

GENOA - ROTTERDAM

A SUSTAINABLE CORRIDOR



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PREFACE

The current crisis in Europe means a reflection on our transport system is essential. From the post-war period up until today, the system has been based almost primarily on road transport, causing unsustainable levels of atmospheric emissions, accidents, and congestion.

It is therefore an opportune moment to promote a *green economy* in this sector, a feeling that is outlined by the OECD, the Global Bank, and by UNEP, as the only concrete proposal able to help the western world exit both the climactic and economical crises.

This paradigm change cannot be achieved by following out-dated systems and practices.

It is therefore essential to evaluate the new choices available for the mobility of people and the transport of goods, which could lead to a system that efficiently uses resources, is socially inclusive, and has a low environmental impact. We need, for example, new investments in *modal shift*, so that the constantly rising volume of goods can be transferred from road to rail, taking full advantage of the enormous environmental potentials of rail transport.

Italy's geographical position and system of ports make the use of combined transport advantageous, but at present only 9% of its goods are transported by rail.

The vast majority of goods travel by road, including those which are potentially hazardous, and are delayed by constantly rising traffic levels.

This independent study, commissioned by the Swiss Embassy from our Foundation, has analysed the environmental, social and economic impacts the Genoa-Rotterdam rail freight corridor, identified by the European Union as one of the more heavily used routes, and already referred to as the *Corridor of the two seas*.

The conclusions we have drawn from the results of our analysis are that the corridor is sustainable and has relevant potential, for modal shift, if transport demand as well as environmental and social advantages are factored in.

Edo Ronchi

President of the Sustainable Development Foundation



ZUSAMMENFASSUNG DES BERICHTS
SYNTHESE DU RAPPORT
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ZUSAMMENFASSUNG DES BERICHTS

Zu Beginn der Neunzigerjahre realisierte die Europäische Union mit dem TEN-V-Netz eine eigene politische Vision von Integration, Kohäsion und Wirtschaftsentwicklung.

Heute stellen sich – nicht nur wegen der drängenden Krise, die Wirtschaft und Vertrauen auf dem Alten Kontinent bedroht –, viele Fragen zur realen Nachhaltigkeit einiger der Bahnanlagen, die Teil des wichtigsten Infrastrukturnetzes Europas bilden.

Es gibt Kritiker, die zu Recht der Meinung sind, dass die Investitionspolitik im Bereich der europäischen Infrastruktur für die kommenden Jahre mit einer vertieften Evaluation der Kosten und Nutzen einhergehen muss und dass die Zugehörigkeit einer Anlage zu einem TEN-V-Korridor nicht mehr die einzige Voraussetzung für die Festlegung der Investitionsprioritäten sein kann.

Andere kritisieren eine unausgewogene Strategie, die allzu stark auf die Realisierung von Infrastrukturvorhaben und zu wenig auf Alternativmassnahmen ausgerichtet sei. Dazu gehört z.B. die Preisgestaltung, die die Nachfrage im Verkehrsbereich "abkühlen" und gleichzeitig die Verlagerung von der Strasse auf die Schiene garantieren und damit die Kosten für die Wirtschaft und die Umwelt senken würde.

Tatsächlich wurde in vielen Fällen festgestellt, dass die Wachstumsprognosen im Verkehrsbereich, auf deren Grundlage gewisse strategische Infrastrukturvorhaben realisiert wurden, sich als falsch erwiesen haben, genauso wie die Schätzungen über das Verlagerungspotenzial von der Strasse auf nachhaltigere Verkehrsmittel.

Auch aufgrund dieser Erwägungen kommt diese Vorstudie, die auf den drei Säulen der Nachhaltigkeit beruht (Wirtschaft, Umwelt und Soziales), zum Schluss, dass der Bahnkorridor Genua–Rotterdam nachhaltig ist, weil er *nützlich* ist, und *nützlich*, weil er nachhaltig ist.

Der Korridor verbindet einige der am dichtesten besiedelten europäischen Industrieregionen, in denen auf wenigen hundert Kilometern zahlreiche Produktionsstätten von Weltrang konzentriert sind.

Wie es sich für eine der europäischen Hauptverkehrsachsen gehört, zeigen alle Daten der letzten vier Jahre zum Verkehrsaufkommen im Korridor, trotz der stark abnehmenden Nachfrage im Güterverkehr in ganz Europa im Gefolge der Wirtschaftskrise, eine gegenläufige Tendenz zum allgemeinen Trend.

Der Korridor Genua–Rotterdam, der auch Korridor der zwei Meere genannt wird, weil er die zwei grossen Hafengebiete an der Nordsee (Brügge, Antwerpen und Rotterdam) und am nördlichen Mittelmeer (Genua, Savona und La Spezia) verbindet, gehört zu den wichtigsten Güterverkehrsachsen der Welt.

Das Verkehrsaufkommen in den Häfen von Rotterdam und Antwerpen nimmt laufend zu und dies gilt in etwas kleinerem Ausmass auch für die ligurischen Häfen.

In Italien nahm ab 2008 der Güterverkehr sowohl auf der Strasse als auch auf der Schiene ab, aber trotz dieses Trends stellt man fest, dass die Güterströme entlang des Korridors durch die

Schweizer Alpen im Rahmen des kontinuierlichen Wachstums, das Mitte der Achtzigerjahre begann, schon wieder die Vorkrisenhöhe erreicht haben.

Im Unterschied zu Europa oder auch Italien liegt der Schienenanteil im alpenquerenden Güterverkehr von und nach Italien bei über 50 Prozent, wobei die *Transportleistung* beim kombinierten Verkehr sowohl absolut wie relativ beachtlich ist.

Dem steht die Tatsache gegenüber, dass seit der Fertigstellung des Autotunnels durch den Gotthard das Gütervolumen auf der Strasse stärker gestiegen ist als auf der Schiene und dass diese ungleiche Entwicklung zu einer laufenden Verringerung des Bahnanteils am Gesamtgüterverkehr geführt hat.

Die neuesten Schätzungen zum **Wachstum der Verkehrsnachfrage** entlang des Korridors, die die effektiven makroökonomischen Auswirkungen der Krise berücksichtigen, sehen bis 2020 ein Nachfragewachstum im Strassengüterverkehr von und nach Italien um 8 Prozent und bis 2030 um 12 bis 32 Prozent vor. Umgerechnet ergibt das für den alpenquerenden Schwerverkehr durch die Schweiz etwa 850 000 Fahrzeuge für das Jahr 2009, 975 000 Fahrzeuge für 2020 und 1 171 000 Fahrzeuge im Jahr 2030.

Heute werden im Strassenverkehr weitgehend längere Strecken (über 300 km) gefahren, was zeigt, dass bei der Verlagerung von der Strasse auf die Schiene noch Spielraum für Verbesserungen besteht.

Was die **positiven Auswirkungen auf die Umwelt** betrifft: Wenn man annimmt, dass der grösste Teil des Güterverkehrs über 300 km von und nach Italien von der Strasse auf die Schiene verlagert wird, könnte man aufgrund der Prognosen des EU-Weissbuchs Verkehr bis 2030 eine jährliche Verringerung der Emissionen um 0,3 Millionen Tonnen CO₂, 1000 Tonnen NO_x und 7 Tonnen PM (Feinstaub) sowie Energieeinsparungen von 100 000 Tonnen Rohöläquivalent erzielen.

Dieses Reduktionspotenzial ist beträchtlich, da die erwähnten Einsparungen sich nur auf den Teil des Güterverkehrs von und nach Italien beziehen, der **mit schweren Lastwagen** transportiert wird. Der grössere Teil des Verlagerungspotenzials findet sich bei einer Betrachtung des gesamten Verkehrsvolumens, mit Güter- und Personenverkehr, das über den Korridor abgewickelt wird.

Dank diesem Verlagerungspotenzial könnten **die vermeidbaren externen Kosten (Unfälle, Stau, Lärm, Luftverschmutzung usw.)** im Vergleich zu den geringeren externen Kosten im Bahnverkehr 2020 etwa 134 Millionen Euro jährlich und 2030 etwa 327 Millionen Euro jährlich erreichen.

Die Verlagerung dieser Verkehrsvolumen von der Strasse auf die Schiene wäre deshalb aus ökologischer, sozialer und wirtschaftlicher Sicht ein deutlicher Vorteil für Italien, der starke Auswirkungen auf die Wettbewerbsfähigkeit des Landes insgesamt und die nachhaltige Wachstumspolitik hätte.

SYNTHESE DU RAPPORT

Au début des années 90, l'Union européenne a concrétisé sa propre vision politique d'intégration, de cohésion et de développement économique au moyen du réseau transeuropéen de transport (RTE-T).

Aujourd'hui, et pas seulement en raison de la crise qui a miné l'économie et la confiance du vieux continent, de nombreuses questions se posent quant à la durabilité réelle des ouvrages ferroviaires intégrés dans le principal réseau d'infrastructures européen.

Certains pensent, non sans raison, que dans les années à venir, les politiques européennes d'investissement dans les infrastructures devront s'accompagner d'une évaluation plus approfondie des coûts et des bénéfices et que l'intégration d'un projet dans le réseau RTE-T ne doit plus être le seul critère pour fixer l'ordre des priorités des investissements.

D'autres, en revanche, posent un regard critique sur une stratégie qui mise trop sur la réalisation des infrastructures au détriment des autres mesures, notamment la tarification, qui permet de limiter l'attractivité du transport routier et d'assurer un transfert modal de la route au rail, réduisant ainsi les coûts économiques et environnementaux.

L'on a en effet pu constater à plusieurs reprises que les prévisions d'augmentation de la demande de transport, qui constituaient les prémisses pour la réalisation de certaines infrastructures stratégiques, se sont à révélées fausses, de même que le potentiel estimé des transferts modaux de la route à des formes de transport plus propices au développement durable.

Même à la lumière de ces constatations, cette étude préliminaire, qui repose sur les trois piliers du développement durable (économique, environnemental et social) conclut que l'axe ferroviaire Gênes-Rotterdam est durable parce qu'*utile* et *utile* parce que durable.

En effet, le corridor ferroviaire relie certaines des régions les plus densément peuplées et industrielles d'Europe, qui concentrent, sur quelques centaines de kilomètres, des zones de production d'importance mondiale.

Ces quatre dernières années, face à la forte diminution de la demande de transports de marchandises dans toute l'Europe, corollaire de la crise économique, les données relatives au trafic du corridor contredisent tout à fait la tendance générale, ce qui confirme sa vocation d'épine dorsale des infrastructures européennes.

Dit également « corridor de fret des deux mers », parce qu'il relie les principales zones portuaires de la Mer du Nord (Bruges, Anvers et Rotterdam) et du nord de la Méditerranée (Gênes, Savona et La Spezia), l'axe Gênes-Rotterdam compte parmi les principales routes du commerce mondial.

Le volume du trafic des ports de Rotterdam et d'Anvers est en constante augmentation. Il en va de même, dans une moindre mesure, pour les ports de Ligurie.

A partir de 2008, on observe en Italie une baisse du transport de marchandises, tant sur la route que sur le rail. Au contraire, les flux de marchandises le long du corridor transalpin italo-suisse ont déjà retrouvé leur niveau d'avant la crise, reprenant une croissance entamée au début des années 80.

Contrairement à la situation en Europe et sur le territoire italien, le transport transalpin de marchandises en provenance et à destination de l'Italie est effectué à 50% sur le rail, avec une performance remarquable du transport combiné, qui présente des valeurs absolues et relatives nettement supérieures.

Cela dit, ces chiffres positifs sont contrebalancés par le fait que depuis la réalisation du tunnel autoroutier du Gothard, le volume du fret routier a augmenté à un rythme plus soutenu que le volume des marchandises transportées sur le rail, évolution qui a progressivement réduit la part du trafic de marchandises effectué par voie ferroviaire.

Les dernières estimations de la **hausse de la demande** de transport le long du corridor transalpin, qui prennent en compte les effets macro-économiques de la crise, prévoient une augmentation de 8% d'ici à 2020 de la demande de transport routier de marchandises effectué depuis et à destination de l'Italie. Selon les pronostics, les valeurs oscilleraient entre 12 et 32% en 2030, soit un trafic de 850 000 poids lourds à travers les Alpes suisses en 2009, 975 000 en 2020 et, dans l'hypothèse d'une hausse maximale, de 1 171 000 camions en 2030.

Actuellement, l'essentiel du trafic routier porte sur de longues distances (plus de 300 km), ce qui confirme que le potentiel d'amélioration est encore considérable pour le transfert modal de la route au rail.

En ce qui concerne **l'impact positif sur l'environnement**, si l'on postule qu'en 2030, la majeure partie du transport de marchandises effectué depuis ou vers l'Italie sur des distances de plus de 300 km sera transféré sur le rail, comme le prévoit le Livre blanc de l'UE sur la politique des transports, les réductions annuelles d'émissions pourraient atteindre 0,3 millions de tonnes de CO₂, 1000 t de NO_x et 7 t de particules fines (PM), auxquelles s'ajouterait une économie énergétique de 100 000 TEP.

Ce potentiel est considérable si l'on pense qu'il ne s'agit que d'une partie du trafic routier à transférer sur le rail, à savoir **le transport de marchandises assuré par des poids lourds depuis et à destination de l'Italie**. Mais l'essentiel du trafic routier de cet axe à transférer sur le rail est celui constitué par tous les volumes de trafic, celui des marchandises et des personnes.

Ce transfert permettrait d'économiser les **coûts externes évitables de la route (accidents, bouchons, bruit, émissions etc.)**, comparés aux coûts mineurs du transport ferroviaire, de près de 134 millions d'euros annuels en 2020, voire 327 millions d'euros annuels en 2030.

Pour l'Italie, l'avantage du transfert de la route au rail serait évident, tant du point de vue environnemental et social que sur le plan économique, et les répercussions positives sur la compétitivité globale du pays et sur les politiques de développement durable seraient indéniables.

SUMMARY OF THE REPORT

At the beginning of the 1990s, the European Union presented the TEN-T network, its vision of a policy of integration, cohesion and economic development.

Today, not only because of the sudden arrival of the crisis that threatens the economy and confidence in Europe, there are many question marks about the real sustainability of some of the rail projects in the main European infrastructural network.

There are those who argue, with some justification, that European infrastructural investment policies in the coming years need to be accompanied by a deeper analysis of the costs and benefits and that being linked to the TEN-T corridors is no longer the only prerequisite for establishing investment priorities.

Others have taken a critical look at what they view as an unbalanced strategy in the realisation of infrastructure. They say that not enough attention has been paid to alternative measures such as pricing, which can freeze demand for transport and can also guarantee that transfer from road to rail with lower economic and environmental costs.

What has happened in many cases is that the forecast for demand for transport which formed the premise for the realisation of certain strategic infrastructure has proven to be incorrect and so too have estimates of the potential for a more sustainable transfer from road traffic.

Even in the light of the framework that has hardly been traced, this preliminary study, based on the three pillars of sustainability (economic, environmental and social), reaches the conclusion that the rail corridor Genoa-Rotterdam is sustainable because it is *useful* and is *useful* because it is sustainable.

The corridor links European regions that are among the most densely populated and highly industrialised and in which productive districts of global importance are concentrated in a few hundred kilometres.

Confirming its role as the backbone of European infrastructure, in the course of the past four years and with demand for goods transport falling severely throughout Europe because of the economic crisis, all the data for this corridor ran completely counter to the general picture.

Also known as the *Corridor of the two seas*, because it includes the main ports of the North Sea (Bruges, Antwerp and Rotterdam) and of the North Mediterranean (Genoa, Savona and La Spezia), the Genoa - Rotterdam corridor is undoubtedly one of the main commercial hubs in the world.

Traffic volumes in the ports of Rotterdam and Antwerp are constantly increasing and this is also true to a lesser extent in the Ligurian ports.

Since 2008 there has been a reduction of goods transport by road and by rail. However the current values of the goods being transported along the corridors crossing the Swiss Alps have now returned to pre-crisis levels in the framework of the continual growth that has taken place since the first half of the 1980s.

In contrast to what is happening in Europe and in Italy, the volume of goods transported by rail on trans-Alpine routes by Italy is higher than 50% and the performance of the combined transport is impressive both in absolute and relative terms.

This positive aspect is counterbalanced by the fact that since the completion of the Gotthard motorway tunnel, volumes of goods transported by road have risen faster than those for rail transport and this differential has progressively reduced the percentage of goods traffic transported by rail.

The most recent estimates **of increase in demand** for transport along the corridor, which take into account the overall macro-economic effects of the crisis, envisage growth of demand of goods transport by road to and from Italy of 8 % in 2020, with a value ranging from 12 to 32 % in 2030. This results in a number of heavy vehicles crossing the Alps totalling about 850,000 a year in 2009, 975,000 in 2020 and 1,171,000 in 2030.

Daily road traffic today is mainly long haul (over 300 kms), which confirms the fact that there are clear margins for improvement for the transfer of goods from road to rail.

Looking at the positive effects on the environment, and assuming that in 2030, in accordance with the forecasts of the EU White Book on Transport, the majority of goods transports of more than 100 kms generated in Italy will be transferred from road to rail, an annual reduction in emissions equal to 0.3 million tonnes of CO₂, 1000 t of NO_x and 7 t of PM (particulate matter) could be achieved, together with energy savings of 100,000 TEP.

This potential for reduction is considerable because it refers only to the volume of traffic to be transferred to the rail - that of **goods transport on heavy vehicles coming from or heading for Italy**. The majority quota of transport volumes to be transferred from road to rail is that of all transport volumes, i.e. goods traffic and passenger traffic, along the corridor.

Thanks to this potential for transfer from road to rail, the **inevitable external costs (accidents, congestion, noise, air pollution etc.)** for the lower external costs of rail transport could total about €134 million annually in 2020 and about €327 million annually in 2030.

The transfer of these volumes of traffic from road to rail would constitute a significant advantage for Italy in environmental social and economic terms and this would have a powerful repercussion on the overall competitiveness of the country and on its sustainable growth policies.

SINTESI DEL RAPPORTO

Agli inizi degli anni novanta l'Unione europea ha materializzato con la rete TEN-T la propria visione politica d'integrazione, coesione e sviluppo economico.

Oggi, e non solo per l'incalzare della crisi che ha minato economia e fiducia nel vecchio continente, sono molti gli interrogativi che sorgono sulla reale sostenibilità di alcune delle opere ferroviarie inserite nella principale rete infrastrutturale europea.

Vi è chi ritiene, e con fondamento, che le politiche di investimento infrastrutturale europee per gli anni a venire debbano essere accompagnate da una valutazione più approfondita dei costi e dei benefici e che l'appartenenza di un'opera ai corridoi TEN-T non sia più l'unico pre-requisito per stabilire le priorità degli investimenti.

Altri invece hanno rivolto il loro sguardo critico nei confronti di una strategia troppo sbilanciata nella realizzazione delle infrastrutture e troppo poco su misure alternative, quali quelle di *pricing*, in grado di "raffreddare" la domanda di trasporto e garantire ugualmente un trasferimento modale dalla strada alla rotaia con minori costi economici ed ambientali.

Ciò che in effetti è stato riscontrato in molti casi è che le previsioni di crescita della domanda di trasporto che costituivano le premesse per la realizzazione di alcune infrastrutture strategiche si siano rilevate errate, analogamente a quanto stimato per le potenzialità dei trasferimenti modali dalla strada a modalità più sostenibili.

Anche alla luce del quadro appena tracciato, questo studio preliminare, incardinato sui tre pilastri della sostenibilità (economico, ambientale e sociale), giunge alla conclusione che il corridoio ferroviario Genova Rotterdam sia sostenibile perché *utile* e *utile* perché sostenibile. Infatti il Corridoio mette in relazione regioni europee tra le più densamente popolate ed a maggiore vocazione industriale in cui si concentrano, in poche centinaia di chilometri, distretti produttivi di importanza mondiale.

A conferma della sua vocazione di fondamentale dorsale infrastrutturale europea, nel corso degli ultimi 4 anni, nel quadro di una domanda di trasporto merci in forte diminuzione in tutta Europa a causa della crisi economica, tutti i dati di traffico del Corridoio sono in controtendenza rispetto al quadro generale.

Chiamato anche *Corridoio dei due mari*, grazie al fatto di comprendere le maggiori aree portuali del Mare del Nord (Bruges, Anversa e Rotterdam) e del Nord Mediterraneo (Genova, Savona e La Spezia), il Corridoio Genova - Rotterdam è pienamente inserito anche tra le principali rotte del commercio mondiale.

I volumi di traffico sui porti di Rotterdam ed Anversa sono in continua crescita e, anche se in misura minore, lo sono anche quelli dei porti liguri.

In Italia, a partire dal 2008, vi è stata una contrazione del trasporto merci sia su strada che ferrovia ma, a fronte di questa caduta tendenziale, si riscontra che i valori attuali dei flussi di merci lungo il corridoio che attraversano le Alpi svizzere hanno già recuperato i valori pre-crisi, nel quadro di una crescita continua che risale alla prima metà degli anni ottanta.

Diversamente da quanto accade sia in Europa che in Italia, la quota su ferro del trasporto merci transalpino da e per l'Italia è superiore al 50%, con *performance* del trasporto combinato ragguardevoli sia in valore assoluto che relativo.

Questo dato positivo è controbilanciato dal fatto che, a partire dalla realizzazione del tunnel autostradale del San Gottardo, i volumi di merci trasportati su strada sono cresciuti a ritmi più serrati di quanto non sia accaduto per quelli trasportati su ferrovia e che questo differenziale abbia progressivamente ridotto la percentuale del traffico merci su rotaia rispetto al totale.

Le stime più recenti sulla **crescita della domanda** di trasporto lungo il Corridoio che sono state effettuate tenendo conto degli effetti macroeconomici indotti dalla crisi, prevedono una crescita della domanda di trasporto merci su strada da e per l'Italia dell'8% nel 2020 e di un valore oscillante tra il 12 ed il 32% nel 2030, traducendosi in un numero di veicoli pesanti attraverso le Alpi svizzere pari a circa 850.000 veicoli annui nel 2009, 975.000 nel 2020 e 1.171.000 veicoli nel 2030.

Il traffico stradale odierno è in larga parte di lunga percorrenza (oltre i 300 km), a conferma del fatto che esistano ancora dei consistenti margini di miglioramento per il trasferimento modale dalla strada alla ferrovia.

Dal punto di vista degli **effetti positivi sull'ambiente**, ipotizzando che nel 2030, in linea con le prospettive delineate dal Libro Bianco UE sui trasporti, la parte maggioritaria dei traffici merci superiori ai 300 km diretti e generati in Italia sia trasferito dalla strada alla rotaia, si potrebbe raggiungere una riduzione annua delle emissioni pari a 0,3 milioni di tonnellate di CO₂, 1000 t di NO_x e 7 t di PM ed un risparmio energetico di 100.000 TEP.

Questa potenziale riduzione è considerevole perché è riferita solo ad una quota dei volumi di traffico da trasferire su rotaia, quella delle **merci trasportate su veicoli pesanti con origine e destinazione in Italia**. La quota maggioritaria dei volumi di traffico da trasferire dalla strada alla ferrovia è poi quella costituita da tutti i volumi di traffico, merci e passeggeri, che si svolgono sul Corridoio.

Grazie a questo potenziale trasferimento modale dalla strada alla ferrovia, i **costi esterni evitabili** (incidenti, congestione, rumore, emissioni...), per i minori costi esterni del trasporto ferroviario, potrebbero raggiungere nel 2020 circa 134 milioni di euro annui e nel 2030 circa 327 milioni di euro annui.

Il trasferimento di questi volumi di traffico dalla strada alla ferrovia costituirebbe dunque in termini ambientali, sociali ed economici un vantaggio cospicuo per l'Italia, con forti ricadute sulla competitività complessiva del paese e sulle politiche di crescita sostenibile.

INTRODUCTION

The aim of this study is to produce a clear and up-to-date representation of the sustainability of the Corridor Genoa-Rotterdam.

The study focuses on the subject of modal shift of freight traffic from road to rail, and the associated environmental advantages.

Traffic that travels to and from Italy using the corridor has been analysed, in order to demonstrate the contribution Italy can make and what it stands to gain by transporting its goods using fully accessible more sustainable transport modes to and from central Europe.

The study is presented in four chapters.

In Chapter 1, a brief overview of the Corridor Genoa-Rotterdam is presented. Since 1996, when the trans-European transport network policy (TEN-T) was first introduced, the corridor, with a few variations and additions, as well as different names, has been included in all development programmes of the main European railway infrastructures.

Chapter 2 presents several fundamental scenarios that put figures on transport demand into context, and demonstrate why this phenomenon is so significant. As well as using data from statistical sources, the main forecasts on freight transport demand envisaged for the Corridor Genoa-Rotterdam have been summarised, along with modal shift scenarios, and the preliminary findings that can already be corroborated by these projections.

After a summary of the European Union's strategic objectives on transport sustainability and a brief definition of modal shift, Chapter 3 presents several estimates of the main atmospheric emissions associated with freight road traffic. These are then compared with rail transport.

This comparison has been carried out using two methods: analysis of individual case studies and at an aggregate level.

The estimate at an aggregate level refers to freight transport demand to and from Italy using the Corridor Genoa-Rotterdam. This estimate covers two scenarios: 2020 and 2030. In this chapter potentially avoidable emissions are also estimated, with a share of modal split in line with the objectives outlined in the 2011 White Paper.

Chapter 4 evaluates external costs related to freight transport demand to and from Italy along the corridor. By assessing the external costs, the social and economic impacts of transport on the environment, in monetary terms become, clear and perceptible. Using the same modal shift scenarios introduced in Chapter 3, it has also been estimated that the annual external cost connected to modal shift is potentially avoidable.

To close the study, a progress report is attached, showing the current status of work on the Italian section of the corridor.

1. CORRIDOR GENOA-ROTTERDAM

1.1. DESCRIPTION

The corridor that snakes between the ports of Rotterdam and Antwerp/Zeebrugge, all the way to the port of Genoa, is the core of the economic and demographic backbone of Western Europe and is referred to as the Blue Banana¹. This term identifies an urban corridor that extends from London to Milan. The regions it covers are the London Basin, the Rhine Valley, and the western part of the Po Valley.

Figure 1.1 Europe by night and the Corridor Genoa-Rotterdam



Source: European space agency

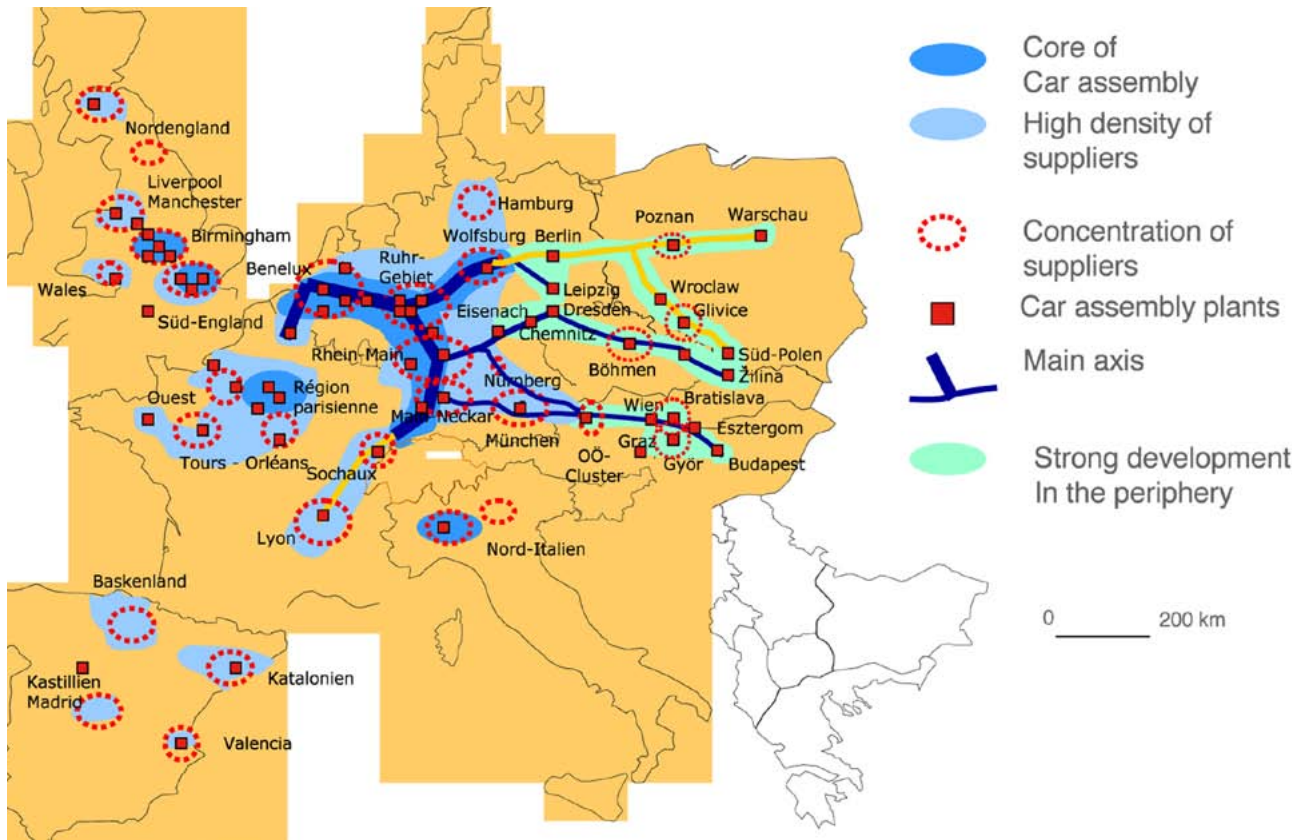
It is an economic backbone because the corridor traverses a series of major industrial hubs, all strategically important to the European economic area. These include the chemical, pharmaceutical, steel, and automobile industry, as sectors responsible for the production and distribution of energy. These industrial centres are heavily concentrated in, or nearby port areas. The Corridor Genoa-Rotterdam connects up with the major ports in Northern Europe – and the world, as well as the most important ports North of the Mediterranean.

However, it is also a demographic backbone in terms of citizens and population density. The five countries that are crossed by the corridor are amongst the most highly populated in the world².

¹ Blue being the colour of the European union's flag and banana referring to its curved shape. It is also known as the European Megalopolis.

² It is estimated that at least 110 million people live inside the Blue banana.

Figure 1.2 European automobile production network



Source: Podvin, to-Consulting.

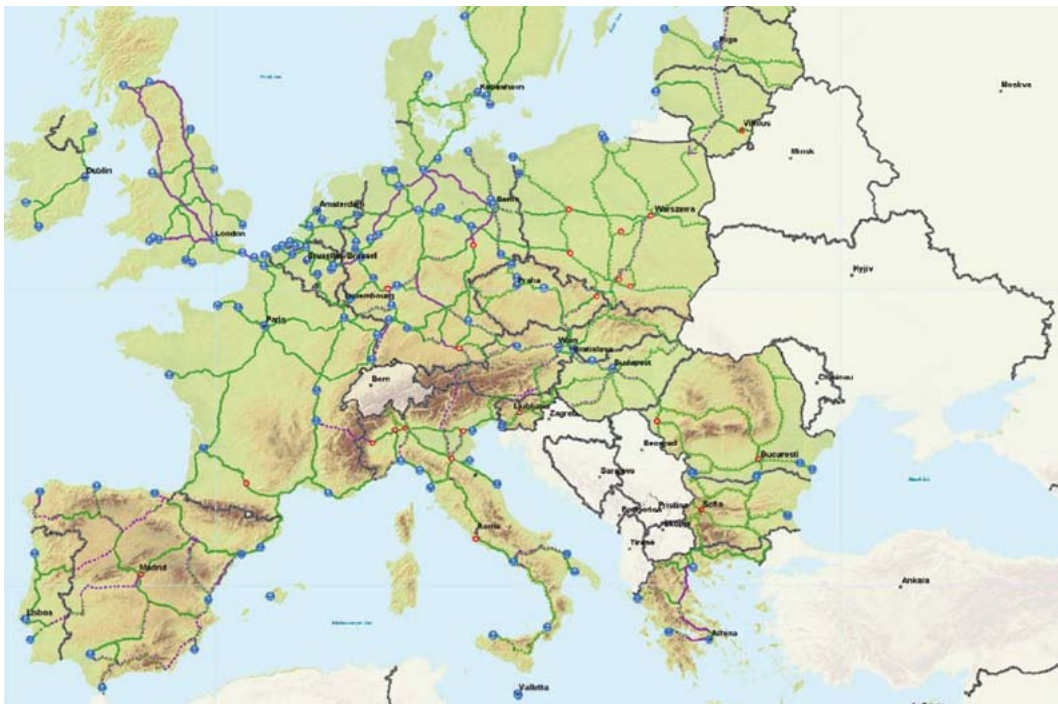
1.2. BRIEF HISTORY OF THE CORRIDOR

In the mid 80's, the European Union took on a priority commitment of developing a trans-European transport network, with the objective of creating the necessary transport infrastructure and interconnections necessary to sustain the single market, to guarantee free movement of goods and passengers, and to enhance growth, employment and competitiveness.

The previous guidelines that define the infrastructure policy TEN-T were only adopted in 1996³, when the railway Corridor Genoa-Rotterdam was named as one of the 30 priority commitments of the TEN-T transport network (Priority project n.24 included in the attached III 'Priority projects on which work is due to start before 2010').

To confirm its strategic importance, in the years following 2000⁴, corridor n.24 was introduced into the six main ERTMS⁵ rail corridors as Corridor A⁶, and in 2010 was extended, to form a link between Cologne and Antwerp/Zeebrugg.

Figure 1.3 Corridor Genoa-Rotterdam



Source: CE

³ In attachment III, rail route 24 was described in different terms to those it is now known as (Railway axis Lyon-Genoa-Basel-Duisburg-Rotterdam-Antwerp) and had a southern branch that terminated in Lyon and Genoa. The East West corridor no. 6 (Railway axis Lyon –Trieste – Divaca/koper – Divaca – Ljubljana – Budapest – Ukrainian border), otherwise known as Paneuropean corridor V, included the new Moncenisio tunnel and the AC line Torino – Lyon.

⁴ Memorandum of Understanding from Lugano 2003 between Holland, Germany, Switzerland and Italy.

⁵ The ERTMS/ETCS model permits the free movement of trains from various countries, based on collective information, defined with a common language, and managed with shared interoperable components, on ground and on board.

⁶ 2005 MoU between EC and the rail sector, 2006 Letter stating the aims of the ministers of transport of the countries involved in the up keep of Corridor A of the European Rail Traffic Management System, confirmed by Genoa in 2009 and Rotterdam in 2010.

In 2011, after the adoption of Regulation 913/2010⁷, ‘For a competitive network for European rail freight transport’ by the European parliament and the European Council, the corridor ‘Zeebrugge-Antwerp/Rotterdam-Duisburg-(Basel)-Milan-Genoa’, was included as Corridor 1, one of the nine priority railway corridors for freight traffic in Europe. The green paper ‘TEN-T: A policy review. Towards a better integrated trans-European transport network at the service of the common transport policy’⁸ was published by the European Commission in 2009, and resulted in a TEN-T policy review, and an evaluation of its priority projects in the following years. In October of 2011, following a two-year consultation process, the European Commission adopted a proposal to transform the TEN-T guidelines, under the ‘Connecting Europe facility’⁹ initiative. The new policy outlines a core transport network to be established by 2030, supported by a comprehensive network of routes, based on the present TEN-T network. The core transport network¹⁰, to be established before 2030, consists of ten main corridors. These corridors will cover at least three modes of transport, three Member states, and two cross-border sections, connecting Europe’s main transport hubs, as outlined by the new policy. In this latest proposal, the Corridor Genoa-Rotterdam is number 6, covering the following main transport hubs: Genoa-Milan/Novara-Simplon/Lotschberg/Gotthard-Basel-Mannheim-Koln,Koln-Dusseldorg-Rotterdam/Amsterdam, Koln-Liège-Brussels/Brussels-Zeebrugge¹¹.

Figure 1.4 10 Corridors of the central network (TEN T Core Network)



Source: CE

⁷ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:276:0022:0032:EN:PDF>

⁸ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0044:FIN:EN:PDF>

⁹ <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1200&format=HTML&aged=1&language=IT&guiLanguage=it>, L’insieme di proposte inserite nel “Meccanismo per collegare l’Europa” si compone di numerosi testi, tra questi una proposta di regolamento sugli orientamenti per lo sviluppo della rete transeuropea dei trasporti.

¹⁰ http://ec.europa.eu/transport/infrastructure/revision-t_en.htm

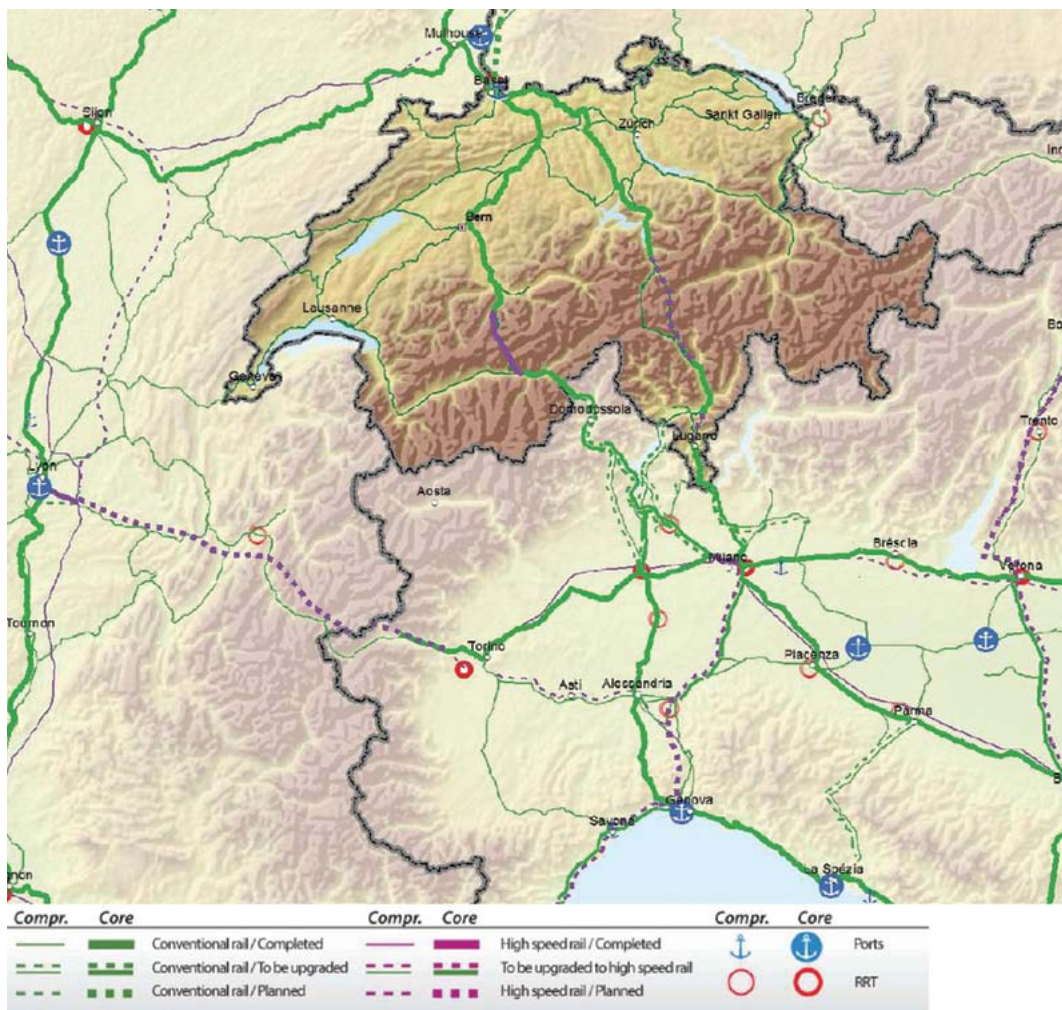
¹¹ <http://ec.europa.eu/transport/infrastructure/connecting/doc/revision/list-of-projects-cef.pdf>

One of the new proposals of the updated TEN-T policy, is to guarantee a clear representation of both the core network and the infrastructure of countries neighbouring the EU.

In Figure 1.5, for example, the Swiss portion of the railway Corridor Genoa-Rotterdam is represented for the first time, in recent maps provided with the proposal, indicated by the lines coming from Domodossola, Luino and Chiasso in Italian territory towards Basel, through the new Lotschberg and St. Gotthard tunnels.

The updated maps, edited by the Ten-T European Agency continue to identify the Corridor Genoa-Rotterdam as Priority Project 24.

Figure 1.5 Southern section of the Corridor Genoa- Rotterdam that covers Italy and Switzerland



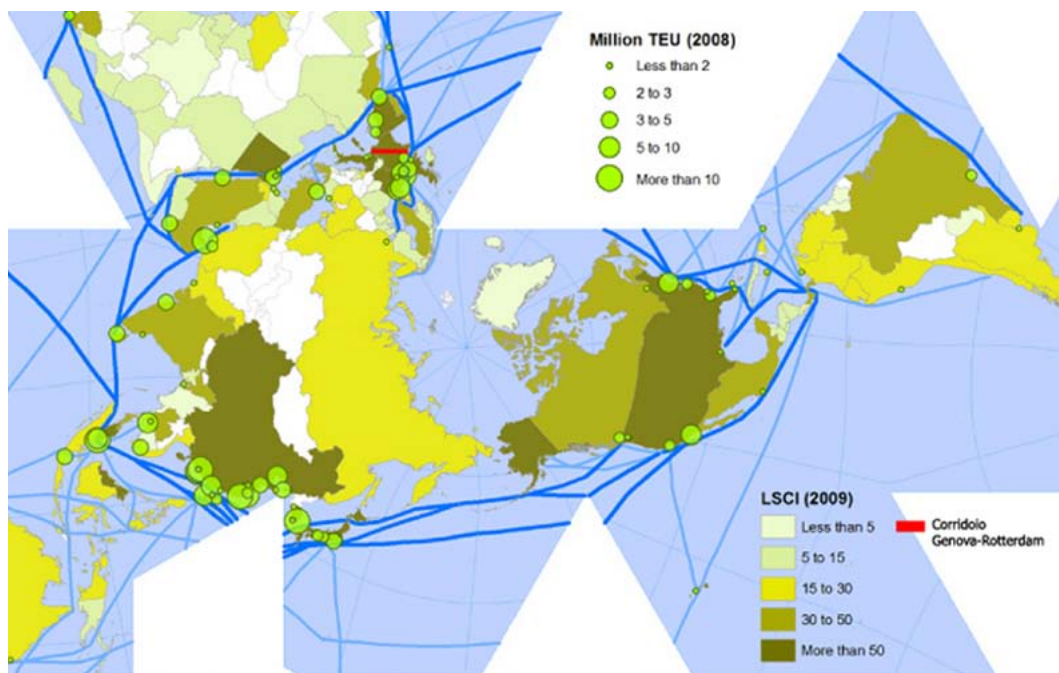
Source: CE

2. FREIGHT TRANSPORT DEMAND SCENARIOS

2.1. GROWTH OF GLOBAL TRADE AND THE CORRIDOR

For Italy, the rail freight Corridor Genoa-Rotterdam¹² is a fundamental tool in connecting its national production system to northern and central European countries. The corridor acts as a gateway to the European continent, where global traffic originating from the Far East and the southern border of the Mediterranean is directed.

Figure 2.1 Main routes of global trade, the movement of TEU in ports and the LSCI Unctad indicator



Source: UNCTAD.

Globalisation has altered the main structures of global trade. In the last twenty years, the intense economic growth in countries of the Far East has caused a shake-up of global trade routes.

The spectacular rise in global container traffic¹³, has caused an increase in European port traffic over the past two decades.

In Hanseatic ports, the area known as the *North Range* is responsible for the movement of the majority of containers in Europe.

¹² From now on the corridor will be referred to as Genoa-Rotterdam although, as seen in previous paragraphs, the description is neither exact nor complete. The term is the most up to date and does not include alphanumeric codes. It refers to the Ten-T Core network that was established by Directive 913/2010 for Freight Rail Corridor 1.

¹³ In 1990 the TEU volume shifted in worldwide ports was around 85 million. In twenty years this grew by six times, at 531.4 million TEU in 2010.

Table 2.1 Container traffic in main European ports (1000 TEU)

Ports	2005	2006	2007	2008	2009	2010	Variation 2005-2010	Variation 2008-2010
Northern Range	29.714	32.114	36.404	37.211	30.823	34.763	17%	-7%
Le Havre	2.118	2.137	2.638	2.500	2.200	2.400	13%	-4%
Antwerp	6.488	7.018	8.175	8.662	7.309	8.483	31%	-2%
Rotterdam	9.286	9.654	10.790	10.783	9.743	11.100	20%	3%
Bremen/B'h	3.735	4.444	4.912	5.529	4.564	4.880	31%	-12%
Hamburg	8.087	8.861	9.889	9.737	7.007	7.900	-2%	-19%
Southern Range	6.283	6.709	7.398	7.206	5.853	6.578	5%	-9%
Barcelona	2.070	2.318	2.610	2.569	1.800	1.946	-6%	-24%
Fos Sur/Marseille	907	941	1.001	847	882	953	5%	13%
Genova	1.624	1.657	1.855	1.766	1.533	1.759	8%	0%
La Spezia	1.024	1.136	1.187	1.246	1.046	1.285	25%	3%
Livorno	658	657	745	778	592	635	-3%	-18%
Mediterranean hub	13.297	13.387	15.156	18.043	17.767	18.917	42%	5%
Tanger Med	-	-	-	921	1.222	2.058	-	123%
Algeciras	3.256	3.244	3.414	3.324	3.042	2.800	-14%	-16%
Gioia Tauro	3.208	2.938	3.445	3.467	2.857	2.851	-11%	-18%
Valencia	2.612	2.609	2.771	3.593	3.653	4.206	61%	17%
Malta	1.321	1.485	1.887	2.300	2.260	2.200	67%	-4%
Port Said	1.621	2.127	2.640	3.202	3.470	3.450	113%	8%
Damietta	1.279	984	999	1.236	1.263	1.352	6%	9%

Source: Logistic plan MIT 2011

Rotterdam and Antwerp hold 10th and 14th place, respectively, in the Top 20 global ports, and are the two leading ports in Europe in terms of annual TEU¹⁴ movement. The Suez Canal has always been strategically¹⁵ important in connecting the European market with the South-East Asian market, the largest area of production worldwide, and the imbalance of trade flows on routes coming from the Far East Europe has again made the Mediterranean the centre of the international trade route network.

In the last few years, this has led to a considerable growth of transshipment¹⁶ port facilities in the South Mediterranean, and a more modest growth of ports in the Northwestern border of the Mediterranean.

If we were to compare Northern and Southern Range commercial traffic in continental Europe, over the period 2005-2010, Rotterdam and Antwerp stopovers have seen an increase in their own container traffic of 31% and 20%, respectively, the port of La Spezia 25%, and Genoa 8%.

In absolute terms, comparing the two extremes of the corridor, the northern ports' market share is six times greater than that of the southern ports.

¹⁴ TEU (twenty-foot Equivalent Unit) is used as the standard measurement for volume of ISO container transport. The majority of containers have a standard length of either 20 or 40 feet: a container of 20 feet (6.10m) corresponds to 1 TEU, and a container of 40 feet corresponds to 2 TEU.

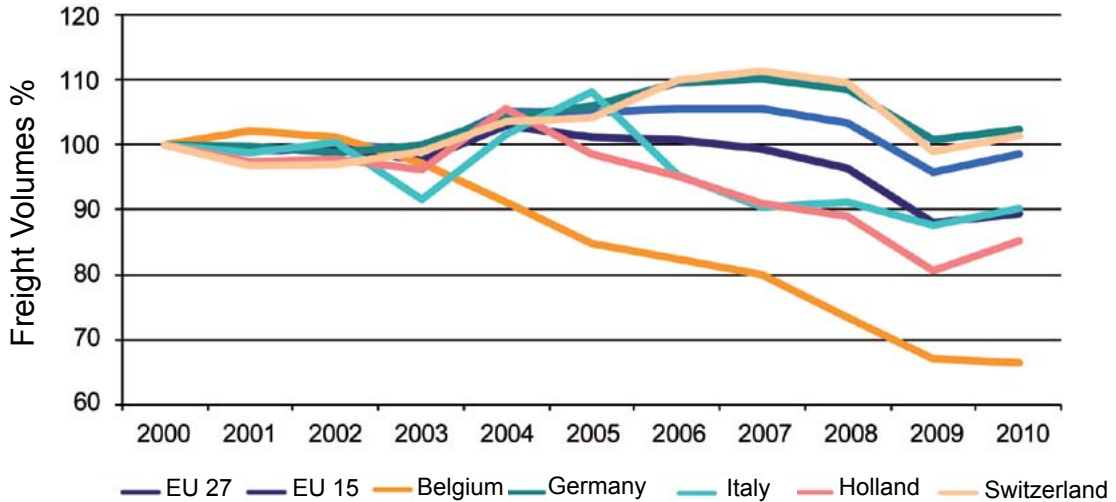
¹⁵ The TEU in transit in the Suez Canal increased by 175% between 2000 (14.031.723) and 2011 (38.641.906).

¹⁶ Container transfer from large ships to small/medium ships or from large ships to others of a similar size.

2.2. IMPACT OF THE FREIGHT TRANSPORT CRISIS IN EUROPE

Since 2007, the volume of freight transport has, mainly, decreased, in contrast with the strong growth of previous years. This is due to the combined effect of the recession and the increase in fuel prices. The decrease in rail transport throughout the continent is higher than the decrease registered in road

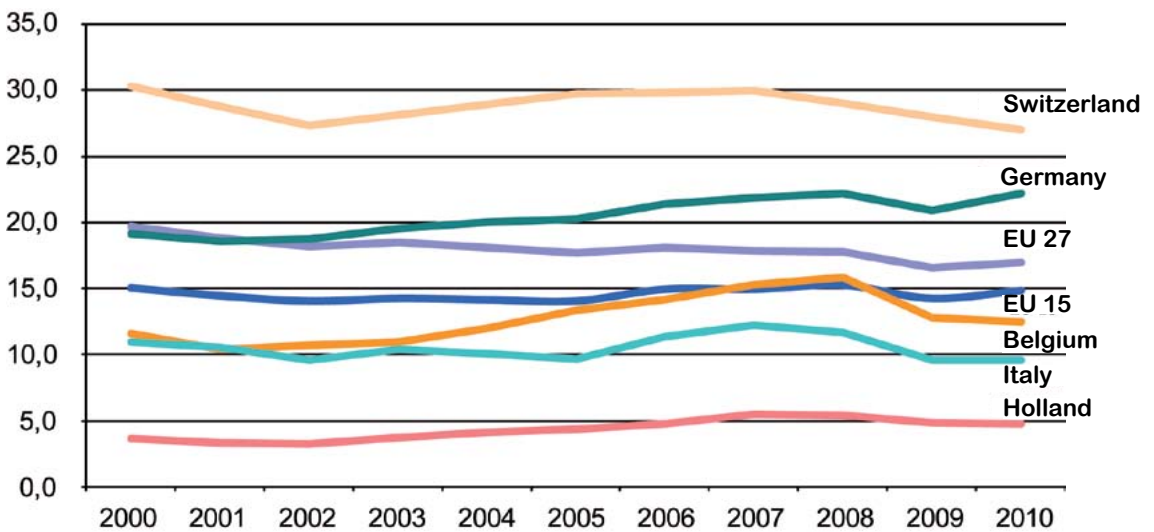
Figure 2.2 Trend in freight transport demand (starting from 100 in the year 2000) in EU-27, EU-15, and in countries of Corridor A from 2000 to 2010



Source: Eurostat 2011

transport. According to the latest available figures, the modal share of rail freight transport accounts for 17% (2010) of the total tonne-kilometres transported in Europe, compared to 19.7% in 2000. In the five countries that are crossed by the Corridor Genoa-Rotterdam, there are no clear-cut trends in both percentage reduction of tonne-kilometres transported after the 2008 crisis, and in the processes that concern modal¹⁷ split.

Figure 2.3 Variation from 2000 to 2010 of the total rail modal share in EU-27, EU-15, and in countries that are part of the Corridor Genoa-Rotterdam.



Source: Eurostat 2011

¹⁷ Modal split represents the percentage of units transported by each individual transport mode compared to the overall shift.

2.3. FREIGHT TRANSPORT DEMAND IN THE SOUTHERN SECTION OF THE CORRIDOR GENOA-ROTTERDAM

By analysing the intersections of the alpine passes that run between Italy and Switzerland, it is possible to create a sufficiently detailed image demand in Italy for the Corridor Genoa-Rotterdam, in terms of both origin and destination transport.

With this in mind, data from the CAFT 2009¹⁸ survey, and the ALPIFRET¹⁹ Project (monitoring of road and rail freight traffic in the alpine region) has been analysed, along with the latest available revisions, made in 2010, presented by the Swiss Federal Transport Office (UFT) in the ALPINFO²⁰ annual report. All analysed data, whether concerning road transport or rail transport, has contributed to the compilation of a thorough outline trends in freight demand in the far eastern section of the corridor. Across analysis of CAFT, ALPIFRET, and ALPINFO data shows how in the last transits traffic and tonnage transported through the Swiss Alps along the Corridor Genoa-Rotterdam have increased, a similar situation that of the Alpine transit in Brenner, in contrast to what has happened in the French Alps²¹.

Table 2.2 Transalpine freight traffic from 2000 to 2010 between Ventimiglia and Brenner

	2000				2004				2009				2010			
	road		rail		road		rail		road		rail		road		rail	
	plm 1000	t (mio)	t (mio)	totale	plm 1000	t (mio)	t (mio)	totale	plm 1000	t (mio)	t (mio)	tot	plm 1000	t (mio)	t (mio)	tot
Ventimiglia	1061	13,7	0,8	14,5	1345	18	0,5	18,5	1273	17,1	0,4	17,5	1338	17,8	0,6	18,4
Monginevro/ Moncenisio/ Monte Bianco/ Frejus	1527	25,2	8,6	33,8	1515	22,3	6,4	28,7	1253	18,5	2,4	20,9	1356	20,2	3,9	24,1
Grand St Bernardo/ Sempione/ Gottardo/San Bernadino	1404	8,9	20,5	29,4	1255	12,5	22,9	35,4	1180	13,4	20,8	34,2	1256	14,3	24	38,3
Rechen/ Brennero	1653	26,6	8,7	35,3	2118	33,1	10,1	43,2	1842	27	13,1	40,1	1947	28,7	14,4	43,1

Source: ALPINFO

¹⁸ CAFT data (CrossAlpine Freight Transport) is compiled every 5 years (2004 and 2009) and collects information on road and rail freight that passes over alpine crossings with the same origin and destination. France, Switzerland, Austria, Germany and Italy all participate in the CAFT survey. The data shown in this study has been collected by the foundation from the CAFT data-base for research purposes on the request of the Austrian and Swiss Ministry of Transport (UFT).

¹⁹ Alpine traffic observatory (ALPIFRET) was created thanks to an agreement between the Swiss Confederation and the European Union. The observatory continuously collects data on the evolution of traffic and its determinate factors, which it then analyses.

²⁰ The main results from the survey carried out by France, Switzerland and Austria are published once a year in the ALPINFO bulletin. The data gathered in the annual ALPINFO report brings transit data up to date, making figures from the first four months of 2011 available.

²¹ The data on transits between Italy and France change if alpine arc A is considered, as it excludes Ventimiglia and Monginevro, compared to arc B that instead includes them.

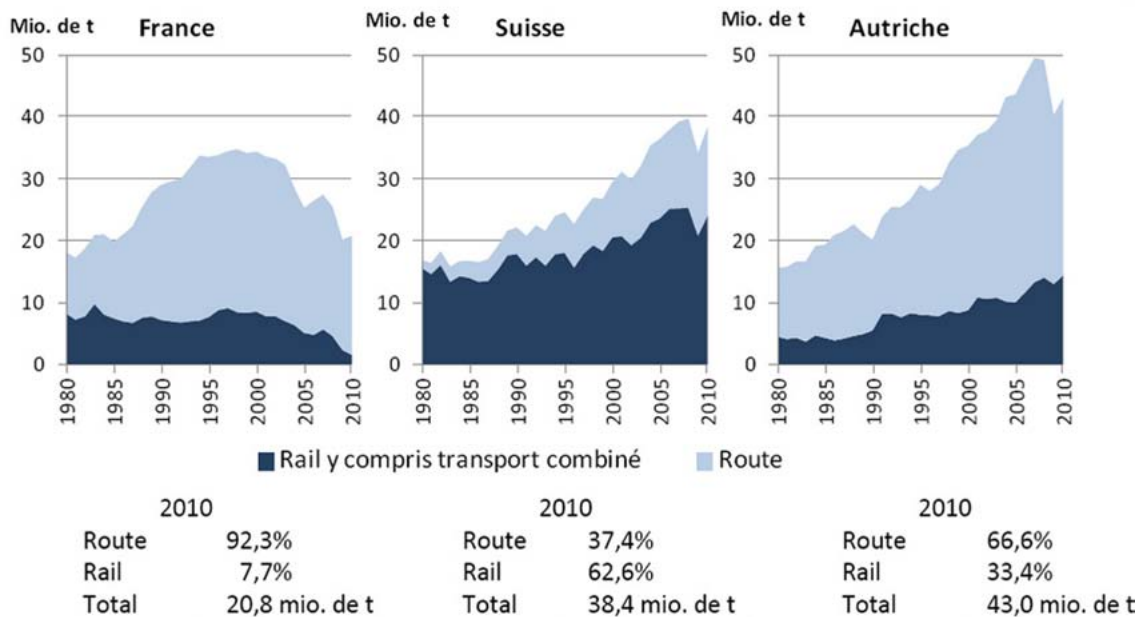
Overall road and rail freight traffic crossing the Swiss Alps via the Corridor Genoa-Rotterdam, has grown continuously since the end of the eighties.

The 8.9 million tonnes transported by road in 2000, reached 14.3 million in 2010 (+61%). In 2009, due to the crisis, there was a large drop (-7.1%) compared with the previous year. However, this was made up for by a growth of 14.3% in 2010 that returned the values to those pre-crisis.

As regards the rail mode, in 2000, 20.6 million tonnes were transported, in contrast to the 24 million tonnes transported in 2010 (+16.5%). The crisis hit rail transport harder, which even after the major recovery of 2010 (+15.4%), has not managed to fully offset the reduction, reaching 17.9% between 2008 and 2009²².

From an environmental point of view, not only is transport demand continuing to grow at an alarming rate in absolute terms, but the greater rate of growth enjoyed by road transport over rail transport²³ is a cause for concern. The resulting gradual decrease in the percentage of goods transported by rail is consistent with the alarming trends that characterize the transformation in European goods demand, and in particular, Italian freight. Nevertheless, rail modal share for traffic passing through the Swiss Alps is still extremely high both in absolute terms (62.6%), and compared to other Alpine passes, and major European freight rail corridors.

Figure 2.4 Transalpine freight traffic from 1980 to 2010 inside the Alpine A arc between Moncenisio-Frejus (F) and Brenner (A)



Source: ALPINFO

²² Using ALPINFO data from the first four months of 2011, it is foreseeable that rail tonnage will continue to grow in the following year, with an increase of around 9% in the volume transported. Rail transport will return to the values pre-2008.

²³ If transport demand by vehicles and not in tonnes transported is illustrated, this tendency was partly balanced by the increase of load rates of vehicles and the increase in maximum tonnes allowed to be transported, from 27 to 40 t. In terms of efficiency, the effect of this increase was that the number of heavy vehicles crossing the Swiss Alps stabilised by 2002, with around 1.2 million heavy goods vehicles.

This last result stands in sharp contrast with the evolution of Italian freight traffic, especially rail traffic, and confirms that the Corridor Genoa-Rotterdam represents a popular rail freight transport route in Europe. The rises, like the growth estimates for combined transport in Europe, unanimously confirm that this type of rail transport should be concentrated in a select few connections, and that amongst these, the Corridor Genoa-Rotterdam will have an important part to play.

Figure 2.5 Role of the network from 2002 to 2015 in combined freight traffic



Source: Kombiconsult e KP

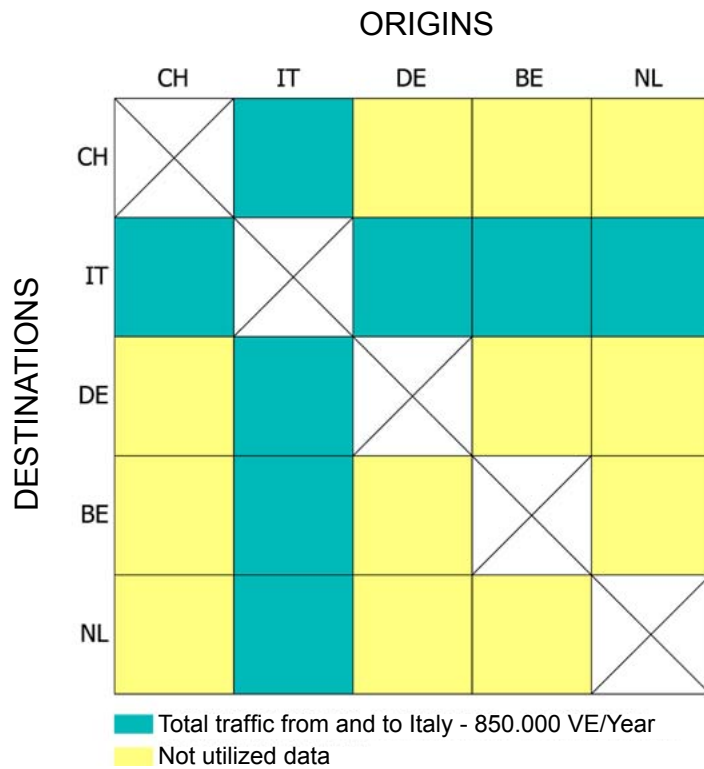
2.4. ROAD FREIGHT TRANSPORT DEMAND

In order to analyse the potential of modal shift, it is important to focus particularly on analysing road transport modes.

Using CAFT 2009 data, it is possible to analyse *road freight demand*, qualitatively and quantitatively, by looking at traffic crossing the Swiss Alps. This gives us a better understanding of the main countries that send and receive traffic to and from Italian territory using the Corridor Genoa-Rotterdam.

This percentage of road traffic only concerns freight going to and from Italy. In other words, it is undoubtedly not the largest proportion of total passenger and freight traffic volumes that use the corridor. Using the CAFT database, freight traffic volumes have been analysed and are illustrated in the following table.

Figure 2.6 Display of analysed volumes for origin and destination

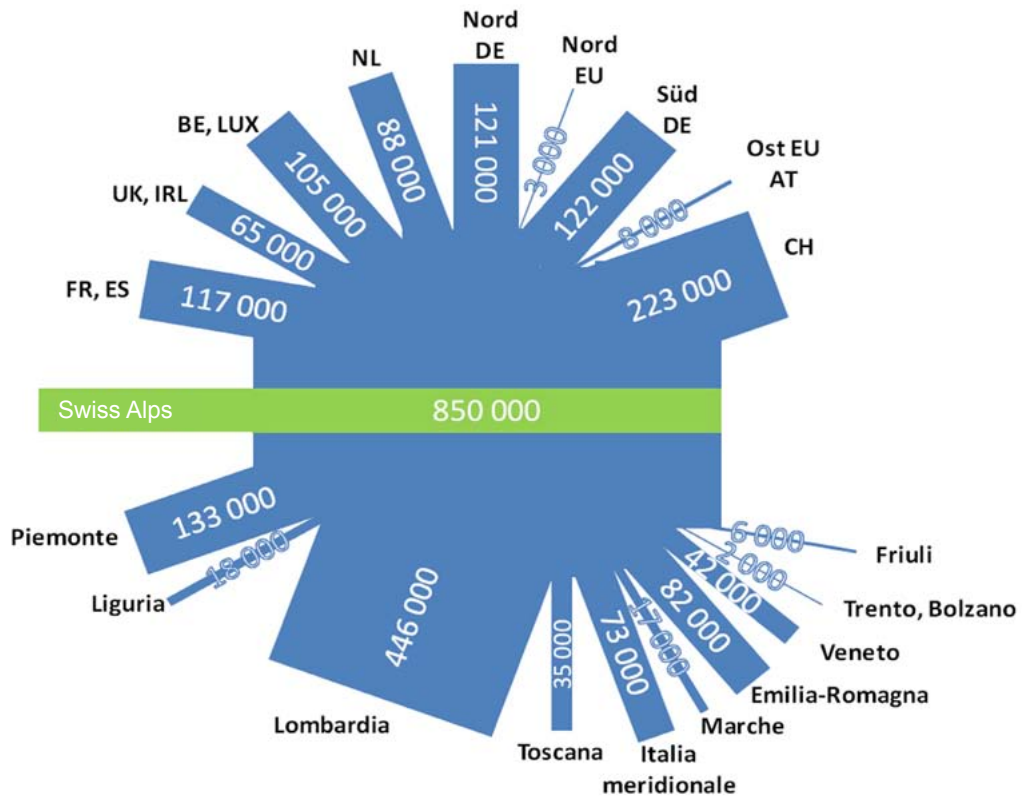


Source: Sustainable development foundation

In 2009, around 850,000 heavy goods vehicles travelling both to and from Italy used the road crossings between Switzerland and Italy (Gran San Bernardo, St.Gotthard, San Bernardino and Semplon), out of a total of 1,180,000 vehicles that year. This means that two thirds of road freight traffic that passes across the Swiss Alps along the Corridor Genoa-Rotterdam is heading to, or starts its journey in Italy.

Lombardy is the largest generator of traffic to and from Italy, and together with Piemonte generates 70% of all traffic (around 2000 vehicles a day). Emilia Romagna follows, along with the whole of Southern Italy. This data confirms that the Corridor Genoa-Rotterdam is currently the main link towards the central Europe logistics platform in the North West.

Figure 2.7 Goods flow along the Corridor Genoa-Rotterdam (vehicles in annual transit) with Italy as origin and destination



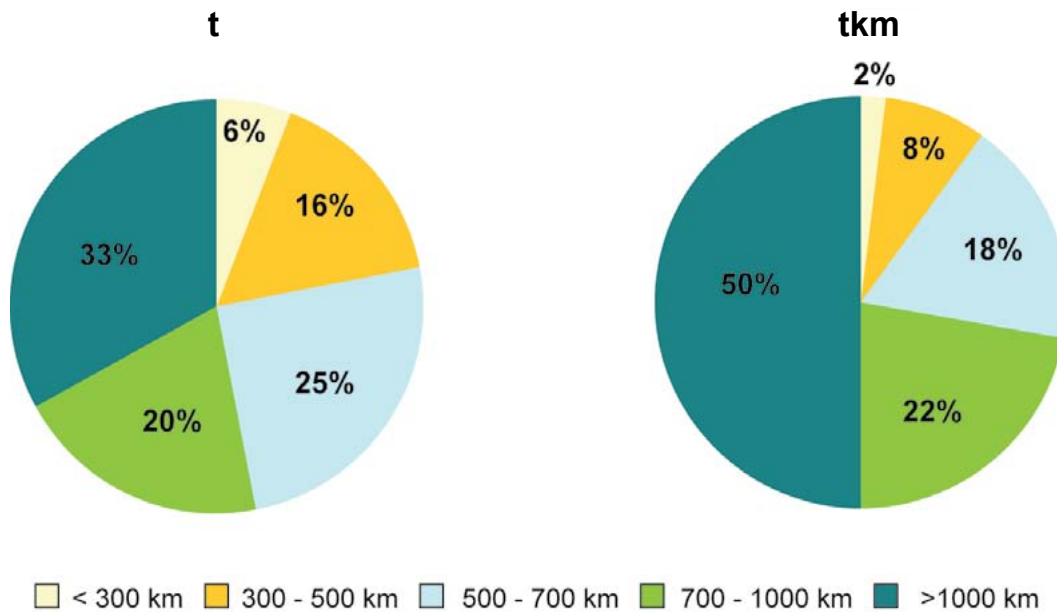
Source: CAFT 2009

It is interesting to compare the data relating to journeys on the corridor to and from Italy, by looking at distance class²⁴, focusing on journeys of the same category in Italian territory.

In general, 92% of tonnage is transported by road in Italy, with distances less than 300 km (and 79% below 150km), however in this particular analysis of the corridor, the amount of tonnage that travels less than 300 km is no more than 6%.

²⁴ The indicator of distance class is crucial in order to understand the potential of modal shift, due to the fact that rail productivity factors determine a convenient economic starting point for distances above 300 km.

Figure 2.8 Distances of transalpine traffic to and from Italy divided by distance class.



Fonte: Sustainable development foundation on CAFT data

2.5. SCENARIOS OF GROWTH IN DEMAND

The chronological time-series data observed earlier confirms that freight demand on the Corridor Genoa-Rotterdam has been increasing for more than twenty years, and that only the recent crisis has temporarily halted this trend.

The most recent data, gathered in 2010 and the first four months of 2011, points to a recovery in traffic demand in both road and rail transport, with the levels closer to those registered in 2008.

But what are the predictions for the coming years?

The factor that complicates matters the most when deciding the fundamental strategies to use in the future, is that, we are not currently following the previously regular pattern of consistency in growth, due to the crisis.

The financial and economic crises have caused sudden disruptions in the otherwise consistent data series, which as a result is now more easily subject to change.

Currently, it is very difficult to say when, and indeed if there will be a true European economic recovery, if the same growth of the last twenty years can be revived, and if the relations between economy, consumption, life style etc. will in time remain intact, as they were in the years preceding the crisis.

In order to formulate a non-biased assessment of future demand, following analysis of the main studies carried out recently, this study has acquired previous results of the ALBA-TRAS study²⁵ carried out using the TAMM model²⁶.

This choice was made for the following reasons:

- For an up-to-date and formal study
- So that the survey is able to return relevant results
- To fine tune the analysis using CAFT data
- To make use of socio-economic parameters concluded from ITREN-2030²⁷, that is to say, post crisis

Results from the simulation of road demand for three BAU scenarios from the ALBATRAS study have been used: one for 2020 and two for 2030 (high growth, low growth).

Table 2.3 Transalpine freight transport: number of heavy goods vehicles in transit in the Alpine Corridor C in 2004, 2020 and 2030 (low growth/high growth)

Baseline/BAU	Baseline 2004	BAU 2020	BAU 2030 low	BAU 2030 high
Number of HDV	(1000)	(1000)	(1000)	(1000)
A - I / SLO	7.325	8.485	9.055	10.512
CH - I	1.258	1.361	1.410	1.662
F - I	2.818	2.583	2.413	2.893
Total	11.401	12.429	12.878	15.067
% Vs Baseline 2004	%	%	%	%
A - I / SLO	100%	116%	124%	144%
CH - I	100%	108%	112%	132%
F - I	100%	92%	86%	103%
Total	100%	109%	113%	132%

Source: Albatras studio

The trend for the BAU scenario in 2020 is based on trade and transport predictions in 2020, carried out using the TAMM model. These are based on the projections for the EU iTRen- 2030 project. For 2030, the two BAU scenarios concerning transport growth (BAU 2030 high growth and BAU 2030 low growth) differ from the BAU 2020 scenarios. This is due to the absence of any new effects of productivity in freight transport, putting basic rail tunnels in Brennero and Moncenisio into operation, and the idea to abolish taxes for rail freight transport.

²⁵ The 2011 Albatras study was commissioned by the directive council 'Transport safety and mobility in alpine regions' within the framework initiated by Zurich. In other words, it is a cooperative project between alpine countries (CH, A, D, F, I, from 2006 also SLO) and the European Commission to increase road safety in alpine regions and to transfer heavy road traffic to rail through the Alps. The aim of the study is to address management methods of heavy goods traffic BTA, AETS and TOLL from a scientific and technical perspective.

²⁶ TAMM (Trans Alpine Multimodal Model) is a model of multimodal distribution of traffic, based on the trends of the 2004 CAFT survey and on social and economic estimates within the iTREN-2030 study. It was developed by Ecoplan and NEA.

²⁷ An estimate from May 2010 by DG Energy of the Environmental commission, therefore after the crisis, and that takes in to account a future lacking in raw materials, with high levels of intercontinental commercial exchange, with demographic displacement towards non active sections of the population, and an economic displacement towards service industries. Overall, these predicted global tendencies are mostly in line with a low to moderate growth of traffic in the alpine region.

Using trends in growth that indirectly concern traffic to and from Italy, simulated by TAMM, all the estimates of emissions and external costs outlined in the following chapter are based on freight traffic volume shown in the table below, taken from the CAFT database.

Table 2.4 Extrapolation of Albatras data and estimation of freight traffic in transit CH- to and from Italy

Yearly road transport		2009	2020	2030 (min)	2030 (Max)
Transalpine total transit - growth scenario Albatras	Ve	1.190.000	1.361.000	1.410.000	1.662.000
Transalpine transit from and to Italy - growth scenario Albatras	Ve	853.000	975.574	1.010.698	1.191.333
	VeKm	706.085.757	807.548.500	836.622.619	986.146.662
	tKm	7.763.412.896	8.878.995.758	9.198.665.700	10.842.682.549

Source: Sustainable development foundation on CAFT/Albatras data

3. ENVIRONMENTAL ADVANTAGES OF MODAL SHIFT

3.1. ASI MODEL

The current transport system largely depends on vehicles run on fossil fuels. This has social impacts and causes environmental and economic unsustainability.

In order to overcome the failures of the current system, a definitive change to the present model is needed. This would enable necessary action to be taken to ensure the mobility of people and goods becomes socially inclusive, and uses resources efficiently, with the lowest environmental impact.

With this in mind, a consistent, thorough, and complete intervention strategy should be followed, consisting of three main avenues:

- Promote accessibility, not mobility,
- Use more sustainable modes of transport
- Technologically enhance all vehicles, ensuring higher efficiency, with lower emissions.

This strategy, endorsed by EEA and UNEP is also known by the initials ASI, from AVOID, SHIFT, IMPROVE.

The ASI approach entails three main avenues:

- Avoid/reduce
- Shift
- Improve

Firstly, the *Avoid/reduce* component comprises all actions aimed at improving the efficiency of the transport system, avoiding, or reducing the expansion of passenger and goods transport demand.

Secondly, *Shift* refers to all actions aimed at improving trip efficiency, shifting modes of transport with higher impacts towards those that are less energy-consuming, less carbonic, less spatially inefficient, less unreliable/unsafe...

Thirdly, the *improve* component, comprises all actions needed to improve vehicles efficiency, whether in operations, other components (tyres, brakes etc.), fuel consumption, or simply driving style

Table 3.1 ASI

Avoid/reduce	Shift	Improve
Reduce/avoid transport demand	Modal shift towards less polluting modes	Improvement on efficiency of mode and vehicle
Efficiency of the system	Efficiency of the trip	Efficiency of vehicle

Source: Sustainable development foundation

3.2. EUROPEAN OBJECTIVES ON MODAL SHIFT IN FREIGHT TRAFFIC BY 2020, 2030, AND 2050

3.2.1 2050 Roadmap from March 2011

The European Union intends to support the transition to a competitive, low carbon emission economy by 2050, and to promote a resource-efficient Europe.

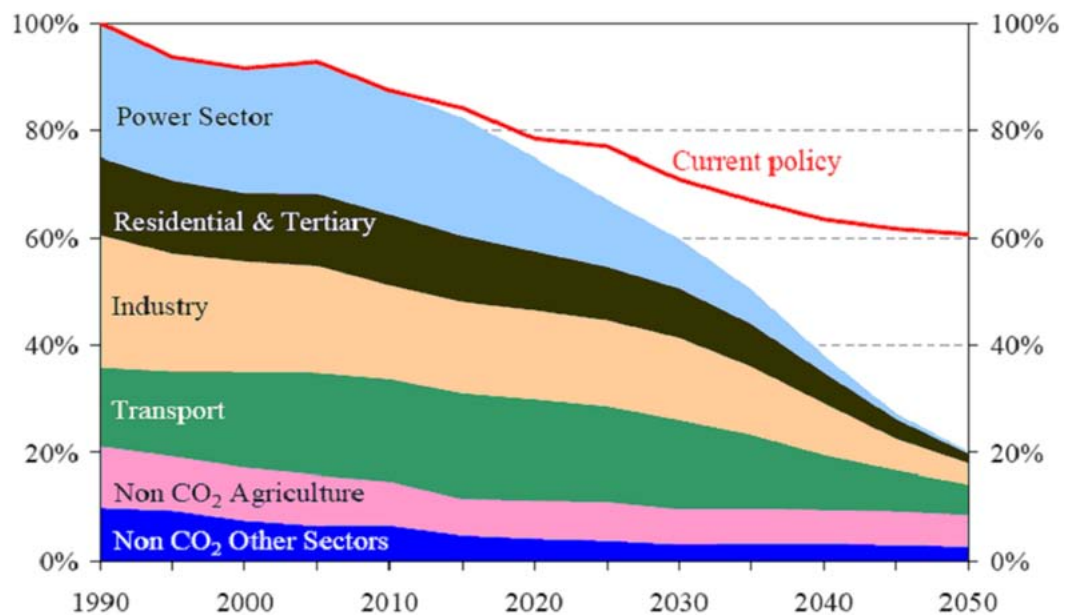
In order to achieve these fundamental objectives, the EU has outlined a long-term reference framework for individual sectors, organised according to time periods, and structured through various analytical and interventional tools.

Following the presentation of the flagship initiative ‘A resource-efficient Europe’, in the March 2011 Communication the commission illustrated the key points that summarise climate action promoted by the EU.

The EU objective is to achieve a reduction in greenhouse gas emissions of 80-95% by 2050, with respect to levels in 1990. This should avoid the predicted 2° C temperature increase, produced by climate change.

By analysing possible scenarios’ the EU has been able to identify various steps up until 2050. These involve the reduction of internal emissions of 40% by 2030, and of 60% by 2040, relative to 1990. This would translate into an annual reduction of around 1% in the first decade, up until 2020, 1.5% in the second decade, from 2020 until 2030, and 2% in the last two decades up until 2050, relative to 1990.

Figure 3.1 Scenario – 80% by 2050



Source: EU Roadmap 2050

The roadmap presents an analysis for sectors, and ETS and non-ETS components²⁸.

Table 3.2 Sector outline

GHG reductions compared to 1990	2005	2030	2050
Total	- 7%	-40 to -44%	-79 to -82%
Sectors			
Power (CO ₂)	- 7%	-54 to -68%	-93 to -99%
Industry (CO ₂)	- 20%	-34 to -40%	-83 to -87%
Transport (incl. CO ₂ aviation, excl. Maritime)	+ 30%	+20 to -9%	-54 to -67%
Residential and services (CO ₂)	- 12%	-37 to -53%	-88 to -91%
Agriculture (non-CO ₂)	- 20%	-36 to -37%	-42 to -49%
Other non-CO ₂ emissions	- 30%	-72 to -73%	-70 to -78%

Source: Primes, GAINS

Table 3.3 Labour distribution between ETS and non-ETS sectors

Reductions compared to 2005	2030	2050
Overall	-35 to -40%	-77 to -81%
ETS sectors	-43 to -48%	-88 to -92%
Non ETS sectors	-24 to -36%	-66 to -71%

Source: Primes, GAINS

Non-ETS sectors should contribute by reducing their emissions by almost 70% by 2050, relative to 2005. By 2030, the contribution of non-ETS sectors will be between 24% and 36%. After 2030 further reductions in emissions should be consistent with those of ETS sectors.

3.2.2 White paper

The White paper ‘Roadmap to a Single European Transport Area – towards a competitive and resource efficient system’ aims to improve the efficient use of resources in Europe, and supports the 2050 Road Map and the Energy Efficiency Plan. The White paper²⁹ of 2011 identifies the challenges that the transport system should confront in the future, through an evaluation of policies and recent developments, and an assessment of trends. Through this evaluation it outlines a long-term strategy that would permit the transport sector to achieve its allocated objectives by 2050.

²⁸ ETS is the acronym of Emission Trading Scheme, that is to say the trading system of CO₂ levels. ETS sectors are those that are particularly energy consuming (high energy consumption) such as: thermoelectric, refinement, production of cement, steel, paper, ceramics, and glass. The transport, construction, services, agriculture and waste industries, along with small industrial plants are not ETS sectors.

²⁹ There are two documents to consult: The White Paper ‘Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system’ that you can find at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:IT:pdf>. English version available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SEC:2011:0358:FIN:EN:pdf>

The White papers proposal for a competitive and resource efficient transport system is assembled in three chapters, and outlines ten objectives³⁰ to reduce 60% of greenhouse gas emissions by 2050:

1 - Developing and deploying new and sustainable fuels and propulsion systems :

- Halve the use of 'conventionally-fuelled' cars in urban transport by 2030, and eliminate them completely by 2050. Achieve CO₂ –free city logistics in major urban centres by 2030;
- Low-carbon sustainable fuels in aviation to reach 40% by 2050; also by 2050 reduce EU CO₂ emissions from maritime bunker fuels by 40% (if feasible by 50%).

2 - Optimising the performance of multimodal logistic chains, increasing, amongst other things, the use of more energy-efficient transport modes:

- 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors. In order to achieve this objective adequate infrastructures will need to be developed.
- By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a strong rail network in all member states. By 2050 the majority of medium-distance passenger transport should have moved to rail.
- A fully functioning and EU-wide multimodal TEN-T 'core network' should be fully operating by 2030, with a high quality and capacity network by 2050 and a corresponding set of information services.
- By 2050, connect all core network airports to the rail network, preferably high-speed; ensure that all core seaports are sufficiently connected to the rail freight transport system and, where possible, to the inland waterway system. Furthermore, this would permit the reduction of other types of harmful emissions significantly.

3 - Increasing the efficiency of transport and of infrastructure use with information systems and market-based incentives:

- Deployment of the modernised air traffic management infrastructure (SESAR) in Europe by 2020 and completion of the European Common Aviation Area. Deployment of equivalent land and waterborne transport management systems (ERTMS, ITS, SSN, and LRIT, RIS) as well as the European Global Navigation Satellite System (Galileo);
- By 2020, establish the framework for a European multimodal transport information, management and payment system;
- By 2050, move closer to the objective of zero fatalities in road traffic accidents. In accordance with this objective, the EU aims to halve road casualties by 2020. Make sure that the European Union is a world leader in safety and transport security in all modes of transport;
- Proceed toward the full application of the principles 'user pays', and 'polluter pays', seeing that the private sector works hard to eliminate distortions, including harmful subsidies, generates revenues, and guarantees funding for future investments in the transport sector.

³⁰ The objectives directly relating to this study are underlined.

The 2050 road map and the White paper on transport outline a clear path to 2050, which although is not currently obligatory, will undoubtedly become so in the short run.

The objective to reduce greenhouse gas emissions by 80% is undeniably the future of technology, as well as the ethical and political future for Europe. The need for intervention is particularly apparent in the transport sector, taking into account that it will take many years to develop, construct and prepare adequate infrastructures, and that trains, planes and ships are only fit to use for a few decades. It is clear that the choices of today will determine the transport choices of 2050.

3.3. TOOLS USED FOR MODAL SHIFT

3.3.1. Eurovignette III

Other than the TEN-T policy briefly described in the introduction of the corridor, the so called accompanying measures are amongst the main tools used to achieve modal shift, in other words, all actions that through regulation policy, contribute to a potential modal shift from road to rail.

Amongst these, economic and fiscal measures are extremely important for internalising external transport costs.

In September 2011, the European council endorsed the new European regulation that aims to reduce pollution generated by road freight transport. This regulation outlines the revision of the 1999/62/EC European parliament and European council directive on the use of road tolls for heavy goods vehicles, known as 'Eurovignette'³¹.

This legislation is the result of a ten-year revision process and should be accepted by all member states within two years. Its fundamental objective is to introduce tolls, in order to internalise external costs from pollution and congestion costs on road infrastructures.

Since it was first implemented, the so called Eurovignette has become one of the main building blocks of a transport policy that is orientated towards sustainability and the restoration of modal balance as a tool of integration, and European economic harmony.

The adoption of the 2006/38/EC³² directive has created conditions in which resources collected from tolls may be put towards main trans-European infrastructural projects, strongly linking Eurovignette with the TEN-T corridors.

The method agreed upon is presented in two parts: Firstly, the principle 'polluter pays' seeks to restore balance to the advantage that different modes of transport have economically, therefore internalising external costs. Secondly, using the leverage of economic resources created through tolls to fund projects of infrastructural modernisation that are necessary for the development of sustainable mobility.

³¹ Now approved, with Italy and Spain having voted against, and Ireland, Holland and Portugal having abstained. Like all directives, the 27 UE states have two years to accept it into their national legislation as soon as the directive is published in the official gazette of the European Union.

³² The so called mark-up, an extra toll with a specific goal, is currently used to co finance the rail tunnel at the base of Brennero.

3.4. ENVIRONMENTAL COMPARISON BETWEEN RAILWAY AND ROAD MODES OF TRANSPORT ON A FEW SPECIFIC SECTIONS OF THE CORRIDOR GENOA-ROTTERDAM

3.4.1. EcoTransIT

The aim of the following paragraph is to give the reader a brief but accurate idea of on the impact different transport modes have on the environment when carrying out the same journey, enabling a quantitative assessment of why the modal shift strategy should be used.

To be able to make these comparisons, the methodology of 'EcoTransIT' will be used, a project initiated by the Institute for energy and environmental research from Heidelberg, which has agreed to assess freight transport emissions.

It is a well known fact, in environmental terms, that motorized transport methods impact the environment in various ways. In particular:

- Consumption of renewable and non-renewable energy sources;
- Atmospheric pollution, due to emissions that affect health, plants, buildings, water sources, and climate;
- Use of natural and semi natural landscapes in areas deprived of vegetation (e.g. conventional railway line embankments) or water resistant areas (roads and fixed railway tracks);
- Infiltration of liquids and solids in soil, and in water resources;
- Noise pollution.

It is only possible to make a unanimous and reliable comparison between transport modes on a consistent, quantitative basis for a few of these impacts. EcoTransIT therefore limits itself to a few important parameters when selecting environmental performance indicators: 'energy consumption' and 'atmospheric pollutants'.

The following seven indicators are, therefore, the environmental performance indicators used:

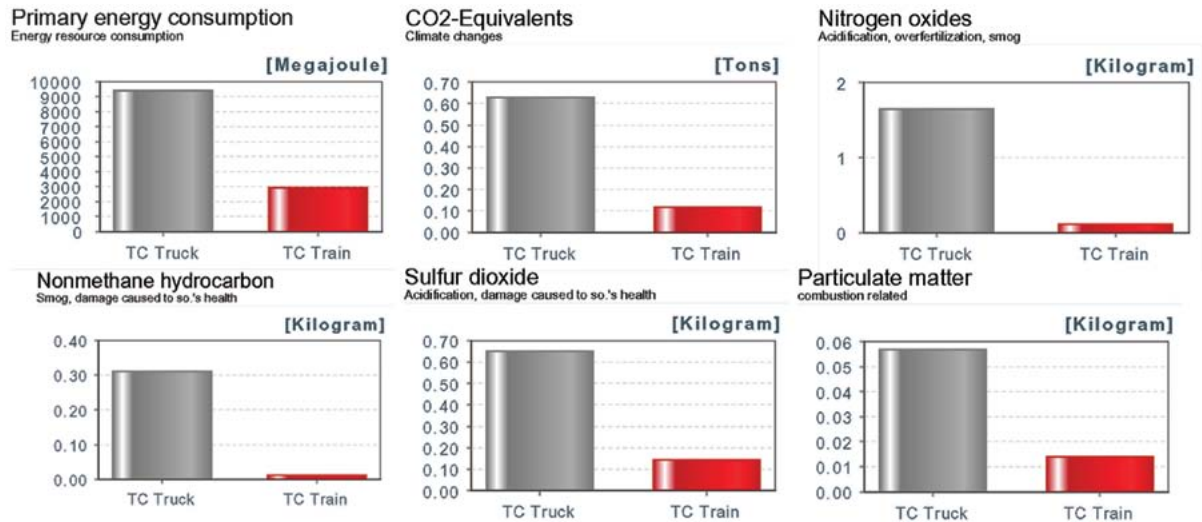
- Primary energy consumption (PEC)
- Carbon dioxide emissions (CO₂)
- Equivalent carbon dioxide and green house gas emissions (CO₂ eq)
- Nitrogen oxide emissions (NO_x)
- Sulphur dioxide emissions (SO₂)
- Non-methane hydrocarbon emissions (NMHC)
- Particulate matter emissions (PM₁₀)

³³ <http://www.ecotransit.org/partners.it.html>

3.4.2 Examples

The first example is of a 10 tonne load transported from Milan to Duisburg by road and by railway.

Figure 3.2 Calculation of pollutant emissions for a load of 10 tonnes transported between Milan and Duisburg by road and by railway



Source: Tool EcoTransIT elaboration

It takes a Euro-V vehicle with a 60% load factor 867 km to travel the route by road, while it takes a train on electric lines a distance of just over 927 km.

The same journey by train generates a saving of:

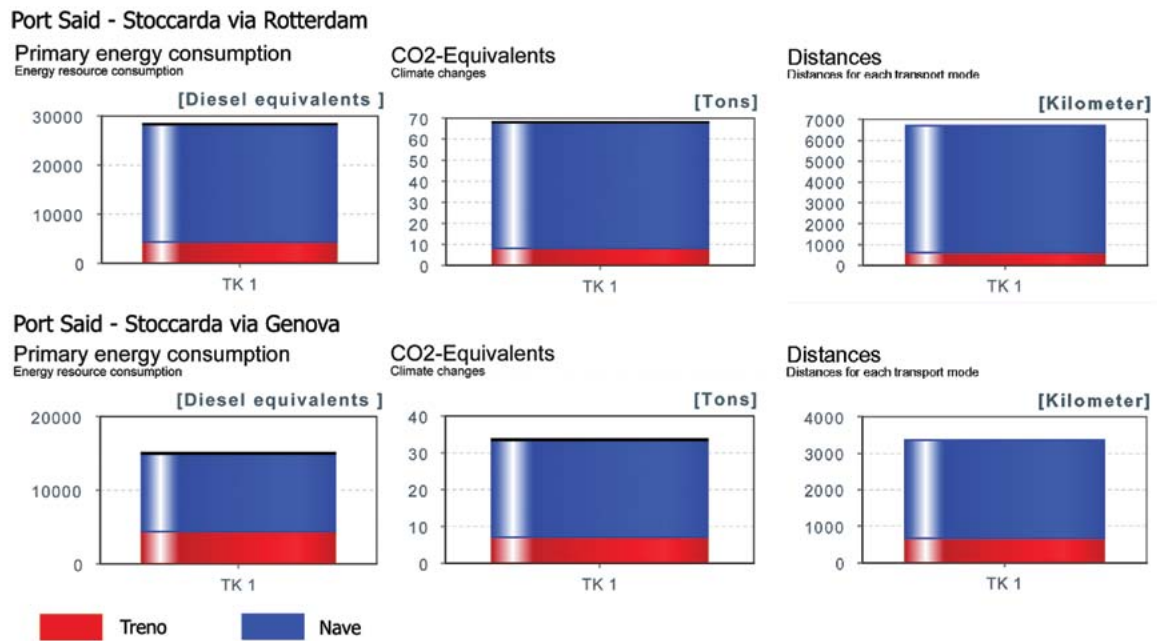
- 6.501 megajoules in primary energy consumption
- 0,5 tonnes of CO₂ and CO₂ eq
- 1,6 kg of nitrogen oxide (NOx)
- 0,30 kg of non-methane hydrocarbon (NMHC)
- 0,6 kg of sulphur dioxide (SO₂)
- 0,05 kg of particulate matter (PM10)

The second example simulates one of the indirect advantages of modal shift. The assessment is of a 1000 tonne load transported from Port Said, in Egypt, to Stuttgart, via Rotterdam and Genoa.

Up until now, many ships have chosen to use the Suez canal, instead of docking in Genoa and saving 4 to 6 days of navigation. This is due to a series of infrastructural deficits regarding the Genoese cross-roads causing an uncertainty in times, and to the problematic intermodality between maritime and rail transport. Instead, they prefer to cross the stretch of Gibraltar and unload in North Range³⁴ ports and from there transfer loads by rail.

³⁴ This dynamic is illustrated in various studies on the logistics of Italian ports, in particular a study carried out by CONFETRA. In this study freight delivery times of a journey between Singapore and Milan, unloading at Antwerp and Genoa, are analysed. To cross the Port of Genoa, 3- 11 days are required, whereas to cross the Port of Antwerp 3-5 are required.

Figure 3.3 Comparison of pollutant emissions for a load of 1000 tonnes transported between Port Said and Stuttgart via Genoa and Rotterdam



Source: Tool EcoTransIT elaboration

Guaranteeing an effective transfer of loads by rail in Italian ports and therefore encouraging modal shift by rail, would mean a difference in distance of around 3500 km. This shortened route would result in the following environmental advantages:

- 47.630 megajoules in consumption of primary energy (PEC)
- 3,4 tonnes of CO₂
- 3,5 tonnes of CO₂ eq
- 77 kg of nitrogen oxide (NOx)
- 4,08 kg of non-methane hydrocarbon (NMHC)
- 44,4 kg of sulphur dioxide (SO₂)
- 6,36 kg of particulate matter (PM10)

3.5. ESTIMATION OF ENVIRONMENTAL IMPACTS ON THE CORRIDOR IN DIFFERENT SCENARIOS

With CAFT 2009 data, it is possible to measure environmental impacts by using the main indicators connected to road freight transport on the Corridor Genoa-Rotterdam that which originates in or is headed towards Italy.

The estimate takes into account:

- Primary energy consumption (PEC)
- Carbon dioxide emissions (CO₂)
- Nitrogen oxide emissions (NOx)
- Particulate matter emissions (PM10)

As already outlined in Chapter 2, road freight traffic to and from Italy using the corridor to cross the Swiss Alps, amounted to around 850.000 vehicles in 2009. Depending on origin and destination of goods, it is possible to obtain the overall journey distance in vehicle kilometres (vekm). 55% of these heavy goods vehicles were made up by articulated³⁵ vehicles, 27% by B-trains³⁶ and the remaining 18% by lorries.

Using CAFT research, it is estimated that the average load transported in these vehicle categories will increase, not just by vehicle dimensions, but also by specific load factor.

Table 3.4 Load factor of heavy duty vehicles 2009

HDV types	% flow	Average load 2009
Articulated lorry	55%	14,1 t
Lorry	27%	9,6 t
Truck	18%	3,6 t

Source: CAFT

This data has been used to estimate the number of tonne-kilometres that have passed over the Corridor Genoa-Rotterdam' for road freight traffic to and from Italy.

Applying growth rates from BAU 2020 and 2030 scenarios deduced by the ALBATRAS study, and identified in Chapter 2, the transport demand in 2020 will reach a value of 8.8 million tonne and in 2030 a value of between 9.2 and 10.8 million tonne-kilometres.

Table 3.5 Demand for road freight transport on the Corridor Genoa-Rotterdam to and from Italy (2009-2020-2030)

Road transport-Year		2009	2020	2030 (min)	2030 (Max)
Transalpine total transit - Growth scenario Ecoplan	Ve	1.190.000	1.361.000	1.410.000	1.662.000
Transalpine transit from and to Italy	Ve	853.000	975.574	1.010.698	1.191.333
	VeKm	706.085.757	807.548.500	836.622.619	986.146.662
	tKm	7.763.412.896	8.878.995.758	9.198.665.700	10.842.682.549

Fonte: Sustainable development foundation on CAFT data

Based on these values, emissions of CO₂, NO_x, PM³⁷, and energy consumption have been calculated for each origin/destination.

³⁵ Vehicle consisting of an engine and trailer. The maximum approved length in most European countries is 16.5m, the approved height is 4m, and weight from 40-44t.

³⁶ Lorries with trailers destined for freight transport.

³⁷ For 2020 and 2030 the constant emissions will be reduced thanks to improved technology in engines, deduced from the TREMOVE model on the European average.

Consequently, consumption and emissions of road freight transport using the Corridor Geona-Rotterdam to travel to and from Italy in 2009 were estimated for four selected impacts. Using estimated traffic volumes, these same impacts were also measured for 2020 and in 2030 (high and low growth scenario).

Table 3.6 Estimation of primary energy consumption and CO₂, NO_x, and PM emissions for road freight transport to and from Italy on Corridor A (2009-2020-2030)

Emissions		2009	2020	2030 (min)	2030 (Max)
Energy consumption	Diesel Eq. X1000	221.733	246.137	253.066	298.295
CO ₂	t	501.522,9	556.720,1	572.394,3	674.694,5
Nox	t	2.583,2	1.528,1	1.319,3	1.555,1
PM	t	71,2	28,5	16,9	19,9

Source: Sustainable development foundation evaluation

The impacts shown in the previous table concern only road freight traffic to and from Italy, in other words, one of the five main origins and destinations of the Corridor (see fig. 2.6).

To put this into perspective, and also compare carbon dioxide emissions from heavy road vehicles in Italy for 2009³⁸ with other emissions, CO₂ emissions were estimated at 17.7 millions tonnes, while those of nitrogen oxide at 193.900 tonnes

3.6. ESTIMATION OF REDUCTION IN ENERGY CONSUMPTION AND OF CO₂, NO_x AND PM EMISSIONS DUE TO MODAL SHIFT

Calculating the quantity of traffic transferable from road to rail thanks to programmed investments in the Corridor would require a detailed model analysis.

This preliminary study therefore outlines only estimates, based on Targets from the White paper of the EU. Freight traffic travelling more than 300 km, according to the White paper³⁹ should be shifted to rail starting from 2030. However, this is already very much a reality: in 2009 the modal share of these traffic volumes was already higher than 50% (62.6% of tonnes transported by rail and 37% by road).

However, these figures should not distort the aim of the European target, which in order to be achieved, requires excellent performance on journeys where rail transport is more suited, thanks to improved infrastructure in the average network. This target is particularly vital in making sure that local areas used for transporting goods are taken into environmental consideration. From the analysis of current transport demand observed by CAFT 2009 explained in Chapter 2, a large amount of road traffic travels more than 300km.

³⁸ National account of Transport 2009-2010

³⁹ In the White paper the term 'majority' is instead used for the 2050 target.

By estimating that 30% of the remaining share of freight traffic is transferred from road to rail in 2020, and the remaining 60% is transferred by 2030⁴⁰, starting in 2020, the number of vehicles crossing the Italian-Swiss border could be reduced by around 275.000 vehicles a year, and from 2030 by a quantity fluctuating between 570.000 and 670.000 vehicles (depending on an estimate of low and high growth of transport demand)..

Table 3.7 Estimation of vehicle reduction to and from Italy on the Corridor

Road transport year		2009	2020	2030 (min)	2030 (Max)
Transalpine total transit	Ve	1.190.000	1.361.000	1.410.000	1.662.000
Transalpine transit from to Italy	Ve	853.000	975.574	1.010.698	1.191.333
	VeKm	706.085.757	807.548.500	836.622.619	986.146.662
	tKm	7.763.412.896	8.878.995.758	9.198.665.700	10.842.682.549
Extimated transit	Ve		701.007	441.792	520.751
	VeKm		569.279.859	342.928.596	404.217.962
	tKm		6.259.232.054	3.770.499.908	4.444.376.488
Shift	Ve		274.568	568.906	670.582
	VeKm		238.268.641	493.694.024	581.928.700
	tKm		2.619.763.703	5.428.165.792	6.398.306.061

Source: Sustainable development foundation evaluation on CAFT/Albatras data

Based on this hypothesis, lower energy consumption and reductions of atmospheric emissions of carbon dioxide, nitrogen oxide and particulate matter have been calculated and are shown in the following table.

Table 3.8 Estimation of energy consumptions and CO₂, NO_x, and PM emissions related to reductions in distances

Emissions		BAU 2009	Shift 2020	Shift 2030 (min)	Shift 2030 (Max)
Traffic	VeKm	706.085.757	238.268.641	493.694.024	581.928.700
Traffic	tKm	7.763.412.896	2.619.763.703	5.428.165.792	6.398.306.061
Energy consumption	Diesel Eq. x 1000	221.733	-49.826	-103.241	-121.692
CO ₂	t	501.523	-123.829	-256.574	-302.429
Nox	t	2.583	-409	-848	-1.000
PM	t	71,2	-2,9	-5,9	-7,0

Source: Sustainable development foundation evaluation on CAFT/Albatras data

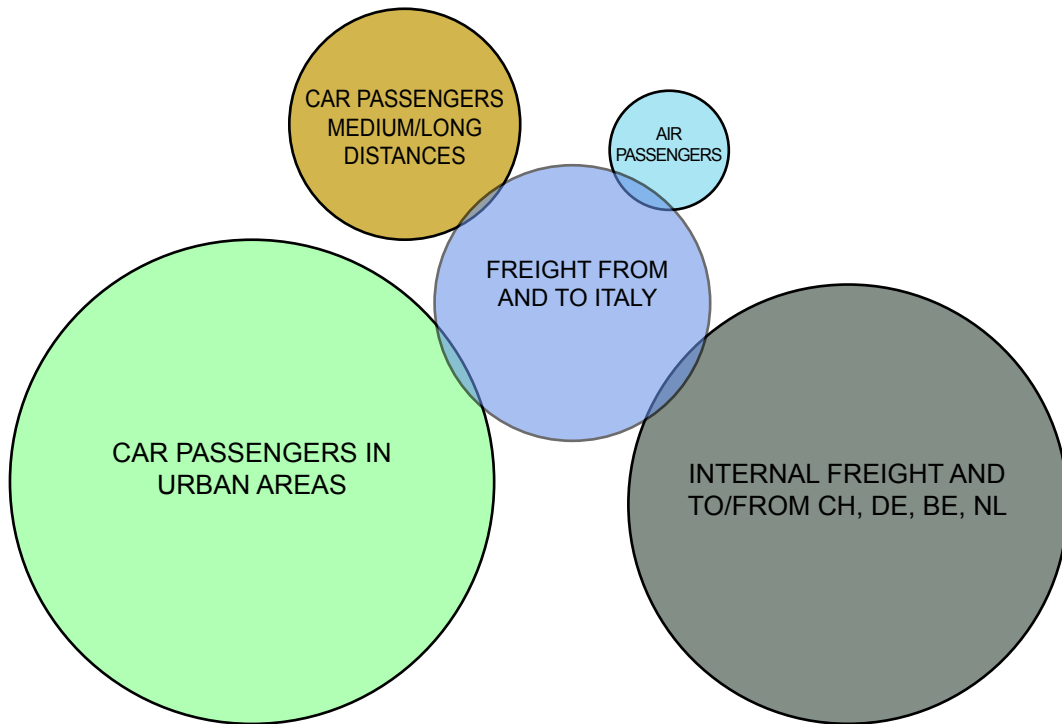
⁴⁰ These hypotheses are in accordance with the estimates from the Albitras study on the impact of toll systems, with respect to the BAU scenario.

This potential reduction is considerable, however, it only refers to a percentage of traffic due to be transferred to rail, in other words, only the freight transported by heavy goods vehicles to and from Italy. The majority of other traffic that uses the Corridor is yet to be transferred from road to rail including:

- Passenger and freight traffic
- Vehicles and heavy goods vehicles
- Medium to long distance traffic as well as the very frequent and small urban crossroads that form part of the Corridor.

Amongst these is air passenger traffic, which can also be transferred to rail in cases where high-speed trains connect two cities, with a journey time of less than four hours⁴¹.

Figure 3.4 Potential for cutting emissions and consumptions in the different types of traffic along the corridor. The portion in question is shown in the centre.



Source: Sustainable development foundation evaluation

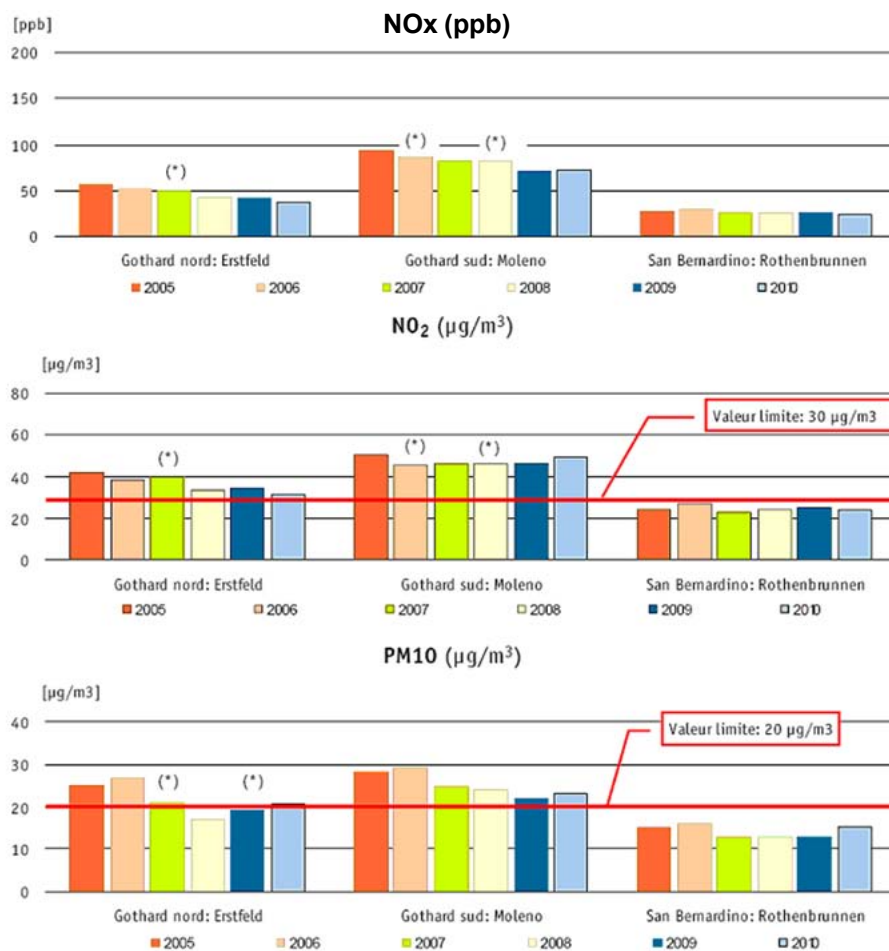
⁴¹ Over 4 hours the potential of modal shift between air and rail tends to rapidly decrease.

3.7. LOCAL CONCENTRATIONS OF POLLUTANT EMISSIONS

As emphasised in Chapter 2, around two-thirds of road freight traffic that passes through the Swiss Alps using the Corridor Genoa - Rotterdam is headed toward, or generated in Italy.

As part of the project ALPIFRET, a few of the most significant effects have been monitored 'on- field', both in terms of atmospheric pollution, and noise pollution in alpine regions. This data completes the analysis of emissions, inasmuch as it allows the effect of these emissions, in terms of local concentration, to be observed. In actual fact, road freight traffic does not produce fewer emissions along the corridor than cars. This is due to higher emission levels specific to vehicles, causing too many impacts with regards to their overall traffic volume. Using the Gotthard road tunnel⁴² as an example, less than 20% of journeys are made by heavy freight vehicles, while NOx emissions represent just under 60%, and PM10 emissions around 80%. These emissions largely account for why the average annual atmospheric concentration has exceeded permitted levels, observed on all the monitored crossings, despite the decrease of traffic from 2007 -2009.

Figure 3.5 Concentration of NOx, NO2 and PM10 on Swiss motorway routes (annual average)



Source: ALPIFRET

⁴² Freight traffic in the St. Gotthard road tunnel is amongst the other causes of accidents. Use of the 'dropper' method, used after the fatal accident of 2001, which imposes a distance of 150m between each lorry, has significantly reduced the number of accidents. Between 2020 and 2025 the St. Gotthard motorway tunnel will have to undergo improvement works. This will result in the closure of the tunnel for a while that affects the utility of the solution adopted by the Swiss government. The solution of a second tunnel along side is becoming more likely, although it is still not decided.

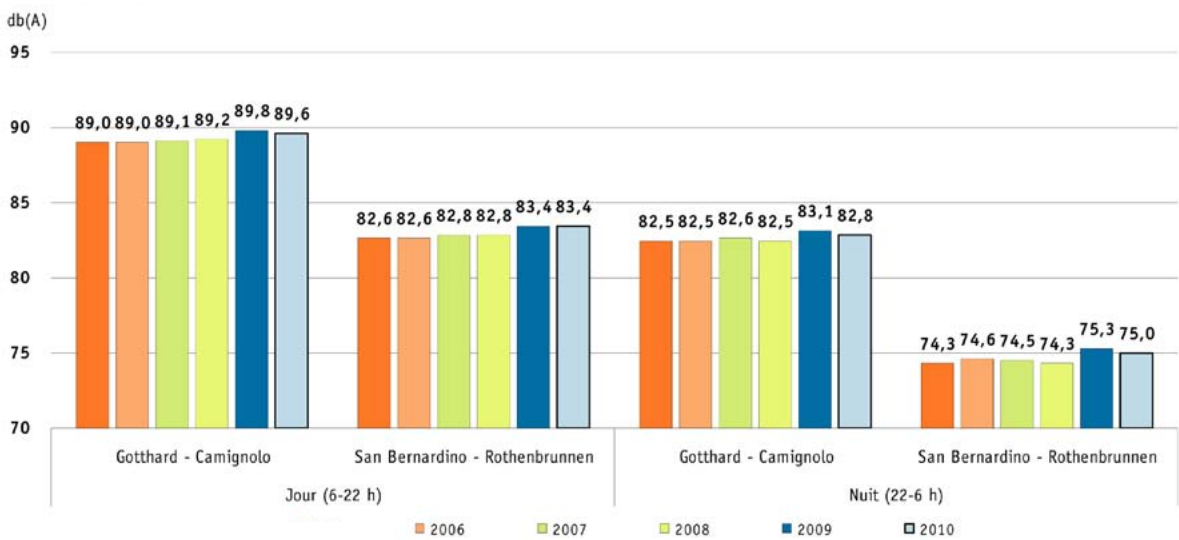
In terms of modal shift from road to rail, when monitoring noise emissions it is interesting to compare levels from motorway routes with those from railway routes, both in absolute terms and in terms of trends.

Monitored road noise emissions tend to remain stable or grow, at the most to around 90 dB(a), while rail noise emissions have consistently decreased since 2005, nevertheless continuing to reach maximum values, not much lower than road noise emissions.

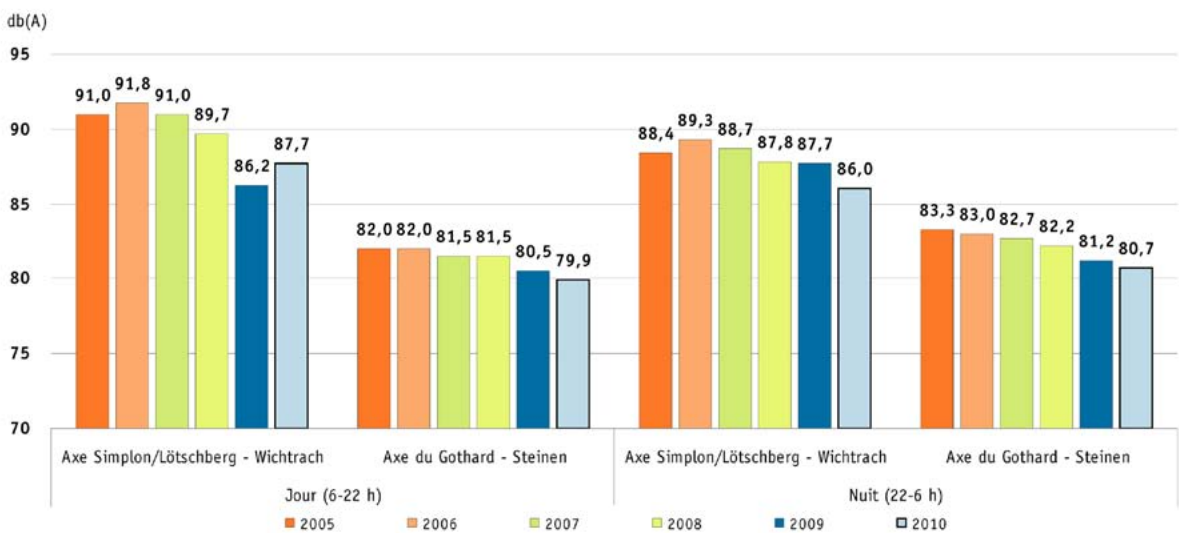
This decrease is due to the modernisation of the current wagon fleet and the replacement of old freight wagons.

Figure 3.6 Noise emissions on road and railway Swiss alpine routes of the corridor (annual average-index Leq (dB(a)))

ROAD TRAFFIC



RAIL TRAFFIC



Source: ALPIFRET

4. SOCIAL, ECONOMIC, AND ENVIRONMENTAL ADVANTAGES OF THE CORRIDOR GENOA - ROTTERDAM

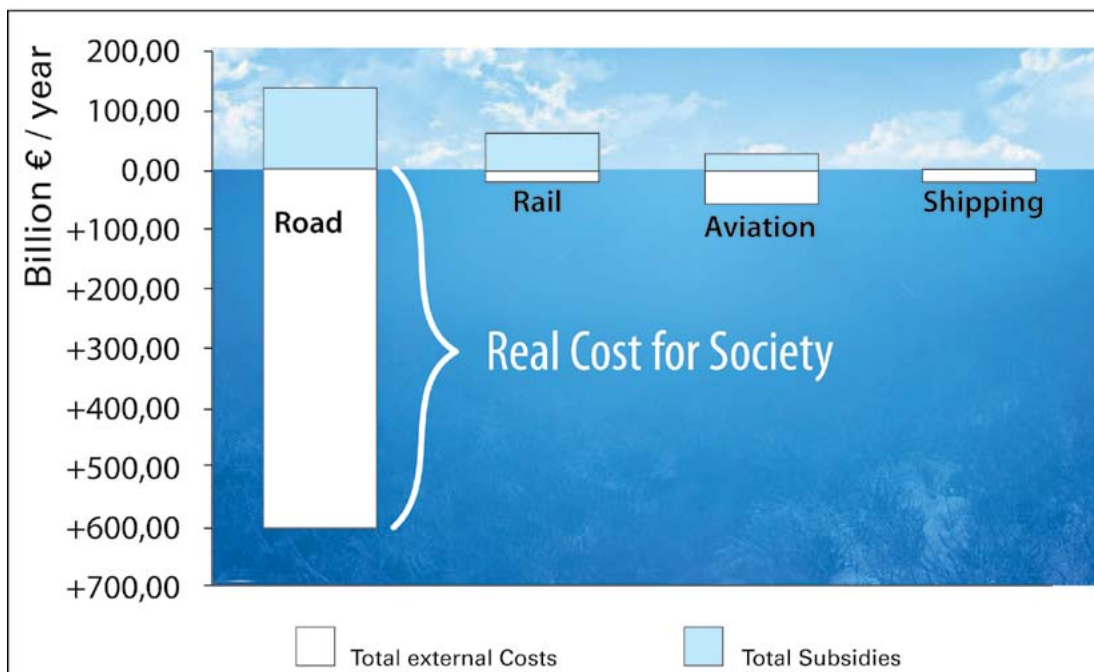
4.1. ALL IMPACTS FROM ROAD FREIGHT TRANSPORT ON THE CORRIDOR GENOA - ROTTERDAM

Road freight traffic does not just amount to primary energy consumption and atmospheric emissions. As has already been outlined, single environmental impacts or human health also pose significant threats. With this in mind, it is important to add indicators that measure accident rates and traffic congestion when carrying out an analysis of sustainability that affects the social and economic impacts of transport. This study has therefore analysed a range of impacts and their physical and monetary figures as external costs.

In other words, quantifying external costs from the main impacts of road freight transport, using a procedure illustrated in the following paragraph, does not just build a more complete framework, but deduces relative intensity by evaluating the economic weighting of different impacts.

This evaluation borders of two disciplinary methods; economic and environmental, and aims to outline and promote modal shift.

Figure 4.1 Report outlining external costs and subsidies in Europe in different transport modes



Source: EEA

4.2. EVALUATION OF EXTERNAL COSTS

The principle 'polluter pays' is also seen as a cornerstone of the strategy for sustainable transport outlined by the White paper (2011), yet to be put in place⁴³.

Regarding progress in research, numerous advances have been made in economics and environmental science, and there are various in-depth journals on the subject.

⁴³ Eurovignette III is a significant step forward but it will be a while before external costs can really be internalised. It will take at least two years for the directive to be accepted by all the member states and then time for it to become effectively applied throughout the EU.

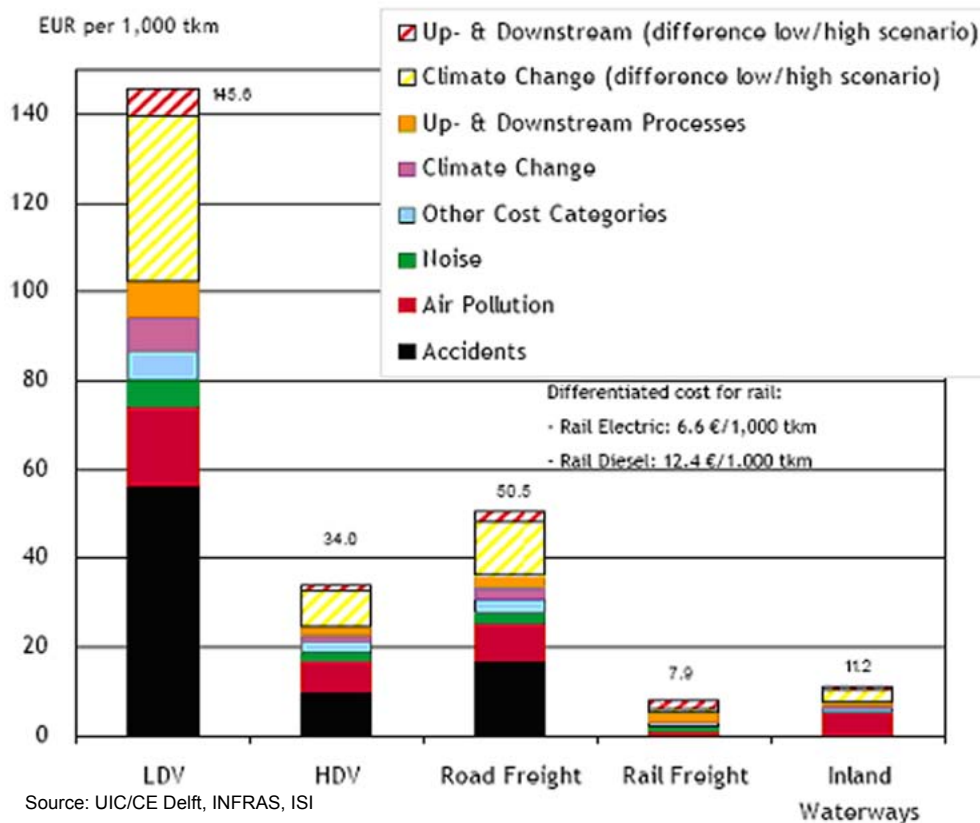
This study refers to the contents of the European project IMPACT, developed for the European Commission in 2007 by CE Delft, INFRAS, and ISI Fraunhofer, along with the associated final report ‘Handbook on estimation of external cost in the transport sector’. For specific values in tonne-kilometres the report ‘External Costs of Transport in Europe: Update Study for 2008’ has been referenced, produced by the same authors on behalf of UIC⁴⁴.

The analysis deals with external costs of the main modes of freight and passenger transport concerning the following impacts:

- Accidents
- Atmospheric pollution
- Climate change
- Noise
- Congestion
- Other impacts (Up and Downstream Process, nature and landscape, impacts on cities, soil and water pollution...)

The lowest average external cost in Europe for freight transport is that in the railway sector. (€7.9 per 1000tkm) with internal navigational costs 1.4 times higher (€11.2 per 1.000 tkm) On the other hand, the average external road freight transport cost is €50 per 1.000 tkm, 6.4 times higher than rail. Within road freight transport, heavy duty vehicles have an average external cost of €34 per 1.000 tkm while the average external cost of light vehicles is €146.

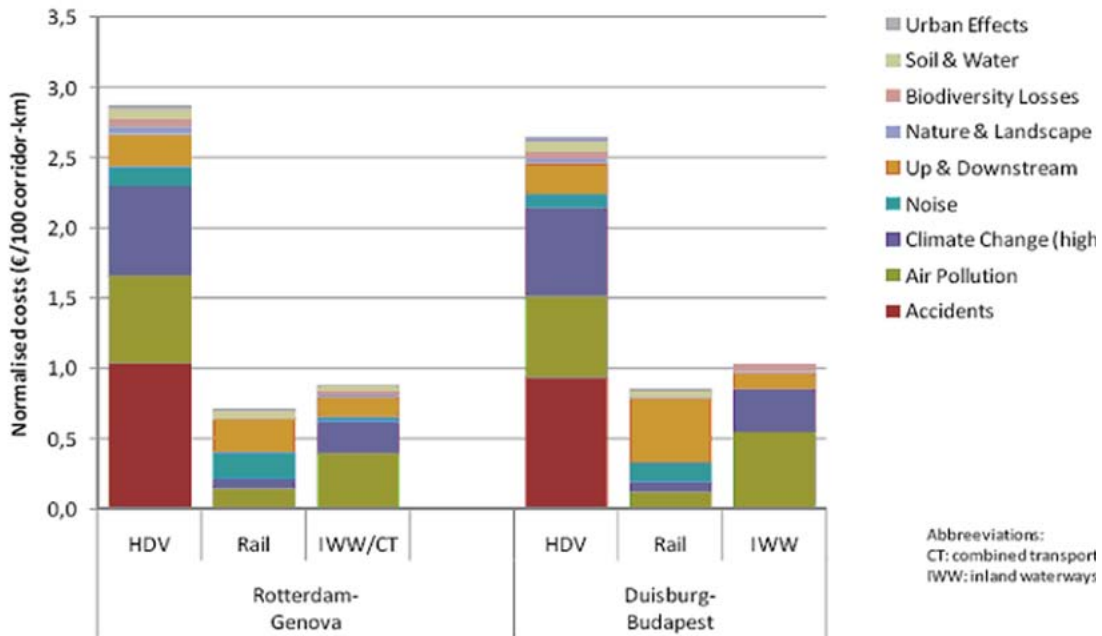
Figure 4.2 Average external costs of UE-27 (including Switzerland and Norway) of freight transport



⁴⁴ On behalf of UIC, the authors (INFRAS and IWW) had already compiled a study on the external European costs, referring to 1995, 2000 and 2004, to which they added 2011, with reference to 2008. This means that all values used in the study from now onwards refer to the 2008 costs.

The study that has been referenced contains a useful in depth analysis of 4 different European corridors, amongst these the Corridor Genoa-Rotterdam.

Figure 4.3 Average external costs of the Corridor Genoa-Rotterdam



Source: UIC/CE Delft, INFRAS, ISI

The overall estimate of external costs of road freight transport only refers to the transport demand to and from Italy using the Corridor Genoa-Rotterdam, as was done for the estimate of main atmospheric emissions.

Overall, the external costs linked to this share of road transport on the corridor are equal to 267 million euros every year, eliminating congestion cost⁴⁵.

Table 4.1 External costs related to the Corridor Genoa-Rotterdam for traffic to and from Italy (2008 costs)

External Costs	tKm	€/tKm	TOTALE (mio €)
Congestion (congestione)	7.763.412.896		€ 119,81
Accidents (incidenti)		€ 0,010	€ 79,19
Air pollution (inquinamento atmosferico)		€ 0,007	€ 52,01
Climate change (cambiamento climatico)		€ 0,010	€ 76,08
Noise (rumore)		€ 0,002	€ 13,97
Up- and downstream (processi a monte e valle)		€ 0,003	€ 23,29
Nature & landscape (ambiente e paesaggio)		€ 0,001	€ 5,43
Biodiversity losses (perdita biodiversità)		€ 0,001	€ 3,88
Soil & water pollution (inquinamento delle acque e del suolo)		€ 0,001	€ 6,21
Urban effects (effetti sul costruito)		€ 0,001	€ 6,99
TOTAL			

Source: Sustainable development foundation evaluation on UIC/ CE Delft, INFRAS, ISI data

⁴⁵ Even if considered as one of the main external transport costs, the cost of traffic, in methodological terms and of quantitative assessment, entails a major risk of uncertainty. In the UIC study, the traffic cost was reported separately from the other external costs and did not provide data for the Corridor Genoa-Rotterdam but only the European average, that from 2008.

The same volume of rail freight transport would produce much lower external costs, equal to 61 million euros per year.

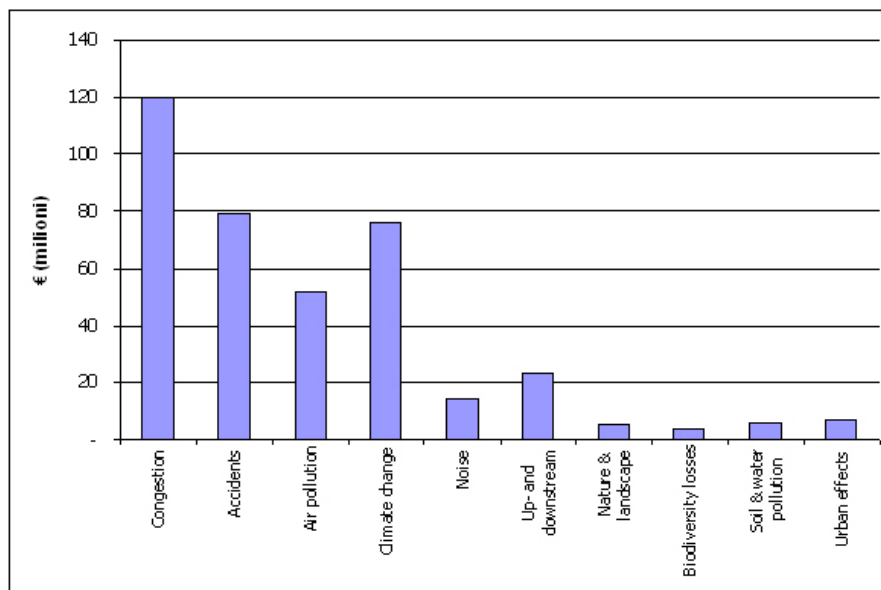
Taking into account congestion, and applying the values of average European deadweight loss and delay time⁴⁶ to the corridor, the overall cost increases, reaching a value that fluctuates between 458 and 386 million euros annually.

Table 4.2 Estimation of congestion costs

Congestion Cost	Min	Max	veKm	Max (mio €)	Min (mio €)
Delay costs	€ 0,233	€ 0,146	706.085.757	164,84	103,15
Deadweight Loss	€ 0,038	€ 0,024		26,58	16,66
TOTAL				€ 191,43	€ 119,81

In the following Figure, the external cost of all analysed impacts are shown, including congestion.

Figure 4.4 Distribution of external costs including congestion (minimum value)

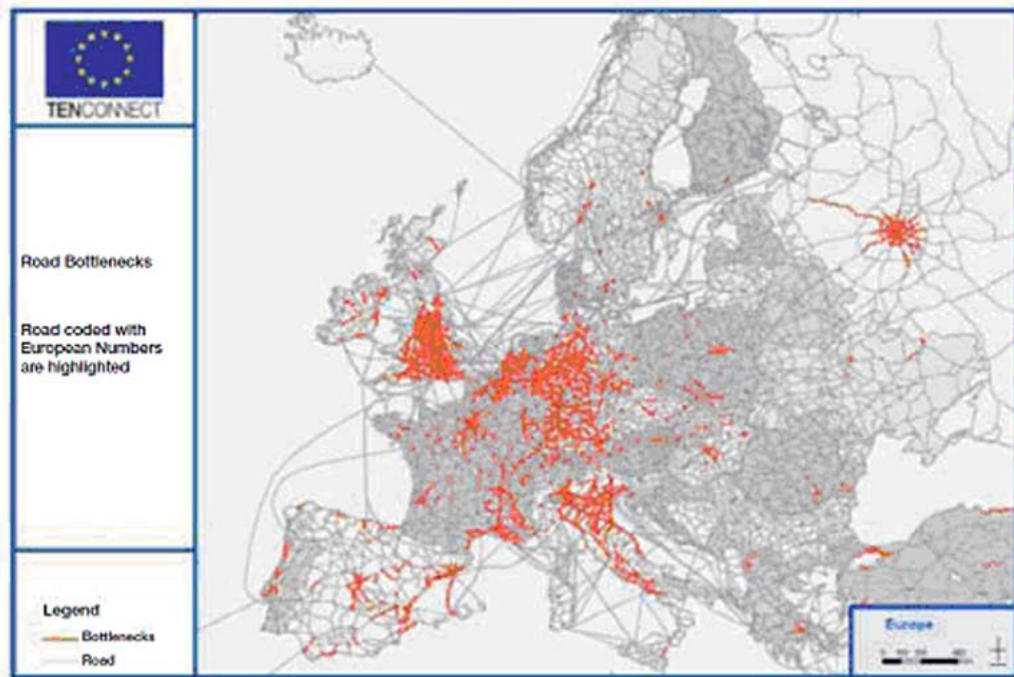


Source: Sustainable development foundation evaluation on UIC/ CE Delft, INFRAS, ISI data

The Corridor Genoa - Rotterdam crosses regions that are amongst the most densely populated and built up areas in Europe, all with extremely congested road networks. The impact of congestion is therefore more likely to be higher than the European average.

⁴⁶ Deadweight loss, in other words the loss of economic efficiency due to the equilibrium in service or goods market that is not an optimum pareto. With regards delay, measuring journey time is linked to infrastructure capacity, and to journey distance and transport type. On road such a relation is connected to LOS which meets a determined speed and a given journey time.

Figure 4.5 Road Bottlenecks in the European road network



Source: Freight vision (2009)

The shift of a traffic share by 2020 and by 2030 is similar to that identified for the estimate of potential reductions of emissions. It would provide the advantage of fewer external costs between rail and road transport⁴⁷, of around 110 million euros annually (2020 demand - external cost minimum -) and 268 million euros annually (2030 low demand - external cost maximum).

Table 4.3 Estimation of avoidable external costs

	2020	2030 (high)	2030 (low)
	mio euro	mio euro	mio euro
External costs (without congestion)	69,4	143,8	169,5
External costs with congestion (minimum)	40,4	83,8	98,7
External costs with congestion (maximum)	64,6	133,8	157,8
<i>Total (minimum)</i>	<i>109,8</i>	<i>227,6</i>	<i>268,2</i>
<i>Total (maximum)</i>	<i>134</i>	<i>277,6</i>	<i>327,3</i>

Source: Sustainable development foundation evaluation

This potential advantage only applies to road freight traffic to and from Italy, as already outlined in previous sections, one of the five main origins and destinations of the corridor.

⁴⁷ This advantage refers to external costs calculated for 2008 and will change with time. Confronting values of the same UIC study, which refer back to 2004, and 2008, the reduction of external costs is already visible due to many factors.

4.3. ADDITIONAL ADVANTAGES

As strongly reiterated, this study focuses on road freight traffic.

In reality, the TEN-T corridors are multimodal and intended as much for the transfer of goods as people. The necessary interventions for modal shift from road to rail apply to the shift of freight and to long distance journeys, but can also be applied to passenger traffic. Increasing the efficiency and effectiveness of rail freight transport and transferring consistent amounts of road freight transport to rail means not only reducing the impacts connected to this specific category of traffic, but also means significant improvements for passenger traffic, both road and rail. On one hand, these improvements provide the opportunity to free up road space, making road infrastructures less congested and more secure, on the other hand, an overall improvement of rail connections could also meet passenger demand.

Figure 4.6 Comparison of different participation rates in infrastructure



Source: UIC

This does not exclusively apply to medium and long distance road and air passenger traffic, but also short distance traffic, typically regional and in urban areas.

The location of the ten new TEN-T corridors along the main crossroads of European territory means that any improvement of these crossroads translates into an improvement of overall rail quality of the corridor and main urban areas crossed. This improvement can be taken advantage of to also transfer both goods and passengers from road to rail.

Looking at the Italian section of the Corridor, it is important to remember that not only do two of the main and most congested Italian rail crossroads (Genoa and particularly Milan) follow one after the other on the southern part of the corridor, but there is also a significant network of urban centres, on the same section, varying from large to medium size, which have the same bearing as major cities. Other than an increase in capacity, speeding-up railway lines would allow an increase in international relations, which could result in many passengers travelling by train instead of by plane from Italy to destinations such as Zurich, Basil, Strasburg, Stuttgart and Frankfurt. The combination of these advantages is what makes the Corridor Genoa-Rotterdam vital for Italy and Europe, strongly effecting competitiveness and overall sustainability of the national and European transport system.

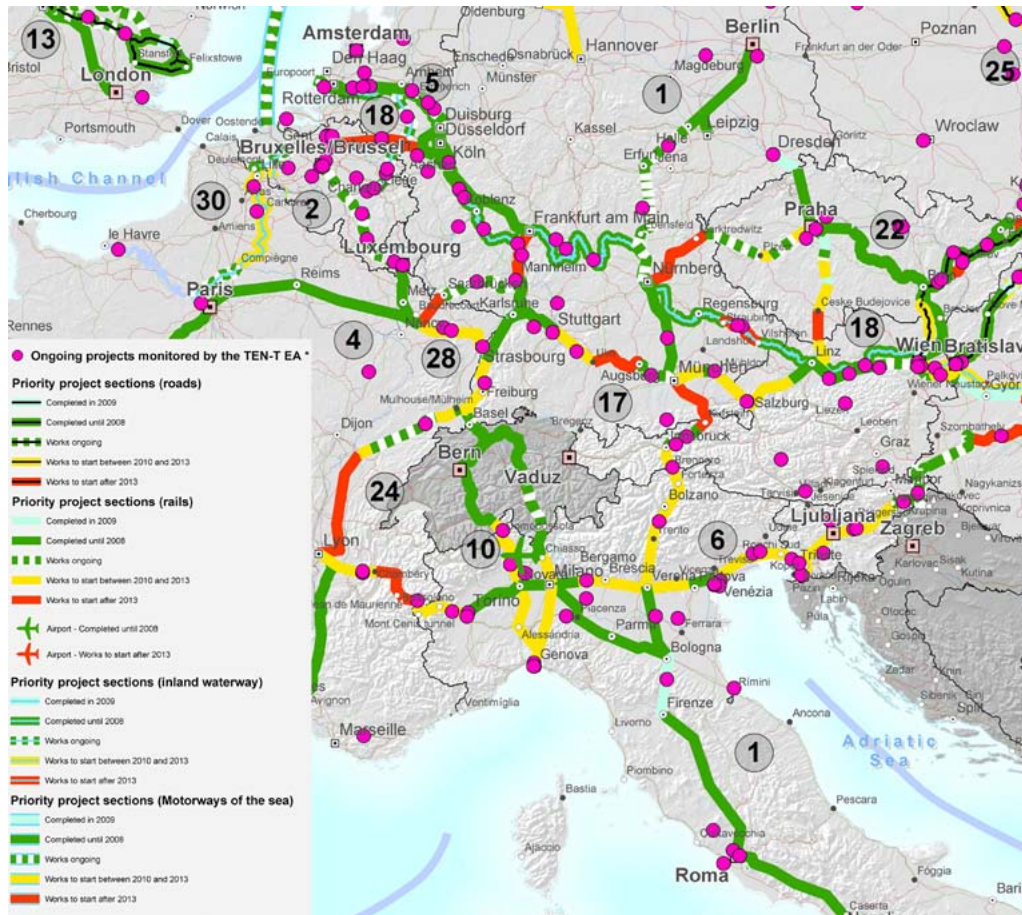
ATTACHMENTS

BIBLIOGRAPHY

ATTACHED - ITALIAN WORK ON THE CORRIDOR: CURRENT STATUS

What can be deduced from the consultation of documents supplied by the European Agency TEN-T, is that the quota for Italian work on the Corridor Genoa-Rotterdam is yet to be achieved.

Figure 4.7 TEN T map showing current status of projects updated 2012



Source: TEN T EA

The main works on the corridor are outlined in the 2007 – 2011 programme contract, with an estimated total investment of around 10 billion euros⁴⁸.

Data provided by OTI Nordovest⁴⁹ outlines how fundamental works toward the modernisation of the corridor have still not been given adequate financial support, or are partly delayed. The rail sectors most critical issues are those connected to the cover of relative costs of the construction of the high speed railway line ‘Tortona/Novi Ligure-’, which has become the most time consuming and problematic section of the Corridor Genoa – Rotterdam in Italian territory, due to operational complexities. The Gottardo, Chiasso – Seregno, and Seregno – Bergamo rail connections, known as Milan Gronda EST, which bypass the Milan (Lombardian state capital) rail crossroad, lack financing of around 2.3 billion euros⁵⁰.

⁴⁸ In attachment 7, PIR (prospectus networks) taken from RFI shows all the proposed interventions in 2011 instead.

⁴⁹ OTI Northwest is an observatory made up by Assolombarda, the Industrial Union of Turin, and the Genoese Confederation, with the aim of making monitoring of infrastructural work necessary to reinforce the transport system in the Northwest.

⁵⁰ From here the recent choice to intervene with the technological improvements on the Chiasso-Seregno-Monza-Milan line. The technical criteria adopted for this choice are shown in a recent contribution from S. Croce by RFI in a report called ‘Rail infrastructure between Italy and Switzerland’.

Table 4.4 Framework summary

	Current status	Start date	End date	Overall work costs (millions of euros)	Available finances (millions of euros)
RAILWAYS					
Genoa-Milan-Novara high speed railway (third Apennine crossing)	Definitive/ Executive project	May 2012	2020	6.200	1.720
Connecting railway at Gotthard: Northeast section (Seregno-Bergamo connection)	Preliminary project	2020	2030	1.000	83
Connection railway at Gotthard: Northeast section (four tracks Chiasso-Seregno)	Proposed/ planned	2020	2030	1.412	0
Milan-Mortara railway: improvement	Work in progress	February 2007		606	271
Novara - Malpensa-Seregno Railway: improvement	Work in progress	2005	December 2013	396	309
Genoa rail crossroad: improvement	Work in progress	February 2010	2016	622	622
INTERMODAL LOGISTICAL PLATFORMS					
Intermodal centre of Segrate: improvement of access conditions	Work in progress	2008	2014	179	179
Hub of Novara C.I.M. Spa: improvement	Definitive/ executive project	2002		108	37
PORTS					
Port of Genoa (improvement of operational areas)	Work in progress	2001	2019	218	218
Port of La Spezia (improvement of operation areas)	Contract in progress	2007	2016	57	57
Port of Savona (improvement of operation areas)	Work in progress	2010	2014	450	450

Source: OTI Nordovest

According to data from the OTI annual report, when it comes to strengthening operational capacities in Ligurian ports, there are several on-going issues connected to the morphologic organisation of the coast, as well as their positions in heavily built up urban areas. As a result, there are now very few areas that can be used for port logistics. To resolve this, reinforcement of railway lines along the corridor is vital, along which logistical platforms could be used as dry ports.

Improvement of terminal capacity and transfer time through improvements of existing terminals, and construction of additional terminals for combined, accompanied and non-accompanied transport, is also late.

An essential in-depth framework of current infrastructural equipment of the Corridor Genoa-Rotterdam in Italian territory, and the main problems that emerge from this analysis are also part of the Logistical plan 2011 in the report on the future of combined transport.

Regarding restrictions of current railway lines, the report has signalled the following important points:

- In the case of the St. Gotthard route and to a lesser extent the Simplon and Lotschberg passes, target limitations that could pose as a major obstacle to modal shift from road to rail have been noted.
- In the case of the Simplon and Lotschberg passes and the St. Gotthard route (via Luino and via Chiasso) the D4 (L) sanction that states that loaded wagons in the highest weight category be subjected to speed limitations.
- Although the standard European railway line can be used by trains of 750 metres, the trains that travel across Switzerland, via St. Gotthard, or Simplon/Lotschberg, due to restrictions, cannot exceed a length of 600 metres.
- Bottlenecks in the lines to and from St. Gotthard remain in trains from Monza to Chiasso because of reduced capacity.

In brief, in the case of the Simplon overpass, it is clear that the biggest restriction that affects the route is the weight maximum imposed on trains, and that target improvements should be focused on the section coming from Busto Arsizio. The biggest restrictions for Gotthard are the handicap of not being able to transfer semi-trailers on standard wagons, and its low potential compared to the Swiss section.

The current status of the Swiss section of the corridor, which is also summed up in the New Transalpine Railway (NFTA) programme, is relevant to the Italian section of the corridor. The Lotschberg route has been in service for 4 years, while it is predicted that the St. Gotthard basis tunnel on the St. Gotthard route will be opened in 2017, while the Monte Ceneri basis tunnel in 2019. Current reports on the current

status of works do not predict any delays in delivery dates and planned exercises.

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