Studies and Perspectives on a common platform for transalpine road traffic monitoring

Work Package 9 "Interpretation and National Set of rules compliance"

Project Monitraf
Monitoring of road traffic related effects in the Alpine Space and common measures

Programme INTERREG III B Alpine Space 2000-2006

ENGLISH

Contents

Part 3 - Quality assessment of the MONITRAF measures

Presentation

Arpa Piemonte actively joins proposals of international cooperation. Organisations that take part in European projects can benefit from precious opportunities to enrich their competences and optimise their strategies. Such collaboration advances the attainment of objectives and also promotes the correct development of its territory; it can also strengthen a country's services, raising the technical and methodological standards by conforming them to those of other foreign partners.
Participating in projects of international cooperation enables countries and organisations to define shared and agreed approaches to manage factors of environmental pressure. In fact, it is possible that excellent solutions at local level can have little effect or even a negative impact on adjacent areas.
Moreover, international projects can collect and make available to everyone common data that is fundamental for an analysis and for the handling of problems that it may not be possible to solve autonomously in a single region. This is certainly the case when we consider pollution caused by vehicle traffic, an issue without simple local solutions. Traffic-induced pollution is a highly complex matter that sees a number of diverse and interconnected action plans, like inter-modality, ICT solutions, technological improvements in the vehicles and, last but not least, changes in the lifestyles of the citizens.
The Interreg IIIB MONITRAF Project - Monitoring of the Effects of Road Traffic in the Alpine Space and Common Measures *(Monitoraggio degli effetti del traffico stradale nello Spazio Alpino e misure comuni)* is striving to find answers to the traffic problem. In this framework, Arpa Piemonte, like the other environment protection agencies that have joined the project, is playing its own role to safeguard the environment by measuring the effects of the remedies currently being applied and suggesting, after a thorough analysis of data coming from different alpine regions, more efficient and more effective interventions to be implemented in the future.

Silvano Ravera
Direttore Generale - General Manager Arpa Piemonte

Premise

Arpa Piemonte, through the Environmental Monitoring and Forecasting Area (Area Previsione e Monitoraggio Ambientale), has recently participated in two projects of European cooperation, both concerning vehicle traffic crossing over the Alps:

- The ALPNAP Project: Monitoring and Minimisation of Traffic-Induced Noise and Air Pollution along Major Alpine Transport Routes *(Monitoraggio e minimizzazione dell'inquinamento acustico ed atmosferico causato dal traffico veicolare lungo le principali vie di comunicazione alpine)*
- The MONITRAF Project: Monitoring the Effects of Road Traffic in the Alpine Space and Common Measures *(Monitoraggio degli effetti del traffico stradale nello Spazio Alpino e misure comuni).*

ALPNAP and MONITRAF operated in a complementary way: the first testing innovative technical and scientific approaches to measure, model and demonstrate the impacts of vehicle traffic; the second, studying the existing data, including those coming from the ALPNAP, and harmonising them in order to compare and predict their evolution. Specifically, the Interreg IIIB MONITRAF Project *(Monitoraggio degli effetti del traffico stradale nello Spazio Alpino e misure comuni)* counted on the added value provided by the presence at the same table of exponents of the political world, of environmental agency technicians and experts in economic and social development coming from the different countries of the Alpine area. Various approaches, therefore, were discussed to try to deal with a common and polyhedral issue: the optimisation of the flows of goods and people across the Alps.

This publication illustrates the methodological foundation of the work done by the Environmental Monitoring and Forecasting Area (Area Previsione e Monitoraggio Ambientale) within the framework of Work Package 9 "Interpretation and National Set of Rules Compliance" of the MONITRAF Project.

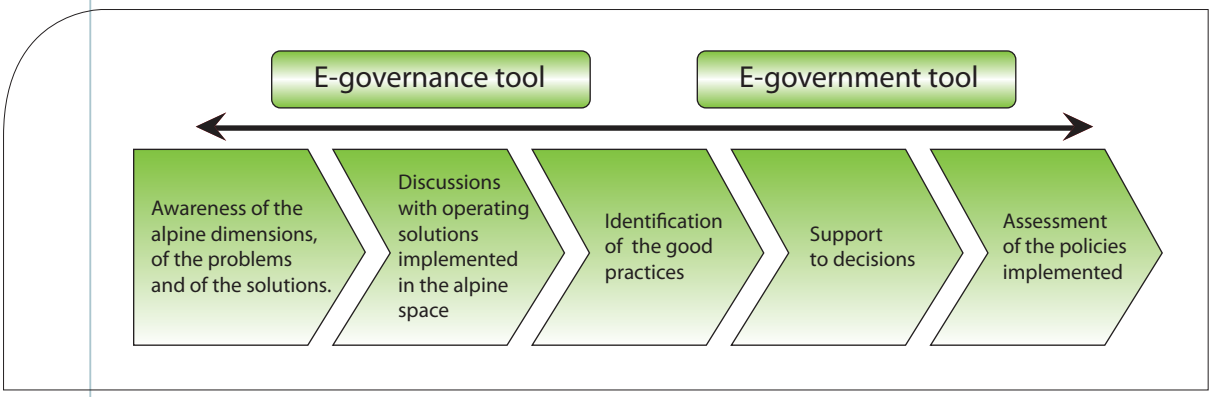
The attached CD ROM collects the results of legislative and bibliographical research for materials connected to the theme; these materials are arranged in an archive (set up as a database) that can be consulted using various interrogation keys. This database is one section of the more complex monitoring system that the MONITRAF Project took on as an objective; it is meant to be a support tool for the policies of all the subjects who deal with road traffic and, more in general, with the sustainable development of the Alpine Space.

Stefano Bovo
Forecasting and monitoring Dept
Arpa Piemonte

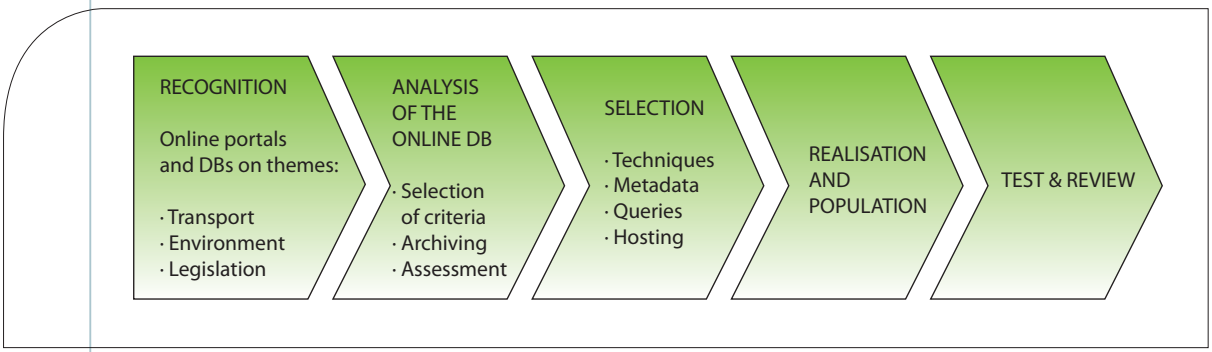
Introduction

The title of Work Package 9 is “Interpretation and National Sets of Rule Compliance”.
The purpose of Work Package 9 is to define a proportional relation between the scenarios, elaborated and/or analysed in the framework of the previous MONITRAF Project and the measures that were activated, and that can be actuated, identified in WP10. WP10, then, would draw information from these indications for a further *best tuning* between common measures to be emphasised and the results expected for them.
At the same time, with the objective of setting up a reference portal on Internet, WP9 has the intention to elaborate its own archiving and data production that will be compatible with the technical and operational requirements of the future portal to come.

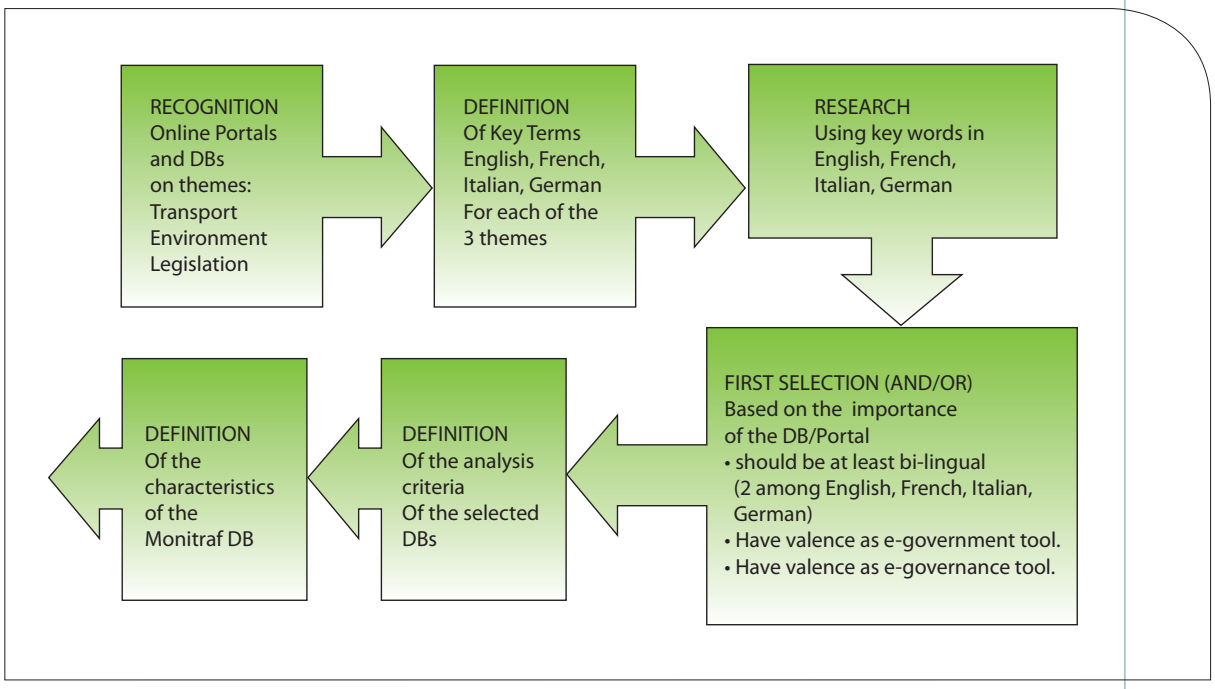
From the point of view of the *results*[1], WP9 is integrated into the overall course defined by the MONITRAF Project, aimed at identifying a tool of *e-government* and *e-governance* for sustainable transport in the Alpine Space.



The *workflow* followed for the implementation of the portal database, of which this publication is an integration, is the following:



[1] In the terminology of the European Programming Interreg III 2000-2006 and Obiettivo 3 2007-2013, the definition of “*output progettuali*” (project outputs) are the results with tangible indicators (like reports, seminars web portals) and *“results” refers to medium and long term results that the project induces on the territory involved in the activities.*



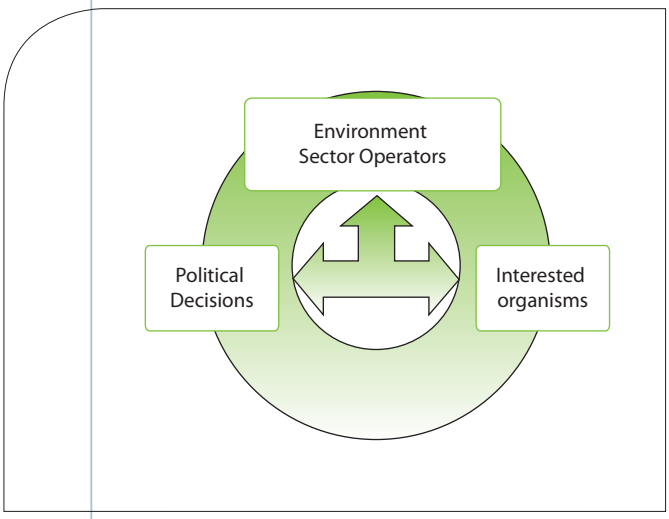
During the course of the Project, however, because of a dialectical exchange within the partnership, and also because of problems in the retrieval of data taken from experience, the WP9 was asked to work on an analysis directed at the recommendations for the future implementation of the *e-governance* / *e-government* tool.

The first part of this publication, then, is dedicated to the preparation of the archive, the second, to the indications requested for its implementation.

1 The MONITRAF database

1 THE USERS OF THE ARCHIVE

The types of users were defined according to 3 macro-categories:



1 - Operators in the environment sector (technicians)
2 - Political decision-makers
3 - Interested parties (NGOs, citizens, transport sector operators, researchers in transport environment, economic, social fields).

The different types of documents archived (LAWS/REGULATIONS/PLANS/ MEASURES/ STUDIES) provide an exceptional space for exchanging documents that normally circulate in different channels.

The possibility to find them, representatively present, in a unified and comparable manner, opens the way to wide and informed debates.

2 THE LANGUAGE CONCERN

The Alpine Space area is divided into four main languages, from East to West:
1.1. Slovene
1.2. German
1.3. Italian
1.4. French
The official language of the Alpine Space Programme, and also the “meta-language” most commonly used is English.
The *database* had the task of enabling, where possible, local actors who may not know foreign languages to navigate in their own mother tongues.
This may not be a major problem if the type of language used in the documents is of a general nature, but in the case of legal, technical and bureaucratic language, it can be a difficult obstacle. The European Union recognises the right of citizens to communicate with institutions in their own languages.

Regulations and other texts of a general nature are edited in all the official languages (art. 4 EC Reg. no. 1, 1958).
"Every citizen of the EU can write to the Institutions or to the Organs […] in one of the official languages and receive an answer in the same" (Art. 21, 3 parag. TR, CE).

There is no problem then for documents of a European character, which can be found, in any case, on the official Eurolex[1] site without having to duplicate the contents.
On the contrary, the NUT0, NUT2, NUT3, NUT5 legislation and measures call for a different approach. To find a suitable solution, reference was made to research conducted by the CNR- ITTIG[2] over the years. For more information, refer to the Bibliography.

It is evident that a multilingual access to law, providing the global sharing of legal knowledge, conforms with the duty of the institutions to dialogue with the citizen and vice versa, and in this way it fosters that *governance* that MONITRAF is aiming for.
Nevertheless the possibility to translate EVERY text archived into EVERY language is not within the practical and economic possibilities of the MONITRAF Project.
In some cases, a partner belonging to a bilingual region enabled us to obtain the translated material at the origin.

In other cases, the solution adopted was the translation into English of the title of the document with a brief description.
The rest of the information memorised in the metadata file provides a multi-language picture that gives a better idea of the content.

THE LAW CONCERN 3

As explained in detail in the WP10 "Common Measures", the division of the responsibilities and of the decisional power are not homogeneous in the different countries of the Alpine Space, so that, among the most evident, for example, we find that competences at a NUT0 level in Italy may correspond to NUT2 level decisions in Austria.

The MONITRAF *database* easily brings out the different levels of competence, with a field dedicated to the legal aspects of the Regulation/Law/Plan/Measure, but, on the other hand, it loses part of its value of decisional support where the competences do not correspond.

As described in the second part of this publication, the added value is not lost, in the definition for which also different decisional dimensions can be a correct *bottom-up* approach to *governance* towards state, and also European decisional levels.

At the translation level, the transformation of a legal text usually makes use of the functional equivalence approach[3]. In the case of this archive, the functional equivalence of the contents is facilitated by the convergence of the topics.

[1] http://eur-lex.europa.eu/
[2] CNR - Consorzio Nazionale per la ricerca - IITG Istituto di Teoria e Tecniche dell'informazione Giuridica
[3] The functional equivalence is defined as "the relation between two terms which distinct one from the other in every constituent part can in some way correspond thanks to a common element (Source - CNR - ITTG)

Another element of convergence is the field of application of the Regulation/Law/Plan/Study, which is the greatest element of discrepancy at the level of alpine management policies. The definition of the field "field of application" (EU/NUT0/NUT2/NUT3/NUT5) gives a direct comparison of the regulations in force, as well as the different operational mediators.

4 ANALYSIS OF PREVIOUS ON-LINE DBs

4.1 The methodology applied

The definition of the operational characteristics of the database as a tool to support decisions took place over a 16-month period in an iterative manner and parallel to the evolution of the project and the arrival of the first results.
The operating modalities illustrated below are therefore a workflow reference, but the final choices were strongly influenced by the debate within the project and by the continuous collection of new materials. The need to respect the deadlines, imposed at the Programme and Project level, were in some ways an element of interruption of a *work in progress*, which in terms of meditation, is still going on.

4.2 First choice

First phase: desking based on key terms

The key terms identified besides the word "transport" were those of the MONITRAF indicators as they were gradually identified during the different WPs.
The 3 main archive topics of the analyses were:
1. Environment
2. Transport
3. Regulations

The first survey conducted based on key words in English, French, and Italian, brought to light the existence of a very high on-line production of documents on the subject, as well as many past and present project experiences, which became the foundation also for the evaluations reported in the second part of this Report.

Second phase: reduction of the list of portals and sites to be analysed

The selection of the databases to be analysed more thoroughly was based on a criterion of the important languages available. Portals were privileged that
1. were at least bi-lingual (two of the following: English, French, Italian, German)
2. had value as an *e-government* tool
3. had value as an *e-governance* tool

In the end, the quality of the material reported often played a role in favour of one or another of the parameters, showing that the choice of criteria was often too rigid and aprioristic.

The details of the analysis work done to decompose the portals and sites in order to draw the information that went into the final formulation of the database are reported in the CD-Rom annexed to this publication.

4.3 - The final choice

The final choice of the reference portals and sites is shown in the outline below.

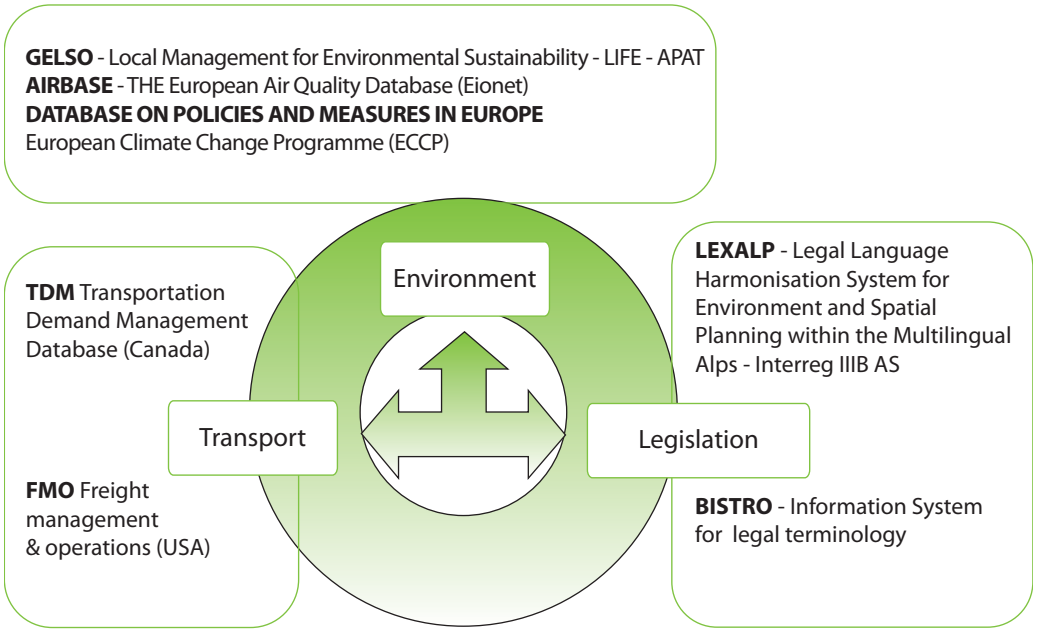


Fig. 4.3.1
Internet portals and sites selected for operational analysis

Refer to the attached CD-Rom for the analysis outline of the fields and functions.

The final configuration of the database was, in fact, a complex synthesis of the thorough analysis of the above sites and portals, and of the knowledge and assessments that came from the preliminary visit to all the sites examined.

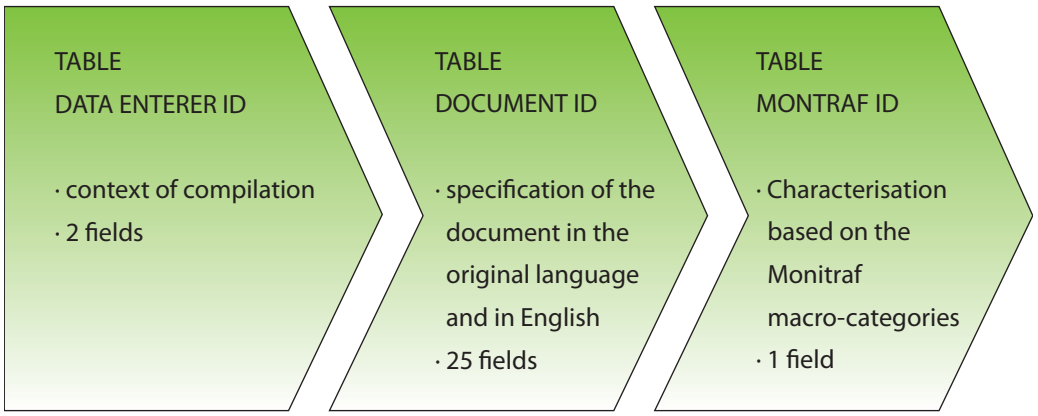
METADATA DEFINITION 5

The definition of the fields to be filled in led to a rather ambitious reference record for each document archived.
The following chart shows the division into types of information archived in each *record* corresponding to a single document (Fig 5.1).

We refer you to the annexes of this publication for details on the fields.
During the archiving, it became evident that some fields could not be easily filled in for every type of document.

These fields therefore, were not set as obligatory in the final implementation. Also in the choice of the Queries, not all the archiving fields are object of interrogation, but they can be object of future implementations.

Fig. 5.1
Tables of metadata for archiving the documents



6 IDENTIFICATION OF FUNCTIONAL REQUIREMENTS

The MONITRAF *database* defined functional characteristics based on the above criteria connected to:

- type of user
- type of research

To these criteria, we added the evaluation connected to the parameters:

- ease of updating
- low management costs

For details on the functional specifications, refer to the help of the DB; here we specify the recommended choice for the interface of the on-line database.

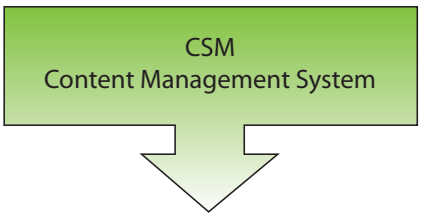
The MONITRAF portal

The choice falls, without doubt on the wide *open-source* offer of the CSM - *content management systems* programmes. The advantages if this choice are shown in the chart 6.1.

Considering the ample selection of manuals available free on Internet and the vast virtual community that it counts, the cost/benefit ratio, compared to a proprietary programme, favours a CSM.

Data base

The documents collected during the project were first filed using simple tables on Excel sheets. Each sheet corresponded to a report table. The archive will be supplied at first for *stand-alone* use on CD-Rom support, though the objective is to transfer them to the reference web portal.



1. Allows the realisation in an easy way of the planned architecture of the data, through the definition of different sections and categories in which the items are classified.
2. Allows the **data to be clearly separated from their presentation.**
3. Allows the easy management of the publication of the information and when it is to be removed from the site.
4. Allows **the integration of contents coming from different sources**, like databases or rss.
5. Allows **users to handle the information with different rights of access and modification** with mailing lists and messages.
6. It has **search functions in the contents that go beyond the arrangement in categories.**

Fig. 6.1
The advantages of using a Content Management System

The table archive method and its structure were selected for the ease of conversion into any format of on-line database.
Also in this case, the open-source choice is vast and considering that the queries, at least those found in the context of this Project, do not require excessive computation, the choice is not in the balance of dedicated softwares, that could guarantee customer assistance that would, in any case, be unreasonable in terms of cost/benefits for the set objectives.

GIS software

The potentials of GIS as a support tool for decisions are now well known. The Joint Research Center (Centro di Ricerca Europeo) has calculated that 90% of environmental data is territorial data and therefore suitable to transfer onto a GIS platform.

The table method of archiving and the document classification in a “territorial” way guarantees the function in a GIS key.
The software choice conforms to the European INSPIRE[4] directive, which can be consulted for details, that identifies proprietary software. On the other hand, this software is de facto the standard adopted by most of the European administrations, in compliance with the above directive.

Implementation costs / management costs

The platform cost is mostly the cost of implementation. In fact, if for the web editor and *database* solution, we refer to *open-source* and if the implementing organisation already

[4] DIRECTIVE 2007/2/CE - became effective on 15/05/07

has, as is probable, the GIS software, most of the investment will be used for the set-up of the platform and its maintenance.
The annual up-dating would, in fact, be minimised in the set-up costs, charged to the proprietors of the data, of the suitable formatting.

We refer you to the report of WP10 for the proposed solutions regarding the integration of the platform in other current situations, in order to guarantee its continued long-term operation.

7 THE DATABASE CONTENT

The database collects 4 different types of documents:
- LAWS AND REGULATIONS
- PLANS (general of activation)
- MEASURES (specific)
- STUDIES

At the date of the publication of this report, the collection of data is clearly preponderant in terms of the type of document and the territory of application.
- Laws - 67
- Plans - 53
- Measures - 62
- Studies - 234

Most of the regulation documents regard the Italian context, while the studies come from a wide variety of sources, and are mostly in English.
In order to optimise the data gathering, the WP9 leader has decided to continue collecting them until the last day useful for the activities of the project, which will be June 30th 2008.

8 QUERIES

8.1 Type of queries

The access to the DB through a multi-language interface gives the possibility to make combined queries in terms of:
1. Project corridor
2. Partner countries of the Project
3. Macro-categories of MONITRAF indicators
4. Type of document (Law/Regulation, Plan, Measure, Study)
5. *Full text* in 4 languages

The selection is always possible with multiple keys (+ corridors + macro-categories + document types + key words).

Because some of the terms do not have all the fields filled in (e.g. not all the studies focus on the subject area), some queries may give null results.

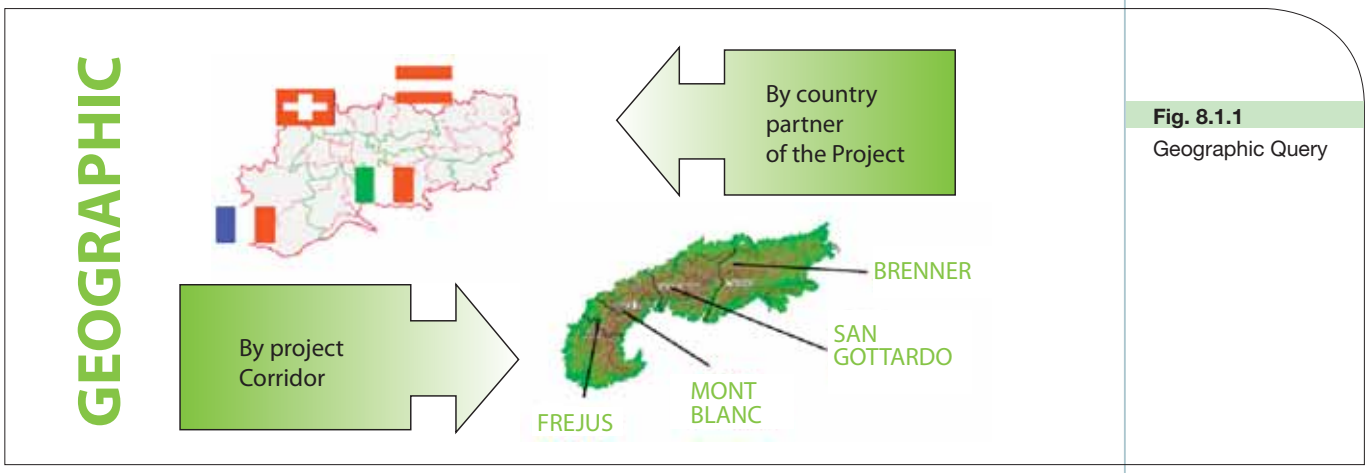


Fig. 8.1.1
Geographic Query

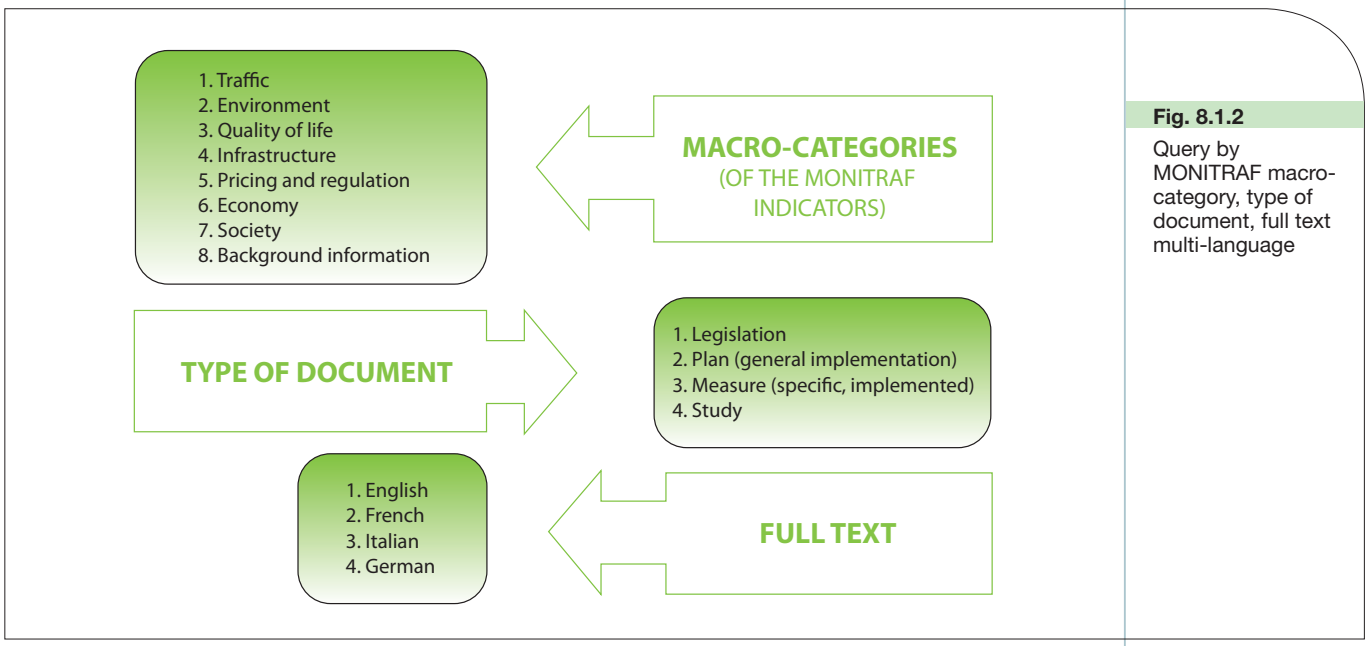
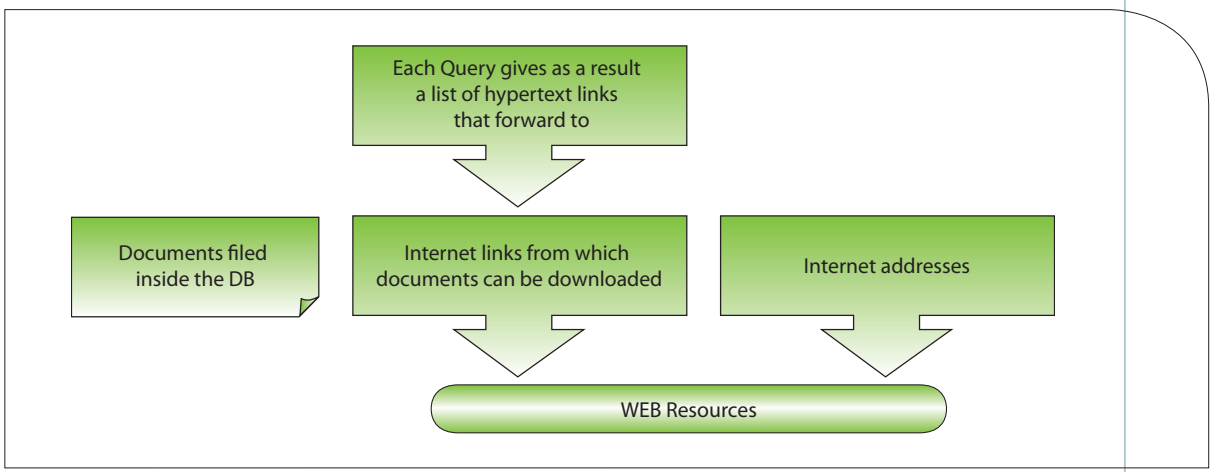


Fig. 8.1.2
Query by MONITRAF macro-category, type of document, full text multi-language

8.2 Type of report



The resulting reports do not take into account all the archiving fields and present a display like the following.

Fig. 8.2.2
Screen showing the result of the query

Document information	
Title Original	
Title English	

Type of document	LAWS/RULE - PLAN - MEASURE - STUDY
Short description (original language)	
Short description English	
Date of issue	
Available languages	
Type of report	*Pdf / web link / web address*

MORE INFO	Click here to see the complete metadata sheet

The screen shows a sheet for each of the documents found by the query.

Further details (the entire meta-data sheet connected to the document) are shown clicking on **MORE INFO**.

Future implementations and recommendations 2

INTRODUCTION 1

The objective of the WP9 "Interpretation and National Sets of Rule Compliance" is to make a comparison between the scenarios identified and/or analysed and the regulations observed at a NUT0 level or lower, in order to bring to light the opportunities and the limits of each of them. The analytical criterion to make this comparison is based on the set of MONITRAF indicators selected, harmonised and populated during the WP5-6-7, and on the scenarios analysed by the WP8.
Thanks to the survey conducted by WP9 in order to populate the MONITRAF database, it was possible to extend the document horizons beyond the timing planned by the project for the individuation of indicators, scenarios and trends.

The first chapters of PART 2 (Geographical Dimension, Partnership Dimension, Indicators Analysis) of this text have, therefore, the purpose of illustrating, based on the further knowledge acquired, proposals of integration or modification of the indicators and scenarios taken into consideration.

The last chapter, finally, based on the assessments made in the previous ones, concentrates on the principal *mission* of Work Package 9, proposing a tool for qualitative analysis of some measures from NUT0 to NUT5, as a potential foundation for a future quantitative analysis (benchmarking).

GEOGRAPHICAL DIMENSION OF THE TRANSPORT "DILEMMA" 2

a. Dimension of the "transport system"
b. Dimension of the "environment and society system"

2.a Dimension of the "transport system"

Figures 2.a.1 and 2.a.2/2.a.3, taken from the 1994-2004 CAFT Study[1], illustrate respectively the different growth trends of the heavy vehicle traffic in the 1994-2004 period (taking 100 as the traffic base for 1994) and the overall and heavy traffic for the year 2004, for each of the following itineraries:
- Ventimiglia
- Frejus
- Mont Blanc

[1] Source: Analysis of road traffic across the alpine range 1994-2004 - Italian contribution to the CAFT 2004 survey.

- Great St. Bernard
- Como - Chiasso
- Resia Pass
- Brennero
- Udine - Tarvisio

In the charts, the vehicle traffic at the Frejus and Mont Blanc tunnels is shown with a single cumulative line, to take into account the effects of the closure of the Mont Blanc tunnel in the 1999 - 2001 period.

The chart shows that the traffic on the A23 Udine-Tarvisio motorway increased by about 130%. The corresponding traffic increase on the A10 (Ventimiglia) motorway reached 90%.

Fig. 2.a.1

Heavy vehicle traffic increase for each itinerary in the 1994-2004 period

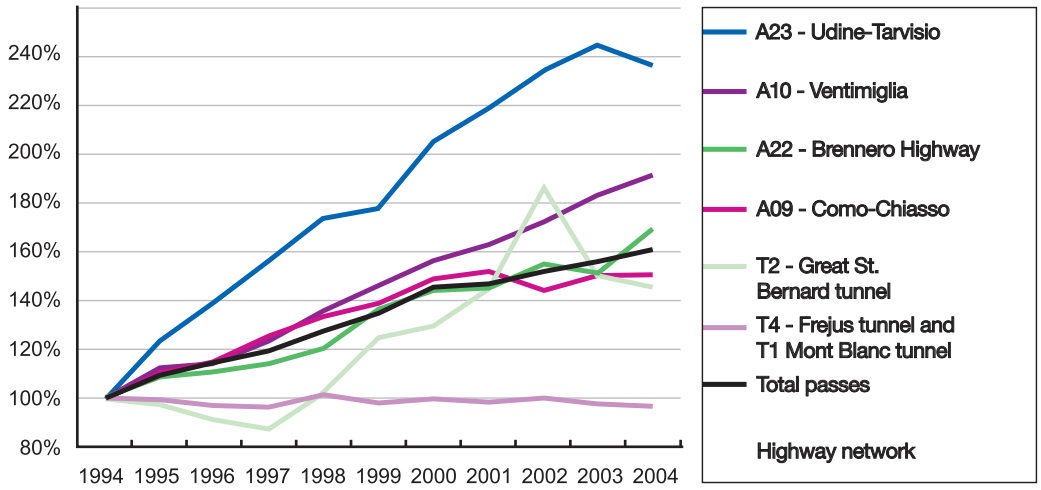
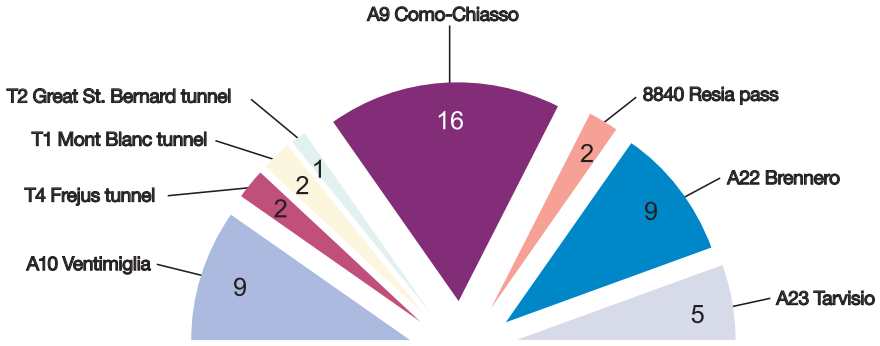


Fig. 2.a.2

Year 2004: Total light vehicle traffic on the different itineraries (values in thousands of vehicles per year)



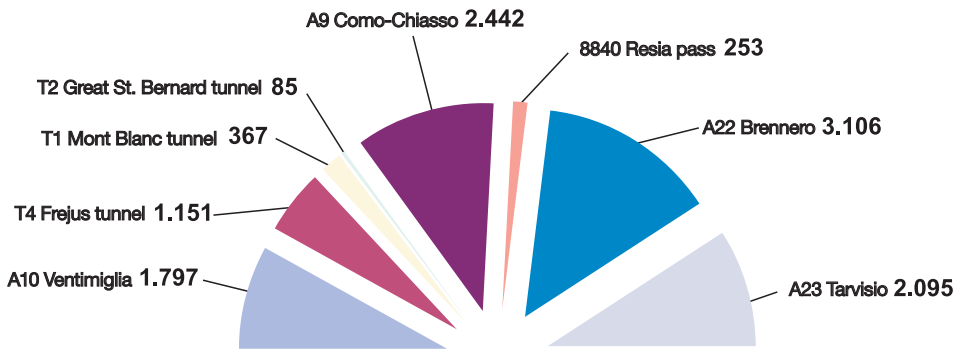


Fig. 2.a.3

Year 2004: Total heavy vehicle traffic on the different itineraries (values in thousands of vehicles per year)

Europe, up to the dimension "a 15", was characterised by a direction of exchanges prevalently N-S, compared to those E-W, because of the flows of the internal markets and of the political separation of the block of countries under Soviet influence.

The extension to the East and the economic exchanges in the "Wider Europe" (including the Countries outside the European administrative borders, but with intense commercial exchanges with the EU) have changed this trend shifting to an overall increase in both directions.

The table below reports the current data and the forecasts for an increase of E-W exchanges for Northern Italy, presented in the "Interreg Project IIIB Spazio Alpino" ALPENCORS "Alpine Corridor South"[2].

Passes	Cars		Light Goods		Heavy Goods		Bus		Total
	Transits	%	Transits	%	Transits	%	Transits	%	
Ventimiglia	12.934	71%	1.910	11%	3.113	17%	164	1%	18.121
Frejus	2.496	36%	401	6%	3.948	58%	18	0%	6.863
Mont Blanc	14.306	83%	1.088	6%	1.689	10%	241	1%	17.324
Great St. Bernard	2.414	80%	166	6%	356	12%	68	2%	3.004
Chiasso	34.796	78%	3.440	8%	5.693	13%	398	1%	44.327
Brennero	8.377	55%	1.240	8%	5.412	35%	268	2%	15.297
Tarvisio	18.959	83%	1.206	5%	2.241	10%	472	2%	22.878
Gorizia	9.202	61%	1.453	10%	4.355	29%	53	0%	15.063
Trieste	34.847	77%	3.371	7%	6.924	15%	266	1%	45.408
Total	**138.331**	**73%**	**14.275**	**8%**	**33.731**	**18%**	**1.948**	**1%**	**188.285**

Fig. 2.a.4

Daily bi-directional transits at the passes per type of vehicle, 2003

Source: operating system processing - in ALPENCORS "Linee Guida per una politica del Corridoio V" (Guidelines for a policy of Corridor V)

[2] Can be downloaded from the site of the Alpine Space - http://www.alpinespace.org/alpencors-results.html?&L=6056

Fig. 2.a.5

Daily transit of heavy vehicles for each pass, 2003

Source: operating system processing - in ALPENCORS "Linee Guida per una politica del Corridoio V" (Guidelines for a policy of Corridor V)

Passes	< 400 Km	> 400 Km	Total	Quota > 400 Km
Ventimiglia	556	2.447	**3.003**	**81%**
Frejus	551	3.382	**3.932**	**86%**
Mont Blanc	97	482	**578**	**83%**
Great St. Bernard	157	175	**332**	**53%**
Chiasso	539	3.679	**4.217**	**87%**
Brennero	1.246	3.894	**5.140**	**76%**
Tarvisio	157	2.006	**2.163**	**93%**
Gorizia	1.310	1.194	**2.504**	**48%**
Trieste	852	935	**1.787**	**52%**
Total	**5.464**	**18.192**	**23.656**	**77%**

Fig. 2.a.6

Flows of freight traffic per macro-area - % variation 2004 - 2010

Source: CSST processing - in ALPENCORS "Linee Guida per una politica del Corridoio V"

O/D	Europe East	Europe North	Europe West	Italy Mid South	Italy North-East	Italy North-West
Europe East	17	22	15	17	34	67
Europe North	25	19	-4	20	26	39
Europe West	14	-3	13	13	24	14
Italy Mid South	16	16	13	0	16	8
Italy North-East	44	23	22	17	18	27
Italy North-West	54	39	16	11	23	12

2.b Dimension of the "environment and society system"

The Alpine Space is an "environmental sensitive area". An environmental sensitive area is a region where the ecosystems (but also of the economic and social systems) are particularly delicate and therefore, the impact of environmental pressures is greater than in other areas.

This is particularly true considering the "Alpine Space" in all the area of the territorial cooperation of the Programme.

Fig. 2.b.1

Area of cooperation of the Interreg Program IIIB Alpine Space 2000-2006 - The area has remained unchanged for the 2007-2013 programming

Source: site www.alpinespace.org

Besides the mountain areas of the Alpine Space, also the Italian "Pedemontani" (foothills) and the Padano (Po River Basin) districts are distinguished by a response to environmental pressures that have few correspondents in the rest of Europe: the Padano district has a particular meteorological condition that greatly amplifies the negative effects of polluting atmospheric emissions.

The Po river basin is a densely populated flat area of about 46,000 km^2, characterized by high industrial, urban and traffic emissions, and it has the country's worst problems with air pollution, especially because the weather conditions, typical for that area, have a tendency to trap the pollutants, rather than to disperse them. The atmospheric circulation of the Po valley is characterised by the strong modification of synoptic flow due to the high mountains (Alps and Apennines) that surround the valley on three sides.
According to the regional emission inventories, road traffic is mostly responsible for the PM_{10} emissions.

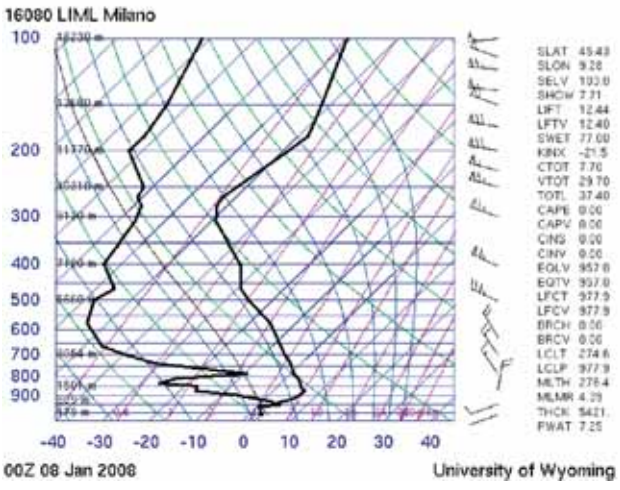


Fig. 2.b.2

Milan radiosounding on 8th January 2008, showing a strong temperature inversion at low levels

Fig. 2.b.3

This satellite picture shows an example of how polluted the Po Valley can get. This picture was taken in February 2005. NASAVE NASA Visible Earth

Courtesy NASA

All strong air pollution episodes are usually associated with the influence of areas of high pressure or a high-pressure ridge. High atmospheric pressure is commonly related with stable stratification; however, it does not necessarily lead to extremely stable conditions or strong inversions near the ground level.

Regarding episodes of PM_{10} and NO_2, an elevated atmospheric pressure is probably a necessary, but not a sufficient condition for the occurrence of an episode. Strong ground-based or slightly elevated temperature inversions usually prevail in the course of the episodes (see figure 2.b.2). The inversions are mainly caused by advection or strong outgoing radiation during wintertime.

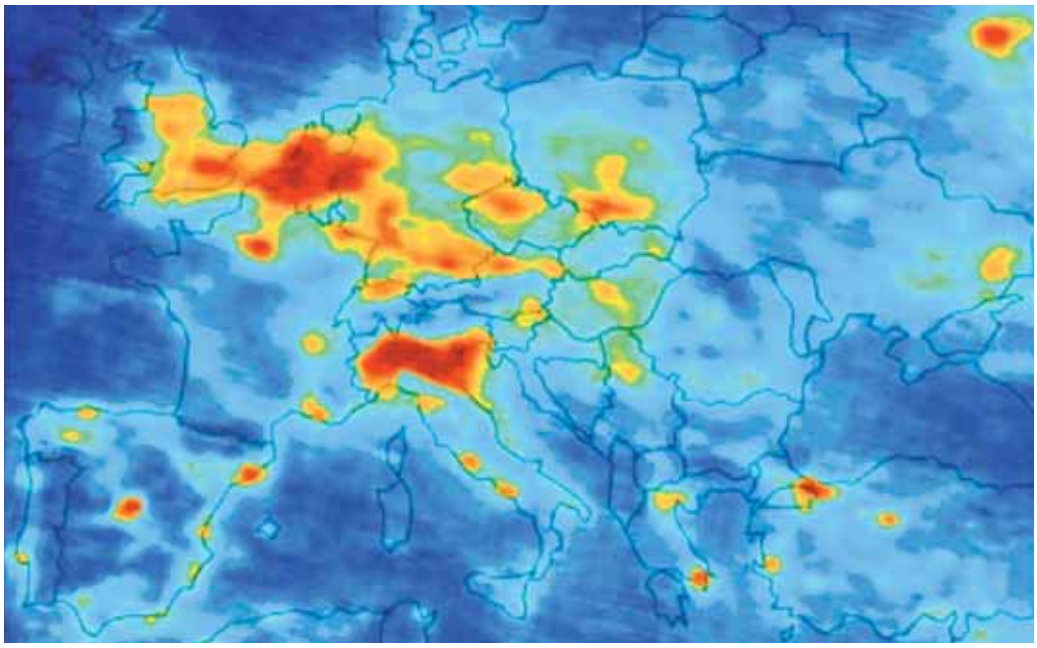


Fig. 2.b.4

Levels of NO_2 2004 - from IUP Heidelberg, ESA, 2004 - Map of the average load of nitrogen dioxide present in the air

Source: www.scienzaonline.com/ambiente/img/pollution_europe_hires-gg.jpg

The PM_{10} values in the different expressions (days above limits, average daily concentration, etc.) measured in the area under observation substantiate the above analysis[3].

To conclude, we can reasonably state that:
- The present and future E-W freight transit is destined to increase,
- The Po River Basin district of the Alpine Space is an area of high environmental sensitivity, considering the polluting emissions whose quantity to a great extent is imputable to the transport sector.

Therefore, it can be said that a harmonious freight (and passenger) transport policy must take into consideration the overall geographic dimension of the problems to be faced.
From this comes the recommendation, for the continuation of the MONITRAF activities, to extend the geographical area of analysis and activity to the entire area of cooperation of the Alpine Space.

THE PARTNERSHIP DIMENSION 3

In this section, a series of observations will be illustrated connected to the definition of types and dimensions of partnerships able to guarantee the maximum performance of the project follow-up. The parameters and the quantitative analysis set up in the MONITRAF Project, ran up against a chronic lack of accessibility of data (studies of other projects indicates that this is a common problem).
On the other hand, there are, also in the data collection field, examples of success to be taken as reference "good practices": in the specific case of the Alpine Space, the CAFT survey 1994/2004 certainly belongs in this category. The involvement of different levels and types of actors combined to provide a high level of accessibility and of quality of the data, which even compensated for the lack of participation of some subjects.
In terms of data supply, below we intend TOP every level, which regarding a certain theme, is the producer and holder of the services and data.

3.a The bottom up/top down approach

The involvement of European political decision-makers

In the framework of result n°4 "Trans-Alpine Transport: a Local Problem in Search of European Solutions or a European Problem in Search of Local Solutions?"[4] of the European ALPNET Project, discussions were held on the relationship between local decision-makers of the Alpine Space and European Transport Policies.
Referring to the documents of this initiative for the details, we want here to point out that the analysis made reached the conclusion that local initiatives had to be included in a *"European mode of governance"*, acknowledging the petitions dictated by specific local needs; based on these, specific measures should be defined for zones of high environmental sensitivity. In the scope of this governance of the transport policy, the involvement in various ways of the European institutions offers a greater impact.

[3] See the various synthesis maps on the site of the EEA.
[4] ALPNET - Thematic network on Transalpine Crossing - Fifth Framework Programme - Competitive and sustainable Growth - http://www.iccr-international.org/alp-net/

On the other hand, as will be shown in the last chapter, the evaluation of the performances of the measures is better guaranteed where the TOP support is effective.

The involvement of political decision-makers at the NUT0 level

As clearly illustrated in WP10, the Italian decision level effective for the definition and implementation of national and international transport policies is NUT0.
Failure to involve this level puts at risk the concrete possibilities to implement the measures selected and agreed on at the Alpine Space level.

The involvement of the political decision-makers of all the NUT2 areas concerned

Based on the observations presented in the preceding chapter, regarding the geographical dimension of the "transport system" of the Alpine Space, the inclusion of all the regional decision-makers in the definition and support of common measures is a factor of fairness and of greater success.
The Interreg IIIB Alpine Space ALPENCORS Project, to which one can refer, has also pointed out how the Ten-T Corridors offer a very important opportunity for local sustainable development if supported by appropriate policies of integration with the International transport system, through investments in regional infrastructures. An indicator and a measure regarding this are proposed in Chapter 4.

The involvement of the citizens, of the local movements and of NGOs

In the scope of the Interreg IIIB Spazio Alpino ALPENCORS Project, a study has been started to define local policies of *governance*[5]. This analysis is focused in particular on the local management and perception, for the Torino-Lyon railway line.
Referring to the report of the ALPENCORS project for the details, it is evident that only with an intense activity of governance, is it possible to define acceptable projects with the populations. On the other hand, the stakeholders *lato sensu* are one of the main groups of users for the MONITRAF Database and Portal.

Fig. 3.a.1
Italian organisations that manage the cross-border itineraries of the considered corridors

		ITINERARIES	ORGANISATION
E80	A10	Fiori-Ventimiglia Highway	Autostrada dei Fiori S.p.A.
E70	T4	Frejus Highway Tunnel	SITAF S.p.A.
E25	T1	Mont Blanc Tunnel	GEIE Traforo Monte Bianco
E27	T2	Great St. Bernard Tunnel	SISTRAB S.p.A.
E35	A9	Lainate-Como-Chiasso Highway	Autostrade per l'Italia S.p.A.
	SS40	Resia Pass	Prov. di Bolzano (dal 1/7/1998) - ANAS
E45	A22	Brennero Highway	Autostrada del Brennero S.p.A.
E55	A23	Udine-Tarvisio Highway	Autostrade Per l'Italia S.p.A.

[5] Alpencors - final report- part C - Chap. 6 "Approcci locali"

The involvement of the road, motorway and railway directors

As demonstrated during the CAFT experience, which in Italy involved all the directors of roads (Autostrade per l'Italia S.p.A., SITAF S.p.A., GEIE T.M.B., SISTRAB S.p.A., Province of Bolzano, Autostrada del Brennero S.p.A.)[6], in the case of Italy, the role of the directors of the roads and motorways for the supply of data is fundamental.

The involvement of the road hauler category

The road haulers category, left out of the involvement, seems to be substantially "demonised", by its absence. European policies for modal transfer do not aim at "zeroing" truck transport; rather they want to slow down the growth trend and transform some road routes (long distances, or particular goods categories, or the passage through "environmentally sensitive" areas) into mixed routes. Given the natural inter-modal vocation of railways, truck transport does not risk, in any case, losing its leadership position as a means of capillary and point delivery from the interchanges to or from the origin or destination. The advancement of the policies without including truckers in the discussions could be harmful in terms of contraposition, instead of managing a phase of change, needed for all the general public, of the transport modalities.
This study, moreover, has made extensive use of data taken from documentation prepared by the truck transport categories, which base their processing on the collection of thorough and precise information of data fundamental for the definition, assessment and implementation of transport policies.

3.b The multi-disciplinary approach

The involvement of expert legal linguists

In the first part of the report, the difficulty was pointed out regarding the legal translation of Laws, Regulations, Plans and Measures. The MONITRAF Project did not focus on this issue, so a "meta-linguistic" solution was developed as a pivot language, which it uses to summarily explain the filed documents.
It is reasonable to state that also the continuation of the cooperation, cannot take on, for reasons of focus and of budget, the part of the project dedicated to this aspect. Nevertheless, the possibility to create useful synergies with other projects or institutional organisations would be of enormous added value to activate an effective dialogue in the legal field.

The involvement of transport modelling experts

The WP8 has conducted an analysis of scenarios based on the identified indicators.
The task of the MONITRAF project was not, in fact, that of identifying new models, but rather to analyse existing data and models and define the state of the art for them.
To be able to refine the forecasting methodology, to support the decisions, it is opportune to involve organisations and institutions expert in the modelling of transport, to pass from a mono-dimension analysis of the indicator to its composition, and also to an analysis of

[6] "Analisi del traffico stradale attraverso l'arco alpino (Analysis of road traffic across the Alps) 1994-2004 - Italian contribution to the CAFT 04 survey" by the General Management for Programming and the European Programmes, in "Le Strade" 3/2006 - pdf in Italian available in the "STUDI" section of the MONITRAF Archives

the impacts of numerous combined and/or overlapping measures. As for the expert legal linguists, in the scope of a single project, direct inclusion may not be practicable, but synergies with other project activities or research organisations are recommended.

4 ANALYSIS OF THE INDICATORS

a. Premise
b. Present MONITRAF indicators
c. Further indicators

4.a Premise

The WP7 of the MONITRAF Project provided a wide-ranging and detailed analysis of the indicators potentially useful to monitor the impacts of vehicle traffic and to devise common measures. Referring to the corresponding report for the details of the survey and the evaluation criteria, here we want to underline that many indicators, useful and appropriate, have had, at least for the moment, to be set aside for lack of data that support the quantification and the trends. The proposals that follow, therefore, are not in contrast with the choices made by the MONITRAF Partnership, but they support the debate regarding the monitoring "techniques", and are a result of the analysis in progress of materials and methods elaborated at a European and world level.
Referring to important recent compendiums[7], we must remember that the "role" of an indicator should be: "simplifying, measuring and communicating trends and punctual events" (Eckersley, 1997) or of "quantifying measures that can illustrate and communicate complex phenomena in a simple way, including trends and evolutions in time (EEA, 2005).
We can assume, therefore, that an indicator renounces the complexity of the phenomenon, focusing on some aspects considered most important.
The selection of the indicator must guarantee clarity, comprehension, political significance, accessibility, reliability and the basic data to calculate it must be accurate.
The cost/benefit ratio for the calculation of the indicator is another criterion of choice.
Its regular updating is a fundamental factor for the definition of trends and scenarios.

4.b Current MONITRAF indicators

GDP - The gross domestic product

The GDP is normally considered a key indicator to assess the economic health of a territory. The GDP, for some time, has been a somewhat controversial macro-economic indicator because, as is known, it combines as "positive" the circulation of money imputable to activities that can be positive or negative: for example, health costs are counted as a positive item, distorting the meaning of "well-being" that its growth would suppose.
In this sense, based on the definitions and characteristics that an indicator should have, as stated in the premise, its capacity to "measure" local, regional or national well-being is the subject of debate.

[7] JRC -Joint Research Center, 2007 - "Indicators to assess sustainability of transport activities"

However, probably it is not simple to immediately set aside this indicator, as it is easily available and universally recognised.
But given the use that is made of it, in the modelling of trends of the mobility demand, it can be a way to validate its opportunity, verifying particularly the decoupling of transport from the GDP at the different NUT levels.

In Section 4-c, referring to the proposal for the insertion of the "transport demand" indicator, the critical aspect of the GDP in the definition of policies regarding transport is further highlighted.

Health indicators - air pollution

Today no one questions the relationship between exposure to polluting atmospheric substances and their effects, acute and chronic, on health.
The World Health Organisation has emphasized the existing relation between the concentration levels of dusts in the air and their effects on populations, both in terms of mortality and of hospitalisation, and it has suggested that the levels be suitably and continuously monitored to provide reliable evaluations of the impact on people's health[8].

In a recent estimate, total outdoor air pollution was found to account for approximately 1.4% of total mortality, 0.5% of all disability-adjusted life years (DALYs) and 2% of all cardiopulmonary disease (World Health Report 2002)[9].

The WHO distributes the AIRQ software that provides an evaluation of the impact with mathematical calculations valid at a European level[10].

Epidemiological studies, moreover, have not succeeded in identifying a threshold level of *no effects*[11]: in fact the number of medical events (deaths or hospitalisations) would not exist if the risk (pollution) were reduced to zero or to acceptable limits.

Through common computer and methodological tools, made available by the WHO, together with a regional calibration of some of the characteristic parameters, for each territorial area of the regions involved, we can define the following quantitative values:
- mortality
- morbidity
- reduction of life expectancy

The procedure is implemented in urban areas, for which the statistic sample is suitable for estimates. As always, for the areas not densely populated, the statistic significance, and the accessibility of epidemiological data have some significant limits.

In spite of the above well-known difficulties, it can be presumed that the involvement of suitable actors can make the estimate practicable. This quantification procedure is therefore advised for the continuation of the project.

[8] OMS -"Review of methods for monitoring PM10 and PM2,5" - Berlin, Germany, 11-12 October 2004
[9] For more information refer to the publication "Outdoor air pollution: assessing the environmental burden of disease at national and local levels Environmental burden of disease" series, No. 5 - WHO - Geneva, 2004
[10] http://www.euro.who.int/air/activities/20050223_5
[11] Indications taken from "Rapporto sulla valutazione sanitaria della qualità dell'aria a Bologna anno 2006" (Report on health assessment of air quality - Bologna 2006) August 2007, by Corrado Scarnato, Emanuela Pipitone

Health indicators - noise

Numerous research studies have pointed out that the noise produced by means of transport can have negative effects not only on the operators and users but also on the populations that live near roads, railways and airports.
The WHO, in the framework of the European Commission's Health Monitoring Programme has made a close examination of the indicators useful to define the impact on health of noise of every origin. The 2004 results of the Commission assigned[12], considered, besides the indictors already contemplated in the MONITRAF Project, a specific marker that relates arterial hypertension with noise.
The pilot tests conducted in Germany and in Holland brought out a definite correlation with noise of air traffic, but for noise coming from land transport, the data were not conclusive because of the low quality of the information on exposure. Considering the experience and the information obtained from the two synergic projects ALPNAP[13] and MONITRAF, we judge that now the conditions exist for a pilot test of applicability of the WHO method.

The European SILENCE[14] project focused on the reduction of the noise of surface traffic in urban areas and identified the following measures that could be implemented.

Infrastructure management

1. **Infrastructure management**
   a. Low noise road surfaces
   b. Roundabouts replacing crossings
2. **Traffic management**
   a. Speed limits and traffic calming
   b. Reducing traffic volume

Roundabouts (correctly planned and adapted to the overall layout of the stretch of road), seem to be particularly effective in reducing noise disturbances due to stops and accelerations. These, obviously, are measures to be implemented at a local level.

Reduction in traffic volume	Reduction in noise (LAeq)
75%	6.0 dB
50%	3.0 dB
40%	2.2 dB
30%	1.6 dB
20%	1.0 dB
10%	0.5 dB

As part of the SILENCE project, focused on the urban and suburban environment, a support guide was prepared for administrators that clearly indicates the roles, competences and the cost/benefit ratio of each measure adopted (*best practice*) or adoptable[15].

[12] WHO, 2004 "Who technical meeting on noise and health indicators- second meeting - Results of the testing and piloting in Member states"
[13] ALPNAP - Monitoring and Minimisation of Traffic-Induced Noise and Air Pollution Along Major Alpine Transport Routes - Interreg III B Alpine Space - www.alpnap.org
[14] SILENCE "Quieter Surface Transport in Urban Areasù2 - Sixth Framework Programme for Research, Technological Development and Demonstration - Integrated Project - www.silence-ip.org
[15] The guide can be downloaded from the site: http://www.smile-europe.org/PDF/guidelines_noise_en.pdf

Two other important projects have come up with solutions and measures regarding noise coming from vehicle and rail traffic:

- the HARMONISE Project - www.harmonise.org
- the IMAGINE Project - www.imagine-project.org

for more information on these projects, refer to the relative bibliography on the Internet sites.

Sample surveys and pilot projects are not part of the specific objectives of MONITRAF, which intends to base its work on already existing and validated databases.
In general we recommend, seeing the existence of consolidated networks that have already made choices of good practices and implemented innovative solutions at a European level, keeping alive a transversal, multi-disciplinary network, in order to have information on the useful indicators of pressure, impact or responses that have been identified.

Fuel prices

The entry into the world arena of the new big economic countries (China and India) has drastically upset the balance between the demand and the supply of fuel, leading to an unprecedented sudden rise of prices. In the past few years, we have seen an enormous and unexpected increase in the cost of oil products.

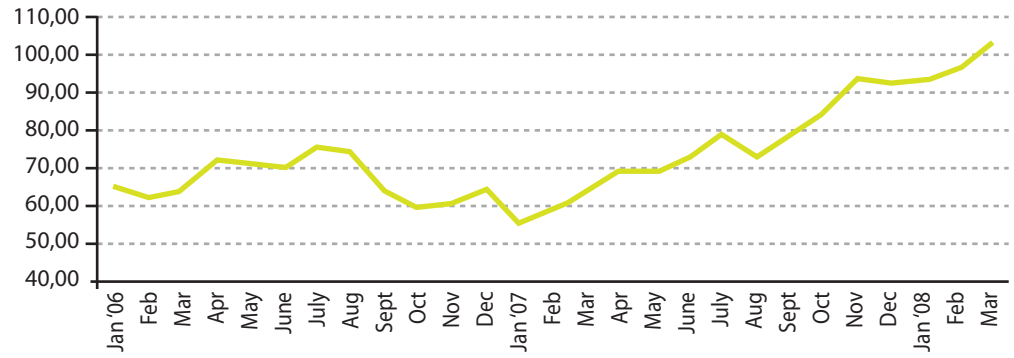


Fig. 4.b.1
The rise of oil prices in the period January 2006 to March 2008. Re-elaboration by CONFETRA

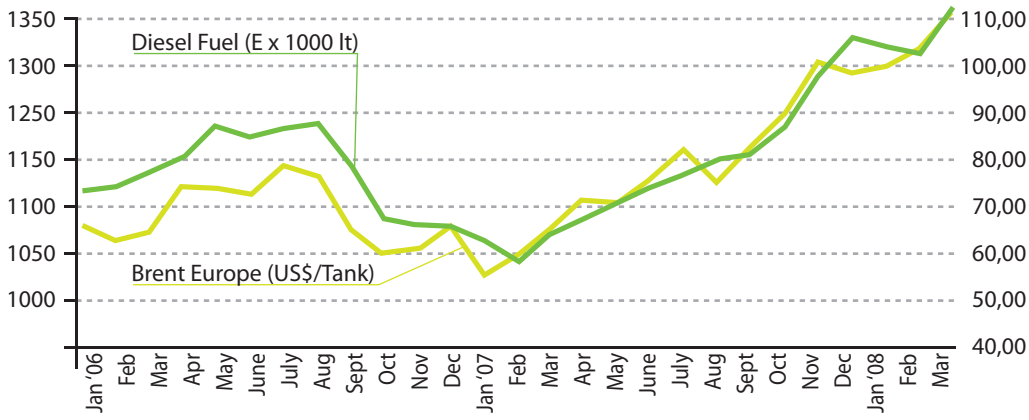


Fig. 4.b.2
Trend of diesel fuel costs compared to Brent in the period from January 2006 to March 2008. Re-elaboration by CONFETRA

The table belove shows the impact of the cost of diesel fuel on the total costs of truck transport for the year 2007 (CONFETRA): note how in the year of reference, fuel cost amounted to almost a third of the total costs.

Fig. 4.b.3

Cost components for road transport - year 2007 .

Source: CONFETRA

Cost component	Impact on total cost 2007
Manpower	27%
Vehicle depreciation, maintenance including lubricants and tyres	33%
Fuel	28%
General expenses, insurance, vehicle taxes, tolls	12%

The COWI[16] Report, at the base of one of the scenarios analysed in the WP8 MONITRAF, reports an LTF estimate of a hypothesis of an oil price increase reaching up to 100.00 dollars per barrel around 2017.
The same report, mentions a recent DGTREN[17] study, which shows that the doubling of oil prices would lead to an increase of about 10% in the total operating cost of truck transport, compared to a 1% increase in rail transport.
So, we can foresee that in a medium-long term, such a large increase in the cost of mobility on roads will lead to a territorial reorganisation of the localisation of manufacturing, in order to reduce the negative economic impact.

This indicator is therefore of considerable importance:
- to observe the entrepreneurial reactions to the new scenario
- to rapidly create appropriate and competitive conditions as replacement of road transport
- to monitor the local accessibility policies, that will replace the reduced mobility capacity of single citizens.

Transport prices - motorway tolls

The CONFETRA note of March 2008[18] on the economic situation, reports that motorway toll prices have increased, both in Italy (average 2.7%, source ISTAT), and in the European countries bordering on Italy, like Austria (+20%) and Switzerland (from a minimum of 5.1% to a high of 6.6%). Since January 1st 2008, motorway tolls have undergone further increases, that go from +3,6% of "Autostrade per l'Italia" (the principal Italian operator), to +8.5% for the Torino - Aosta.

According to motorway operators[19], up to today the lever of toll increases has never been a determining force for a modality change.
According to CONFETRA estimates, moreover, motorway toll costs amount to about 2% of total transport costs, and only 3 per thousand of the inflation increase.

Contrasting these data, the TERM (Climate for a Transport Change, 2008) Report states

[16] COWI, December 2006 "Stima delle potenzialità del traffico merci attraverso le Alpi - Caso specifico del nuovo collegamento transalpino Francia-Italia" (Evaluation of freight traffic potential across the Alps - Specific case of the new transalpine link France-Italy)
[17] DGTREN, 2006 "Impact of high oil prices on the transport sector" ECORYS & Consultrans
[18] http://www.confetra.it/it/centrostudi/notacongiunturale.htm
[19] QUADERNI TAV - The Traffic scenarios according to the Motorway operators - "Gli scenari di traffico secondo le Concessionarie autostradali" - http://www.governo.it/GovernoInforma/Dossier/tav/quaderno2/Q02_2g_Audiz_Autostrade.pdf

Autostrade per l'Italia	3,61%
Ativa (To-Ao)	8,50%
Milano-Serravalle	1,23%
Centropadane	1,29%
Autovie Venete	1,48%
Brescia-Padova	0,68%
Cisa	0,68%
SATAP A4 (No Est-Mi)	0,74%
SATAP A4 (To-No Est)	0,76%
SATAP A21 (To-Pc-Bs)	0,80%
Venezia-Padova	1,00%
Autobrennero	2,75%
RAV (Ao-Monte Bianco)	0,58%
Torino-Savona	2,46%
SITAF (To-Bardonecchia)	2,55%
Autostrada dei Fiori (Sv-Ventimiglia)	0,98%
Tangenziale di Napoli	3,22%

Fig. 4.b.4
Motorway toll increases in Italy, January 1st 2004

that from 2001, the year when Switzerland first applied the Tax Proportional to Performance in Switzerland, to 2005, the total number of run kilometres was 6.5% lower than in 2000.

In any case, the toll rate increases, besides reducing the distortion of the transport market, today favourable principally to truck transport, is a source of income for the *cross-financing* on other sustainable infrastructures, in the *Eurovignette* key.

We can conclude that the rise of toll costs is an important indicator of the revenue for the financing of sustainable transport infrastructures, while we still need to assess through a cross-analysis of the trend, if it effectively has influence as an absolute deterrent. Moreover, if applied in a non-homogeneous manner to the different route choices, it could have a negative *detour* effect on the nearby passes.

Finally, we need to consider the fact that an indiscriminate increase of rates for freight and passenger transit could negatively affect accessibility and mobility, penalising citizens who live in areas farther from the metropolises.

Infrastructure investment

During the debate inside the MONITRAF Partnership, members discussed which items of expense should be considered in the context of this indicator. It is clear that the values connected to large infrastructures influence the calculation of the indicator falsifying its significance.
Local investments (NUT2 or lower) aimed at improving the efficiency of the existing network would certainly be more significant, but also in this case, they cannot be evaluated in the same way. For example, the construction of an additional lane (a measure that alleviates traffic pressure), compared to investments in logistics platforms (favouring inter-modality and therefore backing the shift towards a railway-road mix).

The ALPENCORS Project pointed out how the political *bottom-up* approach to the major European highways and corridors is, in fact, MUST be, the opportunity for local governments to invest through infrastructures in logistics that support inter-modality. In this way, they promote the harmonious integration of the corridor, or of the major roadway into the local production and transport system.

The same project, moreover, indicates a radius of about 400 kilometres as the reference distance for freight and passenger travel, on which regional policies should concentrate; within this radius, the infrastructure is capitalised as a "facilitator" of proximity relations of all types. We propose, therefore, to identify investments aimed at promoting inter-modality with connections to large roadways and corridors, as refining of the "infrastructure investments" indicator.

Employees in the transport sector

In relation to what was said about the preceding indicator, we propose to identify the number of workers in the logistics sector supporting inter-modality, compared to the persons employed in the transport sector in general.

4.c Further indicators

The transport demand

The demand for mobility of freight and persons over the Alps is showing a constant positive trend, that can be seen in the transit values in terms of vehicles and tonnage.

The definition of the scenarios analysed in the work on the WP8 of the MONITRAF Project (LTF, BBT) is founded on the same methodological assumption used to calculate the traffic potential: the growth of the GDP. This assumption is actually the one used also in all the studies conducted at the European Community level analysed in the preparation of this report. The GDP values considered are not those, or not only those, of the countries interested in freight transit.

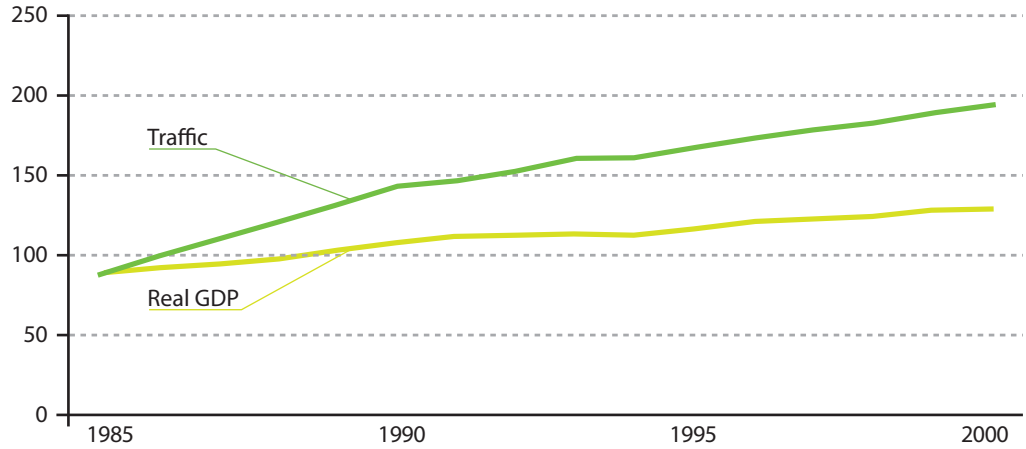


Fig. 4.c.1
Real GDP and Torino-Trieste traffic
Source: Elaborazioni Università di Venezia - The Alpencors Project

In the ALPENCORS Project, referring to the demand evaluated in function of the GDP, it shows a trend higher that that of the GDP of the single areas crossed by the traffic.

The estimation of the growth trend of the transport demand in the E-W direction is based also on the economic growth of the countries at the ends of Corridor V (Spain, Portugal - and the countries of Eastern Europe and "Wider Europe").
In the above-mentioned COWI Study, a comparison is made between the growth forecasts of the GDP: OCSE, LTF and BBT.
These trends give an estimate of the freight traffic growth tendencies.

The above further underlines the fact that freight transit is not in itself directly proportional to local economic growth measured by the traditional GDP macro-economic indicator.

Another important conclusion can be drawn from the traditional models for scenarios of the transport demand: this model is based on the BAU (*Business As Usual*) assumption of the non-decoupling of the GDP from the transport demand. In the end, the scenarios of transport demand, that support the relative transport policies are based on GDP predictions and on the assumption that the trend will remain always directly proportional to the demand for transport.

The latest TERM data[20], regarding the European decoupling trend between the transport demand and economic growth, are shown in the graph below.

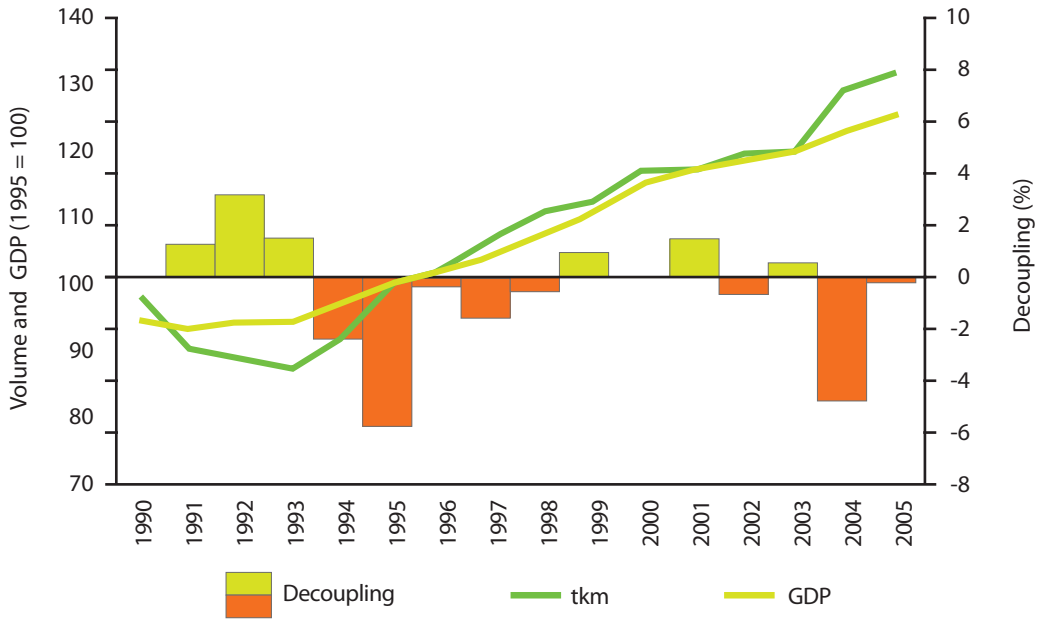


Fig. 4.c.2
GDP-Freight Transport Decoupling (ton-km)
Source: TERM

The *Decoupling* columns of the chart show the annual decoupling. The positive value (green) indicates decoupling (reduction of the percentage of transport intensity com-

[20] Climate for a transport change. TERM 2007: indicators tracking transport and environment in the European Union - EEA Report No 1/2008

pared to the previous year). Data are not available for Switzerland and for Liechtenstein. The GDP is in Euro at constant 1995 prices. The freight transport (ton-km) includes road, railway and internal navigation. Short-range sea navigation and pipelines are not included for lack of data.

The chart opportunely shows that the assumption that there is a direct proportion between the GDP and the transport demand is reliable for a BAU scenario.

We propose inserting the demand for transport into the list of indicators, because of its relevance in the forecast scenarios.

External costs

The offer of mobilisation services on roads has followed a pattern opposite to the general economic trend, leading to a constant lowering of prices that is difficult to match in other industrial sectors[21].
In Italy, Legislative Decree no. 286/2006 abrogated mandatory rates starting from February 28th 2006. Previously a range had been applied - mandatory range of rates in euro/q/km - depending on the class of goods.

The factors that led most to the reduction of costs are:
- the lower manpower costs due to the extension to the 27 member countries,
- the externalisation of costs.

We must admit therefore, that the greater appeal of truck transport compared to railway is due, among other factors, to the distortion of the market deriving in great part from the failure to internalise transport costs. The problem of cost internalisation lies first of all in its computation. We report below a calculation elaborated by a study of the Sub-group COSTS of the Alpine Convention[22]. The method considered was devised by INFRAS[23]: "INFRAS-IWW method 00" (updated to 2000).

In this report, the external costs were calculated for the major corridors included in the space of the Alpine Convention, applied to heavy freight traffic.

The reference texts can be examined for the details of the calculation method; below we synthesise the parameters taken into consideration:
- air quality data
- epidemiological data
- vehicle insurance data
- data on the composition of the vehicle pool
- accident data
- data on the population exposed to noise
- soil use data
- data on various indirect costs

[21] Dati dal progetto Interreg IIIB Spazio Alpino ALPENCORS - report - Parte B - "Linee guida per un'efficace politica del Corridoio V" (Interreg IIIB Alpine Space ALPENCORS Project Data - report - Part B - "Guidelines for an effective policy of the Corridor V")
[22] Alpine Convention - Working group "TRANSPORT" - Sub-Group "COSTS of Transport" - July 2007 "The true costs of transport on the Transalpine Corridors - Final Report"
[23] IWW-INFRAS "External costs of transport. Accident, Environmental and Congestion Costs in Western Europe", Zurich (CH), Karlsruhe (D), March 2000

These data were used to define a monetary coefficient €(ton-km).

The following table shows the results of the calculations:

Corridor	Mileage (km)	External costs lower bound (€)	External costs upper bound (€)
A32 - Torino-Frejus tunnel	76	75,669,067	117,118,365
A43 - Frejus tunnel-Montmelian	83	82,638,587	127,905,583
A2 - Bellinzona-Gotthard tunnel	27	14,686,001	22,730,562
A2 - Gotthard tunnel-Altdorf	57	31,003,780	47,986,742
A22 - Bolzano-Brennero	85	145,648,052	225,429,787
A13 - Brennero-Innsbruck	35	59,972,727	92,824,030
A12 - Innsbruck-Kufstein	75	128,512,987	198,908,636
A93 - Kufstein-Rosenheim	27	46,264,675	71,607,109

Fig. 4.c.3
External costs calculated with the IWW- Infras method - for the trans-alpine corridors
Source: Convenzione delle Alpi

The same Report mentions that other experimental methods lead to an external cost estimation lower than the one calculated by the "INFRAS-IWW method 00". Specifically it refers to the method used by the French Ministry of Transport.

The table showing the type of data and the elaborations considered for the calculation of the external costs as reported in the "Report of the Alpine Convention" is annexed to this report.

The opportunity, or rather, the need to decide on a definition of the external costs is function of several aspects:
- Assessment of the real distortion of the truck transport market compared to that of the railways
- Assessment of the shares in a *Eurovignette* key to be assigned to rating and taxation, and also, in terms of *cross-financing*, of the amounts to destine to infrastructure implementations of various types and sizes
- Assessment (absolute and based on benchmarking) of the performance of the political measures actuated, and that can be actuated, aiming at an effective cost internalisation.

We recommend, moreover, that a shared methodology should be defined and applied at the level of the entire Alpine segment to be able to assess the external costs in terms of "impact".

Liberalisation of the railway market

Since January 1st 2007, in the EU territory, all the freight and passenger transport railway services have been open to competition. The reactions of the national operators up to today, has not been homogeneous.

Fig. 4.c.4

List of the companies assigned railway transport licenses in Italy - (April 2008)

Source: Ministero dei Trasporti (Ministry of Transport)

N. license	Name	Town	
1	Trenitalia S.p.A.	Roma	
2	LeNord S.r.l.	Milano	
3	Impresa Ferroviaria Italiana S.p.A.	Roma	
4	Rail Traction Company S.p.A.	Bolzano	
5	Rail Italy S.r.l.	Torino	
6	MET.RO S.p.A.	Roma	
7	Metronapoli S.p.A.	Napoli	
8	Trasporto Ferroviario Toscano S.p.A.	Arezzo	
9	Interjet S.r.l.	Castelvetro (Modena)	
10	Ferrovia Adriatico Sangritana S.r.l.	Lanciano (Chieti)	
11	Hupac S.p.A.	Milano	
12	Azenda Consorziale Trasporti Di Reggio Emilia	Reggio Emilia	
13	Getras S.r.l.	Perugia	

It appears now that market shares of the traditional operators have been acquired by new subjects.The freight transport market on rails according to economic operators, has a high potential for development.
We foresee that the entry of private operators will improve the quality of the service in terms of punctuality and reliability.
The European Community, on the other hand, through the European Railway Agency and the Network of big corridors, is working to support the extension of the transport offer on rails.

We propose comparing the data on the private railway sector (workers, invoiced revenue, tons transported) as indicator of the vivacity of the private rail transport sector and of the change in the demand of transport mode.

5 ANALYSIS OF THE MEASURES

a. The benchmarking tool
b. Proposal for benchmarking in the plans for the continuation of the MONITRAF project
c. Qualitative analysis of the MONITRAF best practices and other measures

	Service typology		License condition
	Passengers	Goods	Effective
	Passengers	Goods	Effective
	Passengers	Goods	Effective
		Goods	Effective
	Passengers	Goods	Revoked
	Passengers		Effective
	Passengers	Goods	Effective
	Passengers	Goods	Effective
	Passengers	Goods	Effective
	Passengers	Goods	Effective
		Goods	Effective
	Passengers	Goods	Effective
	Passengers	Goods	Suspended

5.a The benchmarking tool

To strive for “sustainable transport”, MONITRAF does not intend to focus only on the protection of the natural environment, but on a process that takes into account, in the same way, economic, social and environmental aspects (the three “pillars” of sustainability), in order to reconcile the pressure of market globalisation, the need to grow and the impacts on the environment and on society. This is why every indicator selected and analysed refers to one of the above three pillars.

The metric introduced by the MONITRAF Project with the definition of indicators useful for the analysis of trends and scenarios is the functional base for a process of quantitative and qualitative evaluation of the performance of local, national and European policies, aimed at the realisation a sustainable “transport system”.
The identification of the “best practices”, done in the work of the WP 10 defines the “political” object of analyses of the performances.

A methodological tool useful to modify current practices and identify better potentially workable procedures to pursue objective data is benchmarking.
Benchmarking is a tool widely used in the economic field to capitalise the best practices existing and identify processes with which they were actuated.

In the framework of the European Project BEST "Benchmarking European Sustainable Transport"[24], benchmarking techniques were analysed together with their applicability to issues of sustainable transport.
Some of the points that follow, aimed at illustrating the tool of comparison and its application to the topic under consideration, are taken from the conclusive report of the BEST Project, to which readers can refer for more details.

The BEST Project indicates 4 steps to actuate a benchmarking
- assess one's own starting condition and performance
- analyse the processes and successful performance of others
- compare one's own performance with the others analysed
- implement the changes needed to cancel the performance gap

The same project illustrates the key actions and attitudes for a useful benchmarking:
- define a common and shared vision of the objectives and results for performance improvement
- have an open and involved commitment at high decision levels
- have the commitment of all those interested in the process of evolution and change
- be prepared to critically evaluate the current (own) operating methods
- be able and willing to cooperate and share information and experiences with others
- be willing to learn from the good practices of others
- be flexible in the implementation of the necessary changes
- set up of procedures that will monitor the successive progress

The same BEST Project, passing on to analyse the applicability of the benchmarking tool in the actuation of sustainable transport policies, recognises that the field of application does not refer to the totality of the measures, but, on the other hand, it can be a useful support to:
- identify environmental and quality standards that will encourage (or impose) the use of sustainable transport modes
- guide towards a modal change of transport
- support the management of the transport demand
- evaluate the economic performance of the transport system and indicate how it can support the economy in general

Finally, we list below the specific success factors for a benchmarking process aimed at implementing sustainable transport:
1. **Top-level support.** The transport sector operators and the local authorities need the commitment of managers and politicians to activate the change
2. A **planned benchmarking methodology** with a precise definition of the steps to take in the analysis for benchmarking purposes
3. **Well defined Area and topic in the transport sector**, that must be done before implementing a benchmarking exercise
4. The **integration of the benchmarking process** in the framework of a more comprehensive strategic plan
5. **Practical output and implementation of the results**: the Benchmarking objectives and output must be clearly defined

[24] Project BEST "Benchmarking European Sustainable Transport" 2000-2003 - Fifth Framework Programme for Research, Technological development and Demonstration, Key Action 2 'Sustainable Mobility and Intermodality', co-ordinated by the Directorate-General for Transport and Energy.

6. Assess **the influence of external factors** on the results: avoid enacting changes on aspects that are not determining for the pursuit of the result or to identify unrealistic measures
7. A **'trusted third party' or 'facilitator' to manage the benchmarking process**: the facilitator helps to ensure the cooperation of all the participants and the systematic implementation of the successive steps of the process
8. The **number of participants in a benchmarking exercise**: Groups that are not too big are easier to manage
9. The **choice of data to be collected** must focus on a reasonable number of really determining factors to guarantee a manageable and realistic process
10. **Harmonised transport data** and indicators shared at an international level facilitates enormously the application of benchmarking in the transport sector. For this aspect, the role that the European Commission can have is crucial.

Also the 'European Commission, Directorate-General Transport, and the European Conference of Ministers of Transport (ECMT) presented a "Communication on Benchmarking" during the BEST conference 'Transport Benchmarking: Methodologies, Applications and Data Needs'.

The communication identified 4 areas for transport benchmarking:
- the european transport system
- transport infrastructure
- the environmental impact of transport
- intermodality

The communication identified 9 benchmarking steps:
1. identification of relevant objectives and areas
2. selection of relevant dimensions
3. identification of indicators and data needed
4. data collection, analysis and assessment
5. identification of benchmarks
6. analysis of reasons for performance differences
7. strategy development
8. implementation
9. monitoring of results

In the BEST Project, as also in the MONITRAF Project, the availability and the quality of the data (step 4) were identified as the major obstacle to the benchmarking of transport.

During the already mentioned project: Project Interreg IIIB Alpine Space ALPENCORS, and also in the BEST Project, the shortage of data, especially of a historical type, was collected with databases and spot readings, with regression methods or with reference to data of a higher geographical level (like Eurostat).

The primary objective of the follow-up of the MONITRAF Project, for purposes of the opportune monitoring of the impacts of traffic in the Alpine Space, is to define the modalities for the punctual, precise, continuous and harmonised acquisition and processing of data.

Measures regarding the railways, identified in the ALPFRAIL Project[25]

At the side, this section ends reporting measures taken from the ALPFRAIL Project, regarding the modal transfer of freight from road to railway, and realised in the same cooperation space of MONITRAF.

Fig. 5.a.1
Catalogue of the measures identified in the ALPFRAIL Project

Intermodal terminal enlargement, and rail accesses improvement	**Best measures**
Profile P/C 80 corridors in Alpine Space area	
Standardisation of terminal planning, construction, operation	
Improvement of rail capacity	
Improvement of locomotive fleet (multicurrent/adapted to ETCS)	**Important measures**
New conventional rail terminal construction (private sidings)	
Development of a "Quality Label" for intermodal terminals	
Rail paths purchasing by non - Railway Undertaking (e.g. Provinces)	
Investment in innovative equipment (cranes, scanners, etc.)	
Trust based handover of rail wagons at cross-border	
Integrated management agencies of cross-border rail operations (e.g. Villa Opicina, Brenner Rail cargo, etc.)	
24h timetable at terminals	
Investement in high-cube rail wagons and other equipment to improve intermodal transport capacity	
Mutual acceptance of foreign drivers	
Corridor Quality Management System (OMS)	
Common management of rail shunting (Infrastructure manager + Terminal operator)	**Other relevant measures**
Decision Support Systems (route palnner)	
Tracking & tracing tools	
Integration of information flows among nodes and actors along the transport and logistic chain	

These are measures connected to the development and integration of railways into the alpine transport fabric.

Collaboration with the organisations taking part in this project can help to define the performance of the application of the measures in the various regions, and also illustrate with the appropriate benchmarking, the harmonies and disharmonies in the pursuit of the objectives.

[25] Alpine Freight Railway (AlpFRail): Solutions for the displacement from road to rail by developing a transnational network - Interreg IIIB Alpine Space www.alpfrail.com

5.b Benchmarking proposal in the context of the continuation of the MONITRAF project

Benchmarking is used to compare the performances of different solutions implemented.
The performance is measured based on precise targets.
These targets must be quantifiable and determined in space and time.

For sustainable transport, for 2030, the OECD[26] proposes the following targets for sustainable transport (freight and passengers):

a. CO_2: total emissions from transport should not exceed 20 per cent of total CO_2 emissions in 1990
b. NO_x: total emissions from transport should not exceed 10 per cent of emission levels in 1990
c. VOCs: VOCs should not exceed 10 per cent of the emission level in 1990
d. Particulates: depending on local and regional conditions, reduction of 55-99 per cent of fine particulate emissions from transport
e. Noise: 55-65 decibels during daytime and 45 decibels at night and indoors
f. Land use: compared to 1990 levels, this criterion is likely to entail a smaller share of land devoted to transport.

The ERTRAC (2004)[27] suggests the following quantitative targets for sustainable transport (freight and passengers):

a. Improvements in vehicle efficiency delivering as much as a 40% reduction in CO_2 emissions for passenger cars and 10% for heavy duty vehicles for the new vehicle fleet in 2020
b. Good vehicle maintenance and driving for fuel efficiency reducing fuel consumption and CO_2 emissions by at least 10% for cars and 5% for heavy duty vehicles
c. Improvements in the road transport infrastructure, best use of transport modes, information technology systems, higher passenger car occupancy rates and freight loading factors contributing to further reductions in fuel consumption by 10-20%
d. By 2020, fuel cell vehicles and low carbon/ hydrogen fuels contributing to carbon reduction provided sustained research efforts are begun now; By 2020, establishing Euro 5 e 6 emissions standard vehicles in the vehicle. The research target 0 emissions is to achieve these near levels at minimum cost while still improving energy consumption and CO_2 emissions
e. Reducing transport noise by up to 10 dB(A) through a systems approach including better indicators and improvements to vehicles, tyres and infrastructure.

The benchmarking of the policies activated in the Alpine Space can lead then, to the definition of a synthesis between specific local situations and European objectives.

5.c Qualitative analysis of the best practices identified in the MONITRAF project

The identification and detailed analysis of the best practices, identified in the MONITRAF Project, were the subject of the WP10 “Common Measures”, which should be referred to for more information.

[26] Organization for Economic Cooperation and Development - cfr. bibliography for the reference publications for this report.
[27] European Road Transport Research Advisory Council

During the MONITRAF Project, the focus was concentrated on the identification of specific indicators for sustainable transport that take into account the peculiarities of the Alpine Space, and also an assessment of the available scenarios, based on the above indicators. The metric for a parameterisation of the policies, in terms of benchmarking was not then a specific object and it cannot, for now, be activated.

In this paragraph, we are presenting, in line with the mission of the WP9: "Interpretation and National Sets of Rule Compliance", an analysis of the performances of the above best practices, in relation to their effects on the three pillars of sustainable transport:
- Environment
- Economy
- Society

The intention of this study, is to lay the foundations for an elaboration of benchmarking parameters that can "weigh" in an opportune and articulated manner, the reciprocal effects of the measures activated on the above three "pillars".
The activated phase is the one of qualitative assessment of the performance of each measure considered.
The assessments activated are presented in a graphic synthesis of the considerations made in the preceding chapters regarding the single indicators.

To avoid rewarding measures that have positive effects at a local level but negative ones at medium and long range, each column of the pillar has been divided into three sub-pillars that have the following significance:
1 - The impact on the area of application of the measure
2 - The impact on the areas adjacent to the area where the measure was applied
3 - The impact on the whole of Europe and Wider Europe

3 Quality assessment of the MONITRAF Measures

The search for quantification parameters for benchmarking

The data collected for the MONITRAF Project do not permit us yet to make a quantitative analysis focused on the local effects of traffic on the alpine corridors, and consequently an approach in rigorous benchmarking terms.

This section, therefore, describes, for the different measures illustrated in WP10, to which one can refer for details, an attempt to bring out which indicators could be considered to compare the measures.

Below is a brief summary of some objectives selected at a European level, which, in the intention of this work, represent, for the continuation of the cooperation activities, the point of reference for the object of the comparison.

1 SCRAPPING INCENTIVES FOR LOWER EURO CATEGORIES

The famous eco-incentives are a typical non-dissuasive measure, which however, promote the changeover to cleaner vehicles.
These incentives are only a partial measure, as they do not bring about any change in the behaviour of truckers or of citizens in favour of mixed (road-railway) or public transport.

On the other hand, they can have positive, short-term economic effects.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Scrapping incentives for lower Euro categories	- Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher	Transport prices										
FURTHER INDICATORS		Vehicles sold for scrapping incentives per year - NUT2/ NUT0	- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution									
REMARK	Action aimed at a medium-term vehicle pool renewal The calculations is for country/region of vehicle registration			The impact is positive but the magnitude is to be evaluated			The impact is positive but the magnitude is to be evaluated			The impact is positive but the magnitude is to be evaluated		

SPEED LIMITS 2

Speed Limits imposed in some countries, with different methods and timing, are a minor command and control measure; they are effective because they reduces air and noise pollution.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Speed limits	- Air concentration $N0_x$ - Air concentration PM_{10} - Lden Night - Lden Day		Transport accidents									
FURTHER INDICATORS			- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution - Morbidity rate for noise									
REMARK				The impact is on the stretch of application						The impact is on the stretch of application		

3 PROHIBITION OF NIGHT CIRCULATION

Prohibiting vehicle circulation at night, as illustrated in the WP10 Report, is a measure that leads to a drastic reduction of noise, but has little effect on atmospheric pollution.

Moreover, for reasons of opportunity, if not coordinated with the bordering countries, this restriction increases the traffic and pollution in the adjacent territories where the measure is not applied.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Prohibition of night circulation	- Air concentration $N0_x$ - Air concentration PM_{10} - Lden Night - Lden Day - traffic volume vehicles - Traffic volume heavy duty vehicles - Yearly transalpine total tonange		Transport accidents									
FURTHER INDICATORS			- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution - Morbidity rate for noise									
REMARK				The benefits are concentrated in the application area but can generate damaging effects on bordering territories			The impact is to be evaluated of: - lower revenue in the territory of application - higher revenue in the bordering territory - effects of the transport cost increase on goods prices					

THE ECO-POINT SYSTEM 4

The eco-point system, placing an upper limit on transit, has a significant immediate and long-term impact. However, it has effects and leads to cost increases on the final product.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Eco-point system	- Air concentration $N0_x$ - Air concentration PM_{10} - Lden Night - Lden Day - traffic volume vehicles - Traffic volume heavy duty vehicles - Yearly transalpine total tonnage		Transport accidents									
FURTHER INDICATORS			- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution - Morbidity rate for noise									
REMARK							The European Community's main objection to Austria's Ecopoint System was the set up of barriers to the free circulation of goods					

5 PROHIBITION OF DAYTIME CIRCULATION

The prohibition of daytime circulation has a significant impact as it drastically reduces noise and air pollution.
If not coordinated with the bordering countries, it has effects on nearby passes, increasing the impact in the adjacent territories where the measure is not applied.

For the days of prohibition in 2008 see the Database in the CD ROM.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Prohibition of daytime circulation	- Air concentration $N0_x$ - Air concentration PM_{10} - Lden Day - traffic volume vehicles - Traffic volume heavy duty vehicles - Yearly transalpine total tonnage		Transport accidents									
REMARK				The benefits are concentrated in the application area but can generate damaging effects on bordering territories			The impact is to be evaluated of: - lower revenue in the territory of application - higher revenue in the bordering territory - effects of the transport cost increase on goods prices					

MAXIMUM NUMBER OF TRANSITS (BELOW MAXIMUM CAPACITY) 6

A maximum number of transits (below the capacity of the tunnel or pass) is another measure, which limits the number of passages and reduces the noise and air impact.

However, if the measure is not harmonised with adjacent territories, it can have a negative impact on them.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Maximum number of transits (below maximum capacity)	- Air concentration NO_x - Air concentration PM_{10} - Lden Night - Lden Day - Traffic volume vehicles - Traffic volume heavy duty vehicles - Yearly transalpine total tonange		Transport accidents									
FURTHER INDICATORS			- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution - Morbidity rate for noise									
REMARK				The benefits are concentrated in the area of application but can generate damaging effects on bordering territories			The impact is to be evaluated of: - lower revenue in the territory of application - higher revenue in the bordering territory - effects of the transport cost increase on goods prices			The benefits are concentrated in the area of application but can generate damaging effects on bordering territories		

7 CAP AND TRADE

The cap and trade currently in study phase, places limits on the maximum number of transits, whose permits are entrusted to the market.
It is another measure that limits the number of transits and reduces the noise and air pollution. However, if the measure is not harmonised with the adjacent territories, it can have a negative impact on them.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Cap and trade	- Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher		Transport accidents									
REMARK				The benefits are concentrated in the area of application but can generate damaging effects on bordering territories A better analysis can be made when the study is completed			The impact is to be evaluated of: - lower revenue in the territory of application - higher revenue in the bordering territory - effects of the transport cost increase on goods prices Its coherence with the free freight circulation principle is to be checked			The benefits are concentrated in the area of application. If the measure is not harmonised with the adjacent territories, it can have a negative impact on them A better analysis can be made when the study is completed		

MANDATORY MODAL TRANSFER FOR SOME TYPES OF FREIGHT 8

This *command and control* measure is already in use in some countries. Its effects are excellent, compensating the road traffic limitations with the less polluting railway.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Mandatory modal transfer for some types of freight	- Air concentration $N0_x$ - Air concentration PM_{10} - Lden Night - Lden Day - Modal split freight transport	- Number of employees in transport sector? - GDP?	Transport accidents									
FURTHER INDICATORS		Number of employees in transport sector for transport mode	- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution - Morbidity rate for noise									
REMARK				The benefits are concentrated in the area of application			The benefits are concentrated in the area of application and at its borders, and they refer to the growth of the market connected to inter-modality The effective impact has to be quantified			The benefits are concentrated in the area of application		

9 INCENTIVES TO COMPANIES THAT USE THE RAILWAY FOR FREIGHT TRANSPORT

Compared to the previous measure, this is a soft variant: the incentive should compensate for the cost increase due to the use of mixed modes.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Incentives to companies that use the railway for freight transport	- Air concentration NO_x - Air concentration PM_{10} - Lden Night - Lden Day - Modal split freight transport	- Number of persons employed in the transport sector? - Gross Domestic Product?	Transport accidents									
FURTHER INDICATORS		- Number of persons employed in the transport sector per transport mode - Infrastructure investments for logistic improvement	- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution - Morbidity rate for noise									
REMARK				The benefits can have widespread effects			The positive or negative effects in terms of economic growth has to be verified			The benefits can have widespread effects		

INCREASE OF THE TRANSIT FEES FOR LOWER EURO CATEGORIES

10

Already in force in many sectors of the Alpine region. It provides incentives for the purchase of higher Euro category vehicles and applies the principle “who pollutes, pays”. The rates increase makes it more expensive using lower-performance vehicles, but in the transition phase, it can lead to higher prices for consumers.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Increase of the transit fees for lower Euro categories	- Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher	Transport Prices										
FURTHER INDICATORS			- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution - Morbidity rate for noise									
REMARK	This action aims for the medium-term renewal of vehicles and the internalisation of costs	An indicator connected to the cost of living in regions at medium and long distances could perhaps point out Ec3 economic effects		**En1** - the elasticity of the transport demand in relation to the rates is to be verified **En2** - favours effects **En3** - due to the effects, the wide range emissions balance worsens			**Ec1-Ec2** - at short range, it does not affect the cost of the goods **Ec3** - the effects on the cost of goods at long range is to be verified			**S1** - the elasticity of the transport demand in relation to the rates is to be verified **S2** - Negative impact due to the increase of the effects		

11 TAXATION PROPORTIONAL TO PERFORMANCE

In force in Switzerland, this applies to the principle: “Who pollutes, pays”, and it seems to be effective according to TERM recent studies.
If not harmonised with the adjacent countries, it can have negative effects on them.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Taxation proportional to performance	- Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher	Transport Prices										
FURTHER INDICATORS			- Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution - Morbidity rate for noise									
REMARK				The benefits are concentrated in the area of application with external effects			The impact is neutral but it could have an impact on costs at long range, to be verified			The benefits are concentrated in the area of application with external effects		

LOCAL INVESTMENTS TO SUPPORT MULTI-MODALITY AND LOGISTICS 12

The pan-European corridors can offer important opportunities for local development if coordinated with regional actions to promote multi-modality and logistics. For further information, see the results of the ALPENCORS Alpine Space Project.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Local investments to support multi-modality and logistics	- Traffic volume HD vehicles - Modal split freight transport	- Yearly transalpine total tonnage - investments in transport infrastructure - Gross Domestic Product										
FURTHER INDICATORS												
REMARK				The benefits are concentrated in the application area			The benefits are concentrated in the application area			The benefits are concentrated in the application area		

THE PROMOTION OF SUSTAINABLE TRANSPORT FOR THE INHABITANTS AND USERS OF THE MOUNTAINS (PASSENGER TRAFFIC) 13

These measures do not regard goods transport, but they are very important for the large vacation resorts crowded in the two main holiday seasons, and also to promote other more isolated and less known localities.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
The promotion of sustainable transport for the inhabitants and users of the mountains (pass. traffic)	- Air concentration $N0_x$ - Air concentration PM_{10} - Lden Night - Lden Day	- investments in transport infrastructure - Gross Domestic Product - Transport Prices (passengers)										
FURTHER INDICATORS			- number of passengers per year, - quality of the service provided, - accessibility (local)									
REMARK				The benefits are concentrated in the application area			The benefits are concentrated in the application area			The benefits are concentrated in the application area		

14 SUPPORT TO THE SPREAD OF BROADBAND IN THE MOUNTAIN TERRITORIES

In the perspective of a review of the Lisbon strategy, the ITCs offer great opportunities for remote territories, as solutions to reduce service costs and telework opportunities.

MEASURE	Performance IndicatorsEn	Performance IndicatorsEc	Performance IndicatorsS	En1	En2	En3	Ec1	Ec2	Ec3	S1	S2	S3
Support to the spread of broadband in the mountain territories			Migration balance									
FURTHER INDICATORS		Number of homeworkers	Number of citizen connected by broadband									
REMARK				The benefits are concentrated in the application area			The benefits are concentrated in the application area			The benefits are concentrated in the application area		

OECD: 2030 OBJECTIVE FOR SUSTAINABLE TRANSPORT 15

Below you will find the OECD Objectives for 2030, with reference to PART 2.

TARGETS	POSSIBLE INDICATORS
CO_2: total emissions from transport should not exceed 20 per cent of total CO_2 emissions in 1990	- Traffic volume HD vehicles - Modal split freight transport - Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher - Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution
NO_x: total emissions from transport should not exceed 10 per cent of emission levels in 1990	- Traffic volume HD vehicles - Modal split freight transport - Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher - Air concentration $N0_x$ - Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution
VOC_s: VOC_s should not exceed 10 per cent of the emission level in 1990	- Traffic volume HD vehicles - Modal split freight transport - Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher - Air concentration $N0_x$ - Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution
Particulates: depending on local and regional conditions, reduction of 55-99 per cent of fine particulate emissions from transport	- Traffic volume HD vehicles - Modal split freight transport - Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher - Air concentration PM10 - Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution
Noise: 55-65 decibels during daytime and 45 decibels at night and indoors	- Investment in noise protection infrastructure - Morbidity rate for noise
Land use: compared to 1990 levels, this criterion is likely to entail a smaller share of land devoted to transport	- Investments in transport infrastructure - Rail network km - Road network km

16 ETRAC: OBJECTIVE FOR SUSTAINABLE TRANSPORT

Below you will find the ETRAC Objectives, with reference to PART 2.

TARGETS	POSSIBLE INDICATORS
Improvements in vehicle efficiency delivering as much as a 40% reduction in CO_2 emissions for passenger cars and 10% for heavy duty vehicles for the new vehicle fleet in 2020	- Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher - Air Quality indicators - Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution
Good vehicle maintenance and driving for fuel efficiency reducing fuel consumption and CO_2 emissions by at least 10% for cars and 5% for heavy duty vehicles	- Amount of HV Euro 1 - Amount of HV Euro 2 - Amount of HV Euro 3 - Amount of HV Euro 4 - Amount of HV Euro 5 and higher - Air Quality indicators - Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution
Improvements in the road transport infrastructure, best use of transport modes, information technology systems, higher passenger car occupancy rates and freight loading factors contributing to further reductions in fuel consumption by 10-20%	- Infrastructure investments - Car sharing diffusion - Air Quality indicators
By 2020: the use of hydrogen-powered vehicles with low CO emissions is predicted, that will contribute to reduce CO_2 emissions; this will be the result of significant research work that is today still in its preliminary phase	- To be defined
By 2020, establishing Euro 5 & 6 emissions standard vehicles in the vehicle fleet. The research target is to achieve these near 0 emissions levels at minimum cost while still improving energy consumption and CO_2 emissions	- Air Quality indicators - Morbidity rate due to air pollution - Death rate due to air pollution - Life expectancy connected to air pollution
Reducing transport noise by up to 10 dB(A) through a systems approach including better indicators and improvements to vehicles, tyres and infrastructure	- Morbidity rate due to air pollution - Lden N & D

ALPINE SPACE OBJECTIVES 17

Below you will find the objectives of the Alpine Space Operating Programme (Programma Operativo dello Spazio Alpino) 2007-2013; these can be used to define indicators for the follow-up of the project.

CATEGORIES	ALPINE SPACE TARGETS
Competitiveness and attractiveness of the Alpine Space	Strengthening innovation capabilities of SMEs, creating appropriate environments for their development and fostering stable cooperation between R&TD centres and SMEs
	Enhancing development options based on traditional sectors and cultural heritage, as well as on emerging sectors at transnational level
	Strengthening the role of urban areas as engines for sustainable development
	Strengthening rural-urban relations and the development of peripheral areas
Accessibility and Connectivity	Securing a fair access to public services, transport, information, communication and knowledge infrastructure within the programme area
	Promoting and improving access and use of existing infrastructures in order to optimise the economical and social benefits, and to reduce environmental consequences
	Enhancing connectivity for the reinforcement of polycentric territorial patterns and for laying the basis for a knowledge-driven and information society
	Promoting sustainable and innovative mobility models with specific regard to environmental, human health and equality related issue
	Mitigating the negative consequences of traffic flows crossing the Alps
Environment and risk prevention	Enhancing cooperation in environmental protection issues
	Stimulating integrated approaches to conservation, planning and management of natural resources and cultural landscape
	Stimulating the development of resource efficiency with respect to water, energy, land use, raw materials and other natural resources
	Coping with the effects of climate change
	Forecasting, predicting, mitigating and managing the impacts of natural and technological hazards

18 BENCHMARKING INDICES INTRODUCED IN THE FRAMEWORK OF THE INTERREG IIIB MEDOCC POR-NET-MED-PLUS PROJECT

Below you can find the list of benchmarking drawn up by the Piemonte IRES Research Institute (Istituto di Ricerca IRES Piemonte) for the transport sector in the framework of the PORT-NET-MED-PLUS Project.

	Index	Description	Calculation method	Notes / Remarks
The role of transport in the regional economy	Regional sector specialisation index (NUT2)	Regional specialisation in transport: relationship between the transport workers and total employed	$I_{SPt} = \frac{\frac{At_i}{A_i}}{\left(\frac{\sum_{i=1}^{n} At_i}{\sum_{i=1}^{n} A_i}\right)}$ where: AT_i = Workers in the Region's transport sector *i*, Ai = Total workers in the Region *i*, n = Number of regions in the western Mediterranean	
The role of transport in the regional economy	Dimensional index of the tansport index (NUT2)	For each region, calculation of the number of workers in the transport sector per dimensional unit	$I_{DIMt} = \frac{\frac{At_i}{ULt_i}}{\left(\frac{\sum_{i=1}^{n} At_i}{\sum_{i=1}^{n} ULt_i}\right)}$ where: AT_i = Workers in the Region's transport sector *i,* ULti = Local Transport units in the Region *i,* n = Number of regions in the western Mediterranean	Less significant that the previous, as it does not consider the average population density
The role of transport in the regional economy	Productivity index of the regional road freight system (NUT2)	Relates the tons produced in the region and transported out of it with the number of workers in the transport sector	$IPRms = \frac{\frac{Tps_i}{At_i}}{\left(\frac{\sum_{i=1}^{n} Tps_i}{\sum_{i=1}^{n} At_i}\right)}$ where: Tps_i = Tons produced in the Region i and transported by road out of the region. At_i = Workers in the Region's transport sector*i* n = Number of regions in the western Mediterranean	All the countries involved are typical importers of raw materials (heavy) and exporters of finished products with high added value (and not necessarily heavy-weight). Perhaps greater significance could come from the turnover of local companies compared to the number of workers

	Index	Description	Calculation method	Notes / Remarks
	Modal specialisation index of land transport	defined by the comparison between the tons of goods transported with the railway mode and the road transport	$I_{MODterr} = \frac{\frac{T(ferro)_i}{T(terr)_i}}{\left(\frac{\sum_{i=1}^{n} T(ferro)_i}{\sum_{i=1}^{n} T(terr)_i}\right)}$ where: T(ferro)i = Tons transported (loaded and unloaded) by rail transport in the Region *i* T(terr)i = Tons transported (loaded and unloaded) by land transport in the Region *i* n = Number of regions in the western Mediterranean	The tons are more indicative for imports, regarding the regional economies and for the transit than for export
	Road mortality Index	It relates the number of road accident victims with the total number of inhabitants that live in the region	$I_{MORTstr} = \frac{\frac{M_i}{P_i}}{\left(\frac{\sum_{i=1}^{n} M_i}{\sum_{i=1}^{n} P_i}\right)}$ where: Mi = Deaths in road accidents in the Region *i* Pi = Population living in the Region *i* n = Number of regions in the western Mediterranean	
	Road Risk Index	Based, based on the relationship between the number of deaths in road accidents and the length of the road and motorway network	$I_{PERstr} = \frac{\frac{M_i}{Km_i}}{\left(\frac{\sum_{i=1}^{n} M_i}{\sum_{i=1}^{n} Km_i}\right)}$ where: Mi = Deaths in road accidents in the Region *i* Kmi = Kilometres of the road system of the Region *i* n = Number of regions in the western Mediterranean	The same as MONITRAF

	Index	Description	Calculation method	Notes / Remarks
	Transport environmental inefficiency Index	It relates the CO_2 emissions of road transport and the tons of goods of inter-regional and intra-regional transport	$$INEFF_{CO2} = \frac{\frac{Eco\,2_i}{Tonn_i}}{\left(\frac{\sum_{i=1}^{n} Eco\,2_i}{\sum_{i=1}^{n} Tonn_i}\right)}$$ where: $Eco2_i$ = CO_2 emissions (in tonnes) of the transport sector in the Region *i* $Tonn_i$ = Tonnes of goods loaded and unloaded in the Region *i* (inter-regional and intra-regional transport) n = Number of regions in the Western Mediterranean	For MONITRAF, these values are not available
	Index of activation of the sector of road freight transport	This index is provided by the relationship between the tons of goods loaded and transported outside of the regional borders and the number of inhabitants in the region	$$I_{ATTms} = \frac{\frac{Tps_i}{P_i}}{\left(\frac{\sum_{i=1}^{n} Tps_i}{\sum_{i=1}^{n} Pt_i}\right)}$$ where: $Tps2_i$ = Tonnes transported by road out of the Region *i* Pi = Resident population of the Region *i* (inter-regional and intra-regional transport) n = Number of regions in the Western Mediterranean	
	Complementarity Index	To measure the potential role of the transport sector in the western Mediterranean, the number of workers operating in this sector was compared to that of the workers of complementary sectors such as telecommunications, travel agencies, goods deposit and storage and all activities involving the transport of goods, persons and "information transport" (telecommunications). From the relationship between these two sizes we obtain the complementarity index	$$I_{COMt} = \frac{\frac{Ac_i}{At_i}}{\left(\frac{\sum_{i=1}^{n} Ac_i}{\sum_{i=1}^{n} At_i}\right)}$$ where: Ac_i = Workers of complementary sectors (agencies, communications and storage) of the transport sector in the Region *i,* At_i = Workers in transport sector the Region *i,* n = Number of regions in the western Mediterranean	

	Index	Description	Calculation method	Notes / Remarks
	Dimensional index of the sector complementary to transports	To have a more complete picture of the logistics territorialisation processes that take place in a region, the number of workers per local unit was considered	$I_{DIMct} = \frac{\frac{Ac_i}{ULc_i}}{\left(\frac{\sum_{i=1}^{n} Ac_i}{\sum_{i=1}^{n} ULc_i}\right)}$ where: Ac_i = Workers of complementary sectors (agencies, communications and storage) of the transport sector in the Region *i,* ULc_i = Number of Local Units of the sector complementary to transport the Region *i,* n = Number of regions in the western Mediterranean	

NEW BENCHMARKING INDICES 19

New benchmarking indices based on the information presented in PART 2 are proposed below.

Index	Description	Notes / Remarks
Transport demand index (NUT2)	Relationship between Regional GDP and the vehicle traffic of the corridor	Of considerable importance to bring out the local effects of the economic growth connected to local and transit traffic
Employment growth index in the transport sector (NUT2)	Relationship between the number of unemployed and the number of employed in the transport sector, always at a regional level	Is the transport sector representing an alternative to the traditional economies?
Accessibility?	Relationship between the public means of transport that reach remote localities and the inhabitants	It must consider the limitations in the movement of goods and passengers, in terms of distance, times and costs

Abbreviations

AS	Alpine Space
BAT	Best Available Technology
BAU	Business As Usual
BBT	Brenner Base Tunnel
CAFT	Cross Alpine Freight Transport
CMS	Content Management System
CONFETRA	Confederazione Generale Italiana dei Trasporti e della Logistica
ECMT	European Conference of Ministers of Transport
EEA	European Environment Agency
ERTRAC	European Road Transport Research Advisory Council
GDP	Gross Domestic Product
GIS	Geographic Information System
JRC	Joint Research Center
LDEN	Day-Evening-Night Level (of noise)
LTF	Lyon-Turin Ferroviairie
NUT(S)	Nomenclature of Territorial Units (for Statistics)
OECD	Organization for Economic Cooperation and Development
OSCE	Organization for Security and Co-operation in Europe
TERM	Transport and Environment Reporting Mechanism
WP	Work Package