federal government is responsible for the provision and maintenance of road infrastructure. It also states how the revenue from mineral oil taxes has to be used.
- **Austria:** the ASFINAG which is a company belonging to the federal government (Gesellschaft des Bundes) is responsible for planning, financing, constructing, maintaining and tolling all Austrian motorways and expressways. It has been founded in 1982 and, as company, has increased its responsibilities since 1997 (e.g. the charging of tolls was not allowed before).
- **France:** different private organisations for different parts of French motorways organised un-der ASFA (Association des Sociétés Françaises d'autorautes de d'ourvrages à péage).
- **Italy:** In Italy, the motorways are run by a private company, the Società Autostrade which was founded in 1956. The company was privatised in 2000 and it is now quoted on the stock ex-change.

The organisation of the motorways is a crucial factor that needs to be considered when discussing common measures especially if the measure is supposed to replace the existing pricing systems.

EXISTING MEASURES FOR FREIGHT TRANSPORT

Existing measures in the different MONITRAF regions can serve as basis for the definition of common measures. The following tables depict existing measures for freight transport per MONITRAF region. The tables include information from regional action plans as well as additional official documents and internet sites of the regional authorities.

From top to bottom of the tables, the measures are grouped according type of measure, from "soft" measures (information, planning,..) to "hard" measures like market-based instruments or regulatory measures. Measures that include an subsidy for specific transport types are included within the group of market-based instruments (as counterpart to charges).

From left to right, different characteristics of the measures are depicted (status, traffic mode, focus/scale, objective/policy aim, temporal aspects). Providing the information in such a structured way helps to identify main aspects of existing measures (e.g. measures for traffic type road (rail) are mostly implemented on regional (local) level).

MEASURES FREIGHT, AUSTRIA							
	Name of measure	**Status**	**Traffic mode**	**Focus/ scale**	**Objec-tive/policy aim**	**Temporal aspects**	**Description**
Infrastructure	Increase of rail infra-structure (AP Tirol): Basetunnel Brenner	Planned	Rail	National	Increase the share of freight and public transport on rail.	General	The action programme Tirol suggests an ex-tension of rail infrastructure.
Market based	Subsidy for combined traffic and rolling mo-torway (AP Tirol)	Existing	Rail	National/ regional	Diversion road-rail	General	Through a subsidy for combined traffic and rolling motorway, their importance for freight transport shall be increased.
	Road pricing	Imple-mented	Road	Re-gional/ national	Financing	General	Special road pricing passages: Brenner-motorway A 13, alpine-crossing part of Tau-ern-motorway A10, Pyhrn-motorway A 9, Karawanken-motorway A 11 (http://www.oeamtc.at/index.php?type=article&id=1056862&menu_active=116). Since 2004: electronic road pricing system for all vehicles above 3,5 tons on all motor-ways (0,13 €/km for two-axle vehicles, 0,182 €/km for three-axles and 0,273 €/km for four-axles vehicles).
Regulatory measures	Speed limits	Imple-mented	Road	Regional	Reduction of en-vironmental pressures	General	Speed limit of 100 km/h on motorway A12 between Kufstein and Zirl (until end of April 2007), from Nov. 2007 on, a “Verkehrsbeein-flussunsanlage” is supposed to be put into operation.

MEASURES FREIGHT, AUSTRIA							
	Name of measure	**Status**	**Traffic mode**	**Focus/ scale**	**Objec-tive/policy aim**	**Temporal aspects**	**Description**
	Ecopoint system	Abolished in 2003	Road, transit traffic above 7.5 t	National	reduction of NO_x emissions from HGVs transiting through Austria by 60% (1991-2003), limit transit journeys to maximum 8% above the level of 1991;	General	A fixed number of eco points were allocated to Member States for each year. Eco points were not tradeable. Each lorry involved in transit traffic needs to carry a Conformity of Production (COP) document which includes information on its NO_x values. With the help of this COP document, the number of eco-points can be analysed. Automatic "brake": if transit increases by more than 8% within one year with respect to 1991, the number of eco points is automatically reduced by 4% in the following year ("108% Klausel"). An exeption of Euro IV lorries from the eco-point system was envisaged.
	Night ban for lorries	Implemented	Road	Regional	Reduction of environmental pressures	Night time	Nigh ban for lorries on motorway A12, 22-5 h, during the wintertime: from 20h. (Kufstein – Zirl)
	Ban for high-emission lorries at the Brenner axis	Implemented	Road	Regional	Reduction of environmental pressures	General	Ban of heavy good vehicles with emissions standards Euro 0 and 1. From Nov. 2008: also Euro 2 also Südtirol (Kufstein – Zirl)
	Sectoral driving ban	Planned	Road	Regional	Reduction of environmental pressures	General	Ban for transport of specific goods on motorway A 12 (Kufstein-Zirl) which could be easily transferred to rail (measure is still discussed),

MEASURES FREIGHT, FRANCE							
	Name of measure	**Status**	**Traffic mode**	**Focus/ scale**	**Objective /policy aim**	**Temporal aspects**	**Description**
Infrastructure	Increase of railway infrastructure (Basetunnel Lyon-Turin)	Planned	Rail	National	Increase share of transalpine freight transported per rail or on waterway.	General	The basetunnel is a precondition for the diversion of transit traffic from road to rail
Market based	Tolls for tunnels	Implemented	Road	Regional	Cost-recovery	General	In France, the tolls for the two tunnels crossing the Alps are rather high for HGV. Mont Blanc and Frejus: single trip two axles: Euro 1: 122 €, Euro 2 and 3: 115 €; Single trip three or more axles: Euro 1: 245 €, Euro 2 and 3: 232 € (http://www.atmb.net/atmb_tunnel.php?id_rubrique=180&lang=fr, http://www.sftrf.fr/doc/commerciales/tariftunnel.pdf)
	Motorway tolls for financing of road infrastructure	Implemented	Road	National	Cost-recovery	General	Different prices for specific stretches of motorways. Prices can be calculated under http://www.autoroutes.fr/voyage/itineraires.php
	Subsidies for rolling motorway	Implemented	Rail	Regional	Increasing the share of Alpine crossings on rail	General	Local bodies paid for the terminal in Aiton, and central government is paying for operations.
Regulatory measures	Ban for specific lorries	Implemented	Road	Regional	Environment and Safety	General	Mont Blanc and Frejus tunnel: Euro 0 lorries are not allowed in the tunnel.
	Ban of dangerous goods	Implemented	Road	regional	Safety	General	Dangerous goods can only be transported through Fejus tunnel with an escort. Very dangerous goods (type INT) are not allowed in Frejus tunnel. In the Mont Blanc tunnel, only packed dangerous goods in limited quantity are allowed.

MEASURES FREIGHT, FRANCE							
	Name of measure	**Status**	**Traffic mode**	**Focus/ scale**	**Objective /policy aim**	**Temporal aspects**	**Description**
	Weekend ban	Imple-mented	Road	National	Protection of inhabi-tants	Weekend	General driving ban for HGVs on Sundays until 10 pm, specific regulations for week-ends during holiday time (March, July/August). http://www.sftrf.fr/doc/general/interdictionpl.pdf

EXISTING MEASURES FREIGHT, ITALY							
	Name of measure	**Status**	**Traffic mode**	**Focus/ scale**	**Objective/policy aim**	**Temporal aspects**	**Description**
Information/Monitoring	Introduction of a local air monitoring system and emissions inventory	Implemented	All	Regional (Südtirol)	Obtaining better information on air quality	General	A network of fixed monitoring stations and meteorological stations shall provide important information for analysis of air quality and for modelling exercises.
Market based	Motorway tolls for financing road infrastructure	Implemented	Road	National	Cost-recovery	General	Motorway tolls are charged on 80% of Italian motorways. 3 different price classes exist for HGV. Prices differ between 5-10 €/100 km.
Regulatory measures	Weekend ban for lorries		Road	National		Weekends	Jan.-Mai: driving ban from 8 am-10pm on all Sundays and public holidays. June-Sept.: driving ban from 7 am-12pm on all Sundays and public holidays. Okt.-Dec.: driving ban from 8 am-10pm on all Sundays and public holidays.
	Short-term measure to introduce in case of increased smog levels/to reduce peaks in air pollution		Road	Regional (Südtirol)	Reduction of environmental pressures, prevent extreme smog intensities	Südtirol; suggested for winter and summer months	Südtirol: The air quality plan for Südtirol suggests a speed-limit for months with high air pollution 80 km/h on national roads, 90 km/h on MeBo, 100 km/h on motorways.
	Ban of high-emission vehicles (e.g. Euro 0)	Implemented	Road	Regional (Südtirol)	Reduction of air pollution	Flexible use in times with high air pollution concentrations (e.g. winter)	Municipal administrations can decide on a temporal and/or regional ban of high-emission vehicles.

EXISTING MEASURES FREIGHT, SWITZERLAND							
	Name of measure	**Status**	**Traffic mode**	**Focus/ scale**	**Objective/policy aim**	**Temporal aspects**	**Description**
Information/Monitoring	Monitoring of productivity	Implemented	Rail	National	Continuous improvement of competiveness of rail	General	Monitoring of increase in productivity of infrastructure and transport. Specifically, the achievement of goals of SBB's energy strategy are monitored.
Planning	Improvement of transport management	Implemented	All	Specific measures for hot-spots	Reduction of congestion, increase of road safety	General	The federal council of Switzerland, is allowed to implement short-term measures for specific cases where either road safety is at risk or where congestion is a frequent problem (e.g. safety aspects at Gotthard tunnel).
Infrastructure	Modernisation and Expansion of rail infrastructure	Implemented	Rail	National	Support the objective of reducing alpine tranit to 650.000 crossings p.a.	General	NEAT: construction of Lötschberg and Gotthard base tunnels.
	Improvement of international rail infrastructure	Implemented	Rail	National/ international	Improve international co-ordination of rail traffic	General	In order to increase the importance of rail transport, international co-ordination needs to be improved. This includes the elimination of interface problems at national borders.
Market based	HGV Fee	Implemented	Road	National	Implementation of polluter-pays principle, charging of external costs	General	The LSVA is a pricing mechanisms which considers external effects of freight transport. It is charged according to the length of a trip as well as emission standard of HGVs (Euro norm). Revenues from the LSVA are used for financing rail infrastructure (including Lötschberg and Gotthard base tunnels).
	Reimbursement of LSVA for CT	Implemented	Rail	National	Increase the competitiveness of combined traffic	General	For freight that is transported to terminals of combined traffic, the LSVA is reimbursed.

EXISTING MEASURES FREIGHT, SWITZERLAND							
	Name of measure	**Status**	**Traffic mode**	**Focus/ scale**	**Objective/policy aim**	**Temporal aspects**	**Description**
	Provision Rolling Motorway and combined traffic	Implemented	Rail	National	Increase the share of freight transport on rail	General	According to data from operators, the federal administration provides a specific amount of trains for combined traffic and rolling motorway.
	Investment subsidy for domestic and foreign terminals.	Implemented	Rail	National/ international	Increase the capacity at terminals for combined traffic	General	Switzerland financially supports the construction of new terminals or the extension of existing terminals for combined traffic in order to increase capacities.
	Track pricing subsidies	Implemented	Rail	National	Increase competitiveness of rail transport	General	Prices for routes (stretches of railway) are decreased for all users in a non-discriminatory way in order to increase the competitiveness of rail.
Regulatory measures	Surveillance of HGV	Implemented	Road	National	Support other measures regulating road transport	General	Through the increase of surveillance, other measures like driving bans or speed limits as well as compliance with working regulations (rest period) are enforced
	Securing working conditions in road transport	Implemented	Road	National		General	Surveillance of working regulations especially rest periods of drivers.
	Night and Sunday driving ban	Implemented	Road	National	Reduction of environmental pressures, support of other measures that aim at shifting transport from route to rail.	General	Night driving ban for HGVs between 22pm and 5 am. Driving ban on Sundays and public holiday.

EXISTING MEASURES FOR PASSENGER TRANSPORT

The following tables present an overview of interesting and important measures for passenger transport. An overview of best practice measures is presented in http://competition.cipra.org/en/questions/question4

BEST PRACTICE MEASURES PASSENGER TRANSPORT, AUSTRIA

	Name of measure	Status	Traffic mode	Focus/ scale	Objective/policy aim	Temporal aspects	Description
Planning	Improved public transport concepts (AP Tirol)	Planned	all	Regional (Tirol)	Reduction of air pollution through increased share of public transport	General	A series of different measures is suggested by the action programme Tirol, e.g. the improvement of regional busses. Timing between busses and trains shall be improved and new concepts e.g. for Lechtal, Paznauntal, Schwaz, Wörgl and Ötztal shall be developed.
Planning/ infrastructure	Bike paths in Lienz	Planned	Urban traffic, Slow traffic	Local	Increase of daily bike traffic	General	To increase the share of slow-traffic and especially bike traffic, Lienz shall obtain a system of bike paths.
Labeling/ clean car fleet	Green public car fleet (AP Tirol)	Implemented	Road	Local/ regional	Reduction of emissions from public car fleet,	General	All public cars are equipped with particle filters. → role setting model;

BEST PRACTICE MEASURES PASSENGER TRANSPORT, AUSTRIA							
	Name of measure	Status	Traffic mode	Focus/ scale	Objective/policy aim	Temporal aspects	Description
Regulatory measures	Driving ban in Zillergrund in combination with environmental bonus	Implemented	Road/public transport	local	Reduction of traffic, reduction of environmental pressures	General	The Zillergrund route (close to Zillertaler Alpen), 20 kilomters long, was closed for private car traffic: a congestion charge was levied, there's a limit of 100 cars a day and a lorries are banned from the Zillergund in summer. To demostrate that a ban on driving does not have any effects on consumation in gastronomy, the Umweltbonus (=environmental bonus) was invented. All passengers, that use the bus in the Zillergund, get a coupon amounting to 1,50 Euro that can be used in every inn or tavern in the Zillergrund. (CIPRA best practices).
	Speed limit (100 km/h) since winter 06/07; concentration- controlled speed limits starts in winter 08 (Kufstein – Zierl on A12)	Implemented	road	Regoinal	Reduction of environmental pressures	During wintertime,	Between Kufstein and Zierl on A12 a general speed limit has been introduced until April 07. From November 07, a concentration-controlled speed limit is introduced during winter time

BEST PRACTICE MEASURES PASSENGER TRANSPORT, FRANCE							
	Name of measure	**Status**	**Traffic mode**	**Focus/ scale**	**Objec-tive/policy aim**	**Temporal aspects**	**Description**
Informa-tion/Monitoring	Stop plus : platform on mobility and or-ganised car sharing in a mountainous area	Implemented	Road	Regional	Increase of transport effi-ciency	General	Stop Plus offers an internet based exchange platform for people who wish to do carpool-ing in mountainous areas for occasional or day to day movements. (CIPRA best practices)
Infrastructure	Set-up of bicycle system in Lyon	Implemented	Slow-traffic	Regional	Increase share of slow traffic, Reduction of air pollution	General	To encourage the use of bicycles in the Grand Lyon agglomeration, the Communauté urbaine has set up a public-private partner-ship which provides fee-service bike stations. Up to now, about 2000 bikes have been dis-tributed which can be used nearly for free. (CIPRA Best practices)
	Alps Autopartage (car sharing ser-vice)	Implemented	Road	Regional	Increase use of car sharing	General	Implementation of a car sharing system. In Rhône-Alpes region: Lyon and Grenoble (CIPRA Best practices)
	The Chambéry Velostation : com-binig bicycles and public transporta-tion	Implemented	Bike	Local	Reduction of passenger traffic in and around Chambery	General	bicycle rental, monitored garage, as well as bicycle accessoires, technical maintenance and repairs and information concerning mo-bility possibilities without using individual cars : train+bicycle, bus+bicycle, taxis... (CIPRA Best practices)
Market based	Motorway tolls for financing of road infrastructure	Implemented	Road	National	Cost-recovery	General	Different prices for specific stretches of mo-torways. Prices for private cars are about 5 €/100km. Prices can be calculated under http://www.autoroutes.fr/voyage/itineraires.ph p

BEST PRACTICE MEASURES PASSENGER TRANSPORT, SWITZERLAND							
	Name of measure	Status	Traffic mode	Focus/ scale	Objective/policy aim	Temporal aspects	Description
Information/Monitoring	Alpine Online	Implemented	All	Regional/national	Reduce passenger traffic in Alpine regions	General	The internet plattform “Alpine Online” provides quick and convenient information on how to reach locations in the Alps with public transport as well as on car sharing and bike rental services. (CIPRA best practices)
Infrastructure	Alpen Retour	Implemented	All	Regional/national	Reduce passenger traffic in Alpine regions	General	The Swiss Alpine club offers public transport to Alpine regions on busses or rail. The aim is to reduce the passenger traffic in the Alps aiming at sports or vacation destinations. (CIPRA best practices)
	Alps Valley bus	Implemented	Public transport/bus	Regional	Increase of public transport	General	The Alps Valley bus has been implemented to close gaps in public transport services where alpine regions have not yet been connected to public transport. (CIPRA best practices)
	Cycling land regional – improvement of cycling infrastructure	Implemented	Bike	Regional	Increase of bike traffic	General	The aim of this measure is to improve regional cycling routes and to connect the regional cycling routes with the national cycling routes of cycling land Switzerland (Veloland Schweiz). (CIPRA best practices)
	Mobility bike sharing	Implemented	Road	National	Increase of bike-sharing	General	Car sharing co-operation which provides 1'700 passenger cars and vans all over Switzerland. Around 75-100 cars are based in alpine areas, many of them in the bigger cities of the alpine cantons. (CIPRA best practices)

BEST PRACTICE MEASURES PASSENGER TRANSPORT, SWITZERLAND							
	Name of measure	Status	Traffic mode	Focus/ scale	Objective/policy aim	Temporal aspects	Description
Labeling/ clean car fleet	New Ride Promotion of energy efficient vehicles	Implemented	Road	National	Increase energy efficiency of vehicles	General	Promotion of energy efficient vehicles. Shift from cars and motor bikes to electric powered bicycles and scooters. NewRide complements the promotion of 'Human Powered Mobility' (HPM) and public transport. In the first three years of its operation around 4300 e-bikes and scooters were sold. (CIPRA best practices)

EXISTING MEASURES PASSENGER TRANSPORT, ITALY

	Name of measure	Status	Traffic mode	Focus/ scale	Objec-tive/policy aim	Temporal aspects	Description
Informa-tion/Monitoring	Awareness raising campaigns	Planned	All	Regional	Reduction of air pollution	General	Through awareness raising and information campaigns, the public shall get a better over-view of measures to be taken on the private level which can help to reduce air pollution.
Infrastructure	Public Transport in the rethian triangle	Implemented	Rail/bus	Regional Südtirol	Increase of pub-lic transport	General	reopening of the Vinschgauer-Bahn Mals-Meran and extension of the Postauto course Zernez-Müstair to Mals closes the gap in the transnational transport chain Grisons – South Tyrol.
Market based	Motorway tolls for financing road in-frastructure	Implemented	Road	National	Cost-recovery	General	Motorway tolls are charged on 80% of Italian motorways. Prices for private cars are about 5 €/100km.
Regulatory meas-ures	Speed-limits as flexible measure to reduce peaks in air-pollution	Planned	Road	Regional (Südtirol)	Reduction of air pollution, espe-cially of pollution peaks	Winter and summer months	The air quality plan for Südtirol suggests a speed-limit for months with high air pollution (mid-December until mid-March, mid-May un-til Mid-September). 80 km/h on national roads, 90 km/h on MeBo, 100 km/h on motorways.

Annex 2: Ideas for implementing an Alpine Crossing Exchange on European Scale

Objectives

An Alpine Crossing Exchange (ACE) on European Scale should meet the following objectives:

Overall objectives

- The ACE should lead to an efficient reduction of freight transport through the alps. This means that transport with the lowest mitigation costs should be avoided and that transport with high mitigation costs should still take place (equalisation of marginal abatement costs). This also includes a minimization of transaction and administrative costs.
- Existing infrastructure should be used in an efficient way without effects of shifting between the different alpine passage or a disproportionate shift to rail.
- From a Swiss point of view: along the Swiss objective to reduce transalpine freight traffic to 650.000 passages until 2009, an overall absolute number of alpine crossings should be the basis for the ACE (cap-and-trade system based on number of crossings).
- From Austrian point of view: the Austrian alpine transport policy focuses on the reduction of environmental pressures so that an ACE based on environmental criteria would be favourable (cap-and-trade system based on environmental criteria or system with specific reduction aims).

Distributional aspects

- The implementation of the ACE should not bring along major distributional impacts and thus no discrimination between different actors. This is mostly relevant for the differentiation between long-distance transport, inland traffic and regional traffic/short-distance traffic.
- No discrimination between existing actors and new market players: depending on the design of the ACE, the definition of new market players will play a central role. The ACE should not lead to a freeze-in of existing market structure but should much more stipulate a competitive market.
- No discrimination between countries: depending on the design of the ACE the definition of participating countries will play a crucial role. It has to be ensured that operators from all countries still have access to alpine passages.

Setting the total cap/specific reduction aim

The main factor which influences the effectiveness of the system is the determination of the total cap or – for a system without an absolute cap – the specific reduction aim. The experience with the EU Emissions Trading Scheme (EU ETS) has shown that the setting of the cap critically influences the steering effect of the system as well as its acceptance. If the cap is too high, the price of alpine crossings becomes very low or even close to zero so that the steering effect towards modal shift cannot be realized. If the cap is too low, the price of alpine crossings becomes very high and the acceptance of the system is compromised.

a) Setting an absolute cap in a cap-and-trade system

Within a cap-and-trade system, an indicator with an absolute value needs to be taken as basis. In the case of the ACE this could be an indicator linked to the amount of alpine crossings (total number of crossings, maximum weight transported over the Alps) or an environmental indicator (cap for CO_2-emissions, other air emisisons, mixed index including noise).

- **Number of alpine crossings:** according to the Swiss objective of reducing the number of alpine transits to 650.000 until 2019, a maximum number of alpine transits could be defined for all alpine passages. If needed, the cap could be differentiated for the four main alpine passages (e.g. ¼ of absolute number of each passage, a weighted distribution according to security aspects, etc.). In this system, one certificate would be good for one alpine crossing. The disadvantage of choosing the number of alpine crossings as

cap is that no environmental criteria are considered. Thus, the system would not set an incentive towards using vehicles with lower air emissions.

- **Mixed indicator linked to alpine crossings:** in addition to the number of alpine crossings, an indicator for weight or emission standard could be included (similar to the Austrian ecopoint system). This would mean that the absolute cap is a multiplicator considering the number of alpine crossings, weight and (if needed) emission standards. In this system, one certificate would be good for transporting a certain number of weight with a certain emission standard over the Alps. In the easiest version, the transport of 1 ton tranported with Euronorm 3/4/5 would equal one certificate and a lower emission standard would require additional certificates (e.g. 1,5 certificates for 1 ton transported with Euronorm 2, 2 certificates for 1 ton transported with Euronorm 0/1). When looking at abatement measures, this option would leave the greatest flexibility to operators. It would set incentives into reducing the number of alpine crossings (shift to rail), use of cleaner vehicles and exhaustion of maximum possible load.
- **Cap based on environmental criteria:** if the major objective is to reduce environmental impacts of alpine traffic, the cap could limit air emissions and/or noise. In line with the EU ETS, the cap could for example be defined as maximum annual CO_2 emissions, or similar to the Austrian ecopoint system it could be set as maximum NOx emissions. If the cap is based on one single air emission, possible trade-offs need to be considered. The disadvantage of such a system is that it does not directly influence the number of alpine crossings.
- **Environmental Index:** in order to take into account a larger number of environmental criteria, a multiplicator approach based on several environmental indicators could be chosen (e.g. for noise and air emissions, could be weighted in favour of one aspect). In order to make this approach operational, it would be necessary to group vehicles according to their noise and air emissions and to link a specific number of certificates to each group. With a rather complex index of different indicators, such a grouping might become rather difficult and could create unwanted interfaces.

ASSESSMENT OF DIFFERENT OPTIONS FOR SETTING THE CAP

	Advantage	Disadvantage
Cap based on number of crossings	› Transparent and easy-to-use system, › Minimum monitoring requirements › Can be differentiated for alpine passages	› Does not consider environmental criteria › Sets no incentive into using low-emission vehicles
Cap based on multiplicator of crossings, weight and emission standard	› Includes both number of crossings as well as environmental criteria, › Leaves greatest flexibility to operators with regard to abatement measures, › Can be differentiated for alpine passages	› Less transparent, would require a grouping › Monitoring more difficult than in system based on number of crossings.
Cap based on single environmental indicator	› (A CO_2-system could be linked to the EU ETS)	› Does not directly influence number of alpine crossings, › Trade-offs between different air emissions are possible › Depending on the diffusion of air pollutants, it is not possible to differentiate between the different alpine passages (e.g. CO_2 as global pollutant).
Cap based on environmental index	› No trade-offs between different air emissions. › Leaves great flexibility with respect to abatement measures.	› The composition of the index will be difficult to negotiate, › Grouping of vehicles might become rather problematic (+ creates unwanted interfaces).

Table 10

b) ACE with specific reduction aim

As alternative to a cap-and-trade system with absolute reduction target, the ACE could be linked to a specific reduction aim. This option would be possible if the major objective of the ACE would be the reduction of environmental pressures from alpine transit without that the total number of crossing are limited. Such a specific reduction aim could for example be formulated as g CO_2/tkm. This would mean that operators would have to demonstrate their performance regarding this aim. For example, if the specific aim is g CO2/tkm, an operator with higher specific emissions would have to buy additional certificates while an operator with lower specific emissions could sell his surplus certificates on the market.

The monitoring of such a system would be rather difficult and within a growing number of alpine traffic it does not necessarily lead to an improvement of environmental quality. Even if all vehicles would emit less air emissions and would create less noise, the absolute air quality could deteriorate.

→ taking into account these major disadvantages of a specific reduction aim which don't meet the objectives of the ACE, this option should be abandoned.

Trading entities

As a smooth operation of alpine traffic requires a rather flexible approach, it seems most useful to implement a "downstream" approach in which HGV operators are the trading entities. This would imply that an alpine crossing could be bought or sold with short notice on the exchange. This would imply that infrastructure is used in an effective way.

If the ACE is supposed to focus on air emissions, an alternative would be an upstream approach in which fuel suppliers need to surrender the allowances. The basic idea is that suppliers of Diesel fuel would be obliged to surrender allowances according to the air emissions caused when the fuel is burned. To cover their costs for additional allowances they would increase their fuel prices correspondingly.

ASSESSMENT OF DIFFERENT OPTIONS FOR TRADING ENTITIES

	Advantage	**Disadvantage**
Downstream approach (HGV operators)	› Enables a flexible approach › Enables most efficient use of infrastructure › Can be used for all different options for fixing the cap › Operators have direct control over all technical and operational measures to reduce impact/number of alpine crossings, › Incentive structure reaches directly the source	› Involves many trading entities which makes the initial distribution of crossings difficult, › Many trading entities = high transaction costs + high administrative costs, ›
Upstream approach (fuel suppliers)	› Does not allow a flexible use › Does not reveal willingness to pay as prices are not flexible enough › Fewer trading entities = lower transaction costs + lower administrative costs › No discrimination between existing vs. new operators or between operators of other countries.	› From operators point of view, this option is similar to a tax or a charge, › Only fuel-related impacts can be addressed › requires a mechanism in order to pass on the incentive to operators › strategic behaviour: as the initial allocation will probably only include fuel suppliers in alpine countries, a new aspect of tank tourism will evolve

Table 11

→ although it involves lower transaction and administrative costs, the upstream approach does clearly not go along with the objectives of the ACE. Especially, it can only be used within a cap-and trade system based on air emissions which does not directly influence the number of alpine crossings. Also, it does not set the same incentives to HGV operators as the downstream approach.

Initial allocation

From a theoretical point of view, as long as certificates can be traded freely, the final allocation of allowances is independent from the initial allocation. Through the market mechanism, alpine crossings will flow to the actors with highest abatement costs. However, from a distributional point of view, the different allocation methods lead to different effects.

a) Free allocation

To ensure that all market actors have free access to transalpine traffic (legal protection of status quo), a free initial allocation of certificates might be necessary. This would imply that existing and potentially new market players are identified and some mechanism for the distribution of available certificates needs to be found. To prevent that certificates are distributed in a rather random way, the allocation can either be based on historical data or on a benchmark system. The decision for one or the other free allocation mechanisms partly depends on the definition of the cap, taking into account the availability of data.

- **Grandfathering:** a rather easy distribution mechanisms is a grandfathering system based on historic data. Such a system of course requires the availability of data so that it probably will not be possible for the more complex design options.
    - General approach: In this system, existing operators obtain allowances equal to their historic role. If the cap is defined as number of crossings, this would imply that operators with many crossings in the baseline period obtain a high number of certificates while operators with a historically less important role obtain only few certificates. This would also imply that inefficient operators which did not use maximum vehicle load but had many empty passages obtain a benefit. On the other hand, efficient operators are punished.
    - Baseline period: this already shows that the setting of the baseline period will become a crucial point for discussion. In order to take account of recent developments, a very recent baseline period would be useful. However, it has to be ensured that strategic behaviour is not possible (e.g. if operators already know that the ACE will be implemented and if their current behaviour will influence the allocation).
- **Benchmarking System**: instead of allocating certificates on the basis of historical data, a Benchmarking-System might be possible for some design options. This would be especially relevant within a system that considers environmental aspects (e.g. in a system with mixed indicator and number of alpine crossings, the allocation is based on historic number of crossings multiplied by a benchmark-factor for emission standard and weight. This would imply that operators using vehicles with low emission standards would need to buy additional certificates on the market).
- **Distributional aspects of free allocation:** as certificates within the ACE might become an asset with a rather high value, the free allocation is similar to a direct subsidy to participants of the ACE (windfall-profits).
- **New market players:** the treatment of new market players is a crucial question within a free allocation system. It is possible to allocate all certificates to existing operators and that new market players need to buy certificates on the market. However, this implies a considerable competitive disadvantage for new operators. An alternative would be to set aside a specific reserve of certificates for new entrants.
- **Participants:** in a system with free-allocation, it needs to be decided which countries will be included in the ACE and are considered for the initial allocation. This would imply that operators from other countries would have to buy certificates on the market and thus have a competitive disadvantage.

b) Non-free allocation

An alternative to a free allocation is to give out certificates either in an auction or to sell them at a fixed price. This implies a revenue for the government which can either be re-distributed or used for other aspects of alpine traffic (e.g. improvement of rail infrastructure).

- **Auctioning:** all certificates are distributed to operators via an auction. The auctioning mechanism needs to be chosen so that no strategic behaviour is possible. Also, it needs to be decided how often an auction takes place (e.g. all certificates for one year are auctioned at the beginning of the year or several auctions during the year). This system has the great advantage that all operators can take part in the auction and that no competitive disadvantages arises. Existing operators are not privileged over new market players and operators from all countries can take part.
- **Fixed-price**: an alternative to the auctioning system would be to sell certificates at a fixed price. This could for example increase the acceptance of the system if market players fear that an auctioning leads to a high price. The fixed-price system would then serve as a price-cap. However, such a fixed-price system would involve high efficiency losses as the market mechanism is derogated. Similar to the auctioning system, a fixed-price system is open to all operators.

Hybrid system: it is also possible that the allocation system is a mixture of free allocation and either an auctioning or fixed-price system. For example a specific percentage of certificates could be auctioned and the rest allocated for free. A hybrid system would be especially helpful during an introductory phase. The role of the auctioning could be strengthened from year to year (e.g. 10% auctioning in first year, 20% in second year, and so on).

ASSESSMENT OF DIFFERENT ALLOCATION METHODS

	Advantages	Disadvantages
Free allocation with grandfathering	› High acceptance	› Rewards inefficient behaviour in the past, › Punishes early-action (especially if a recent baseline is chosen) › Involves distributional impacts (windfall-profits) › Specific mechanism to include new market players needs to be constructed › Rather high administrative costs
Free allocation with benchmarking	› Rewards early-action › Rather high acceptance	› Involves distributional impacts (windfall-profits) › Rather high administrative costs
Auctioning	› Low administrative costs › All operators (from all countries, existing and new) can take part in the auction ›	› Low acceptance › Redistribution of revenue will influence acceptability
Fixed-price system	› Low administrative costs › All operators can buy certificates › Would enable to set a price-cap in order to increase acceptability	› Rather low acceptance › Efficiency losses as market mechanism is disturbed › Redistribution of revenue will influence acceptability

Table 12

Special rules for short-distance traffic / inland traffic

A crucial question for the acceptance of the ACE will be the consideration of short-distance traffic. For short-distance transport which mainly includes the passage over the Alps, the cost of the ACE would be disproportionally higher as for long-distance transport. Thus, a mechanism needs to be implemented within the ACE which gives a favourable treatment to short-distance traffic. Depending on the general design of the ACE, different possibilities for a special S-traffic mechanism can be envisaged.

- Favourable treatment within a grandfathering system: from the total available number of allowances, short-distance traffic is allocated alpine crossings according to their historic data (100% allocation). The remaining crossings are reduced according to the ratio of remaining allowances to the number of transits (e.g. if the total number of remaining allowances is 80 and the relevant number of transits according to historic data is 100, each operator receives crossing allowances amounting to 80% of his historic crossings).
- Favourable treatment within a system with multiplicator and number of crossings: if the number of certificates for one crossing depends on weight as additional aspect, a minimum weight could be allocated for free so that only higher weight classes would need to buy additional allowances.
- Treatment within auctioning system: in a such a system, S-traffic could obtain certificates free of charge so that no additional costs occur for them while all other operators need to buy certificates either during an

auction or at a fixed price. From the total available number of allowances, the necessary certificates for S-traffic (based on historic data?) are subtracted and the rest is available for the auctioning.

- are differentiated according to the weight of the vehicle, a minimum weight could be allocated for free and higher weight classes would need to pay the delta.-→ as vehicles in inland traffic (S-traffic) tend to be lighter than transit traffic, this would result in an advantage for inland-traffic.