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POLICY DEPARTMENT B: STRUCTURAL AND COHESION POLICIES

TRANSPORT AND TOURISM

UPDATE ON INVESTMENTS IN LARGE TEN-T PROJECTS

ANNEX

CASE STUDIES

Provisional version

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Abstract

This study updates the TEN-T investment study of early 2013 and adds five new case studies to the analysis, three of which deal with mega projects that are still in the planning or early implementation phase: Lyon-Turin, Iron-Rhine and S21/Stuttgart-Ulm. Findings confirm that not all stakeholders have learned past lessons on successfully developing projects. In particular, this concerns the need for early and transparent public participation and the necessity of a clear project definition prior to the project decision. New findings suggest that aspiring to measure wider economic benefits and European added value, respectively, seems to be a must to justify the socio-economic benefits of multibillion euro cross-border projects.

IP/B/TRAN/FWC/2010-006/Lot4/C1/SC7 2014

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LIST OF ABBREVIATIONS

AECOM	Consulting Company, Headquarters Los Angeles
ASTRA	Assessment of Transport Strategies, System Dynamics Model,
BBT	Brenner Base Tunnel
BBT SE	Brenner Base Tunnel Company
BCR	Benefit-cost ratio
BIM	Building Information Modelling (Implementatation Tool)
CBA	Cost-benefit analyis
CEF	Connecting Europe Facility
CF	Cohesion Fund
CIA	Climate Impact Assessment
CoR	Committee of the Regions
COWI	Consulting Company, Headquarters Copenhagen
CSF	Common Strategic Framework
CSIL	Centre for Industrial Studies, Research Institute, Milan
CSNE	Canal Seine Nord Europe
DEGES	Planning Company, Berlin
DG MOVE	Directorate-General Mobility and Transport
DG REGIO	Directorate-General Regional and Urban Policy
ECA	European Court of Auditors
EEIG	European Economic Interest Grouping
EERP	European Economic Recovery Plan
EIA	Environmental Impact Assessment

EIB	European Investment Bank
EIF	European Investment Fund
EIRR	Economic internal rate of return
ERDF	European Regional Development Fund
ERTMS	European Rail Traffic Management System
EVA-TREN	Improved decision-aid methods and tools to support evaluation of investment for transport and energy networks in Europe (research project)
FIRR	Financial internal rate of return
FS	Ferrovie dello Stato Italiane (Italian railway company)
GDP	Gross domestic product
GHG	Greenhouse Gas Emissions
GVA	Gross value added
HSR	High-speed rail
IASON	Integrated Appraisal of Spatial Economic and Network Effects of Transport Investments and Policies (research project)
IHS	Institut für höher Studien, Vienna
INEA	Innovation and Networks Executive Agency
INFRAS	Consulting Company, Zurich, Bern
IO	Input Output
IRR	Internal Rate of Return
ITS	Supporting Telecommunication Systems
IWW	Institut für Wirtschaftspolitik und Wirtschaftsforschung, Karlsruhe Institute of Technology
JV	Joint Venture

LTF	Lyon Turin Ferroviaire
MAP	Multi-annual programme
MoS	Motorways of the Sea
NEAT	Neue Eisenbahn-Alpen-Transversale
NPV	Net present value
NRLA	New Railway Link through the Alps
NUTS	Nomenclature of Territorial Units for Statistics (Eurostat)
OMEGA	Centre for Research on Large Transport Investment Projects. Bartlett School. University College. London
PP	Priority projects of TEN-T
PPP	Public-private partnership
SCGE	Spatial Computed General Equilibrium Models
SDR	Social Rate of Discount
SDM	System Dynamics Modelling
SEA	Strategic Environmental Assessment
SEITT	State Company for Land Transport Infrastructure
SNCF	Société Nationale des Chemins de Fer
TAV	Treno Alta Velocita
TEN	Trans-European Networks (communication, energy, transport)
TEN-STAC	Scenarios, Traffic Forecasts and Analysis of Corridors on the Trans-European Network (research and consultancy project)
TEN-T	Trans-European Transport Networks
TEN-T EA	TEN-T Executive Agency (has now become INEA)
TINA	Transport Infrastructure Needs Assessment

TIPMAC	Transport Infrastructure and Policy: A Macroeconomic Analysis for the EU (research project)
UIC	International Union of Railways
VDE	Verkehrsprojekte Deutsche Einheit
VOT	Value of time
WCML	West Coast Main Line

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ANNEX 1. BRENNER BASE TUNNEL (BBT)

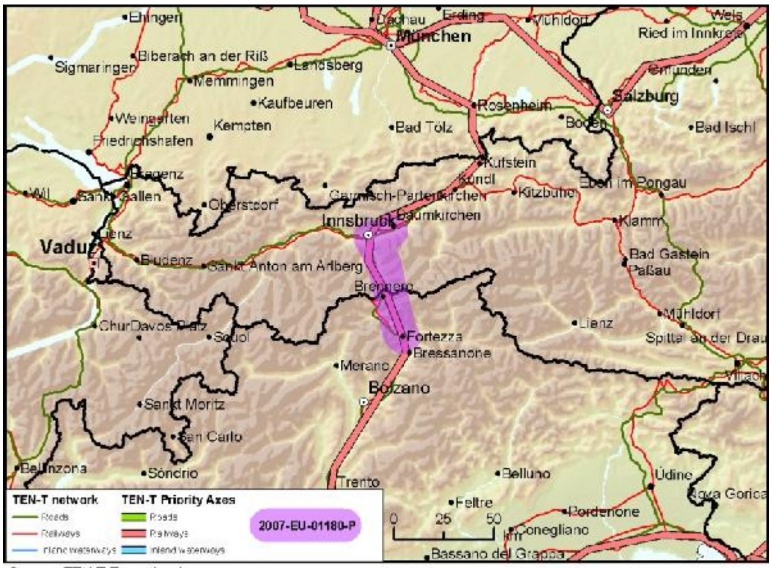
Table C1-1: Project summary of Brenner Base Tunnel (BBT)

Aspect	Description	Aspect	Description
Project Title	Brenner Base Tunnel	TEN-T code	2007-EU-01180-P
Countries / area	Austria, Italy	Start date	April 2011
Mode(s)	Rail	End date	December 2013 (present phase) ; 2022 (total project)
Managing authority	Brenner Basistunnel BBT SE - Galleria di Base del Brennero	Duration	11 years
		Delay (mth)	
Included in TEN-T	Part of Essen projects (1994) Also part of priority projects (2004)	TEN-T element	Core network
Investment cost (m€)	2,195 (2007-2013) 7,460 as of 1 January 2010 (total project with tunnel and access links) 8,062 including a total risk reserve of 1,144	Length (km)	64
EC funding TEN-T (m€)	From 2007-2013 budget, extended to 2015: Studies: 193 + 85 Works: originally 593, reduced after mid-term review to 151 and increased in 2013 to 168	EC share	Studies (inc. exploration and access tunnels): 50%; Works: 30%
EC funding Cohesion (m€)	d.n.a.	EC share	d.n.a.
Funding agent 1	National budget – Austria	Value (m€)	801.2 (2007-2013)
Funding agent 2	National budget - Italy	Value (m€)	801.2 (2007-2013)
Cost-benefit-analysis	Ernst & Young Financial Business Advisors S.p.A: Brenner Basis Tunnel Project Cost Benefit Analysis, July 2007.	CBA ratio	Social discount rates :0%;2.5%;8% EBC ratio: 4.2; 1.9; 0.5 ENPV: bn€11.147; bn€2.435; bn€1.000 EIRR: 4.7%
		Public y/n	Y
Transport scenario	Traffic forecast by ProgTrans	Dated from	2007
Externalities covered	Environmental damage costs produced by air pollution, climate change, electromagnetic fields, road accident costs, noise costs, congestion costs	External cost savings (m€)	2030: 97.5 2050: 190.3

Aspect	Description	Aspect	Description
EIA	TAE Consulting/ILF: Non-technical summary of the environmental impact assessment, 10.6.2003 - Noise, vibration, air and public health - Geology, surface water and groundwater - Landscape - Ecosystems, vegetation, agriculture and fauna.	Public y/n	Y
CIA	None	Public y/n	
Financial analysis	Not available	Expected RoI	Not available
Ex-post evaluation	d.n.a.	Cost overrun (m€)	d.n.a.

Source: own analysis.

Figure C1-1: Location of the Brenner Base Tunnel Project



Source: TEN-T Executive Agency

"The Brenner Base Tunnel is the centrepiece of Priority Project 1, the railway axis Berlin-Verona/Milano-Bologna-Napoli-Messina-Palermo. This project foresees the construction of two low-gradient parallel tunnels envisaged mainly for the transport of heavy goods across the Alps. It will run for 55 km from Innsbruck (in Austria) to Franzensfeste/ Fortezza (in Italy). Adding the existing Innsbruck railway bypass the entire tunnel through the Alps will be 64 km long, the longest underground rail link in the world. The cross-border tunnel across the Alps will remove a major bottleneck in an environmentally sensitive area, shifting heavy traffic from road to a high-quality rail service."[1]

1.1. Methodology and remarks on CBA and project selection

A first Cost-Benefit Analysis of the Brenner Base Tunnel project was conducted in 2004 by external consultants Ernst & Young (report not available), followed by an update in 2007 (report publicly available), taking on board new traffic forecasts by ProgTrans (also publicly available). The methodology of the CBA followed the guidelines set up by the European Commission and, specifically for railway projects, by the European Investment Bank (RAILPAG). The CBA covered 68 years containing the planning and construction period as

[1] Trans-European Transport Network Executive Agency. Online: http://tentea.ec.europa.eu/en/ten-t_projects/ten-t_projects_by_country/multi_country/2007-eu-01180-p.htm (21.11.2012).

well as the concession period (2021-2070).[2] The procedure quantifies the increase of general welfare in terms of "social surplus", defined as the sum of

- "consumer surplus"
- "producer surplus" and
- savings of external costs

As external costs were included in the CBA:

- Environmental costs (e.g. damage produced by air pollution, climate change, electromagnetic fields, etc)
- Road accident costs
- Noise costs
- Traffic congestion costs[3,4]

The CBA resulted in an economic internal rate of return of the project of 4.73%, with a total financial investment cost of EUR 6 billion, converted to an economic investment cost of EUR 3.44 billion. In a sensitivity test, assuming 25% higher construction costs, the EIRR drops to 3.91%.

While the methodology used for the CBA can be qualified as state-of-the-art, the analysis was conducted prior to the financial and economic crisis and hence with a brighter economic outlook than that of today.

The project was not selected on the basis of a CBA ranking in either of the two countries. Its importance for strengthening the Berlin-Verona transport axis justified the inclusion into TEN-T priority project n°1.

1.2. Methodology and remarks on environmental analysis

In the framework of the BBT Project various EIAs were carried out. The following elements have been investigated in the environmental impact analysis:

- noise, vibration, air and public health
- geology, surface water and groundwater with an open design and in the construction areas
- landscape
- ecosystems, vegetation, agriculture and fauna[5]

The methods which have been used by conducting the EIAs were all in line with the existing EU legislation.

[2] Ernst&Young (2007): Brenner Base Tunnel Project, Cost-Benefit Analysis, p. 3.
[3] Congestion costs are often mistaken as external costs which they are not in a strict sense.
[4] Ibidem.
[5] BBT SE (2003): Non-technical Summary of the Environmental Impact Assessment of the Project (June 2003) 42.

1.3. Characteristics of the transport demand scenario and its economic drivers

In 2005 the Swiss transport consultancy ProgTrans AG developed and updated the traffic forecast concerning the Brenner axis. In 2007 an update followed and contained a traffic forecast which was developed with a multimodal transport network model covering the transalpine traffic-related origin-destination relationships of all European Union countries plus Switzerland and Norway. Six traffic forecast scenarios were defined for freight transport:

Table C1-2: Brenner traffic forecast 2004-2030 under six scenarios (million tonnes)

	Basis Trend		Trend		Minimum		Distortion		Worstcase		Consensus	
Year	Road	Rail	Road	Rail	Road	Rail	Road	Rail	Road	Rail	Road	Rail
2004	31.5	10.7	31.5	10.7	31.5	10.7	31.5	10.7	31.5	10.7	31.5	10.7
2015	43.9	14.9	38.8	14.9	38.9	14.9	38.8	19.8	38.9	19.8	31.9	14.9
2020	47.3	20.8	41.8	21.6	41.8	16.6	41.8	27.6	41.7	22.0	31.8	22.6
2025	50.6	28.1	44.7	30.2	44.9	18.4	44.5	37.6	44.7	24.5	30.9	32.3
2030	54.2	31.8	47.8	33.2	47.2	19.5	45.8	49.1	48.0	27.0	30.9	36.2

Source: ProgTrans (2007): Brenner Basis Tunnel. Aktualisierung Verkehrsprognose. Schlussbericht, p. 197.

The basis of the traffic forecast covered socio-economic and policy drivers at an appropriate level and at sufficient geographical differentiation:

- Population (inhabitants, age structure, driving licence ownership)
- Economy (GDP, domestic demand, foreign trade (exports, imports), private consumption)
- Transport policy (market regulation, prices and taxes, infrastructure and supply-side policy)
- Logistics (shippers' requirements, organisation)
- Mobility behaviour

The second step performed for the update and expansion of traffic forecasts for the Brenner Base Tunnel was the estimation of transport demand in the form of origin-destination matrices at NUTS 3 level (Alpine region), NUTS 2 level (Austria, Italy, Germany, France and Switzerland) and for the rest of Europe at NUTS 0 level. This is based on current and expected socio-economic developments of national economies and of individual sectors (see above). The predicted demand matrices were assigned to the forecast road and rail networks.

A so far unpublished update of the traffic forecast on the Brenner axis was also prepared in October 2012, taking account of the most recent, crisis-reflecting long-term socio-economic forecasts.

1.4. Investment cost and structure of financing

The European Joint-Stock Company "Brenner Basistunnel BBT SE" was founded on December 16th 2004 with a shareholders' agreement between Austria, Tyrol and RFI (Rete Ferroviaria Italiana) as the successor company of the EEIG Brenner Base Tunnel. The main task for the BBT SE lies in the planning and construction of the tunnel and the development of the financing model as well as the grant details of the operational license. The State Treaty signed in Salzburg on the 30th of April 2004 laid down the legal framework. Originally, 50% of the company shares were owned by RFI and 25% respectively by the Austrian Republic and the Land Tyrol. In April 2011 the share distribution was as follows: Austria: 50% ÖBB Infrastructure; Italy: 50% TFB (of which RFI: 84.98%, Autonomous Province of Bolzano; 6.22% Autonomous Province of Trento: 6.22% and Province of Verona 2.58%.[6]

Due to the fact that the financial engineering has not yet been finalised we will have a closer look at recent cost updates. The most recent one of 2010 put total financial investment costs of the global Brenner Base Tunnel project at EUR 7.46 billion (in prices of 1 January 2010) with the following break down:

- Basic structure 65%
- Outfitting and Equipment 15%
- Management and land acquisition 12.5%
- Provision for risks 7.5%

Including a total risk allocation of EUR 1.144 billion, total investment costs were tabled at EUR 8.062 billion. This risk allocation reflects the specific requirements of the Austrian ÖGG directive.[7]

The basic structure of financing this large-scale project is quite simple: By following the ÖBB internal manual and ÖGG directives and the European legislation the European Commission formally guaranteed a very high level of support for TEN-T priority project n°1, with a grant of up to 20% of works. Austria and Italy will equally share the remaining costs. However, Austria and Italy hope that the EU will shoulder one third of the entire costs for the construction of the Brenner Base Tunnel.[8]

Concerning the financial return on investment for the entire Brenner Base Tunnel project we cannot be very precise because this does not appear in the documents available for our analysis. However, as the funding is entirely public, the economic internal rate of return is the more appropriate indicator for the viability of the project.

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6 Bergmeister (2011): Brenner Basistunnel, p. 174.

7 Österreichische Gesellschaft für Geomechanik (ÖGG): Richtlinie Kostenermittlung für Projekte der Verkehrsinfrastruktur unter Berücksichtigung relevanter Projektrisiken.

8 Bergmeister (2011): Brenner Base Tunnel, 110-111.

1.5. Cost developments over the life-cycle of the project

During the implementation phase the following finance planning has been based on the report of the European Coordinator Pat Cox, in charge of the Brenner project.
The financial framework for the period of 2007-2013 the TEN-T budget focused on the cross-border sections and bottlenecks of the priority project n°1. In total EUR 960 million have been committed to the project, of which EUR 786 million are for the Brenner Base Tunnel. The financial commitment was always based on decisions made by the European Commission in 2008.

In the context of Priority Project No. 1 five decisions were made by the European Commission of which two concerned the Brenner case. The decisions covered the studies and the works on the tunnel and the covering finances. The European Commission supported the studies with EUR 193 million (for the period 2010-2013) with a co-financing rate of 50% and, with a commitment of EUR 593 million, it supported the works in the actual tunnel of roughly EUR 2.2 billion, with a co-financing rate of 27% (C(2008)7723, dated 5/12/2008)[9].

These finances were confirmed once again in the most recent European Coordinators' report of 2011. The studies on the Brenner Base Tunnel served to assess the risks, costs and duration of the construction of the tunnel. The EU contribution remains at EUR 193 million. Concerning the works on the Brenner Base Tunnel the amount of EUR 593 million has been reduced to EUR 151.4 million after the mid-term review had revealed that the planned works could by no means be implemented within the programming period. The reduced investment amount of EUR 560.7 million justified an EU contribution of EUR 151.4 million (C(2012)8560, dated 19 November 2011).

1.6. Developments since the last study

Because of delays in the decision taking process, construction performance was much lower than expected. Consequently, after the mid-term review the European Commission reduced the TEN-T budget approved in 2008 from EUR 593 million to EUR 151 million. Subsequently, by implementing the decision of August 21, 2013, [C(2013 5399 final)[10] the Commission approved two TEN-T financing applications by BBT SE and two applications for studies for the Northern and Southern access lines to the Brenner. The two financing schemes for the Brenner Base Tunnel are:

1. Study programme of EUR 171.3 million with a 50% TEN-T financial support of EUR 85.65 million (2012-EU-01098-S). INEA explains that "This project covers the excavation of the exploratory tunnels from several fronts. The studies will serve to assess the costs and duration of the construction, as well as to assess more accurately the risks of the overall project."[11] The term "study" has in this case a wider sense than is usually understood by this term.

2. Works programme of EUR 558.9 million with a 3% TEN-T financial support of EUR 17.8 million (2012-EU-01099-P), increasing the total TEN-T financial support from

[9] Pat Cox (2010): TEN-T Trans-European Transport Networks. Annual Activity Report 2009-2010 for PP1. Railway axis Berlin-Verona/Milano-Bologna-Napoli-Messina-Palermo, Brussels.

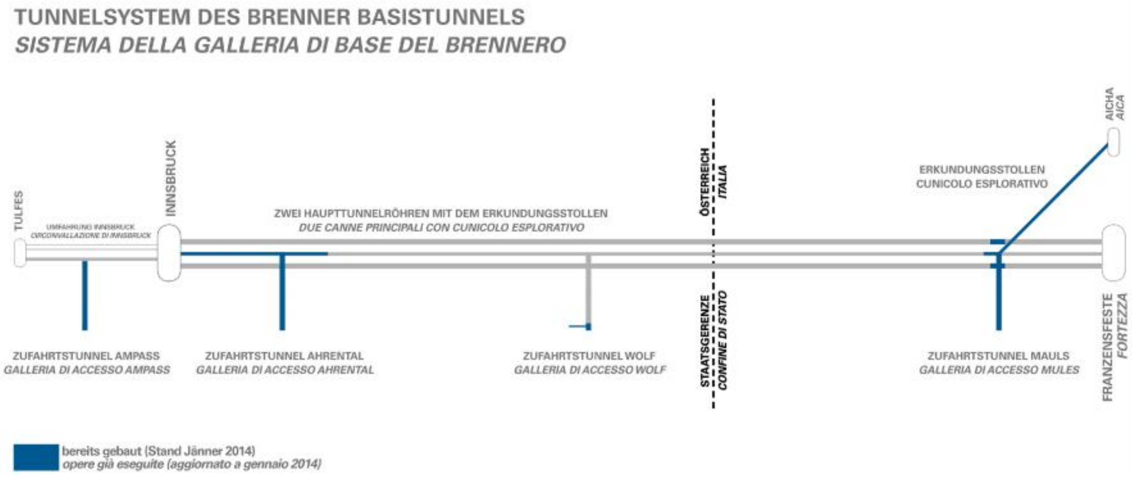
[10] http://ec.europa.eu/transport/themes/infrastructure/ten-t-funding-and-financing/doc/c_2013_5399.pdf

[11] http://inea.ec.europa.eu/en/ten-t/ten-t_projects/ten-t_projects_by_country/multi_country/2012-eu-01098-s.htm

27 to 30% of works, i.e. from EUR 151 million to EUR 168 million, to be disbursed by 2015 (C(20139147, dated 9/15/2013).

In view of serious budgetary limitations in both Austria and Italy, progress is slower than planned. The actual status of works including access and exploration tunnels is shown in Figure C1-2 below. As of January 2014, the sectors marked in blue in the graph below have been built. These are essentially exploration and access tunnels of only 1.4 km of length.

Figure C1-2: Status of works



Source: BBT SE.

The only comment received in response to the first description and analysis of the Brenner Basis Tunnel one year ago was from the Greens/EFA in the European Parliament[12]. Two points were specifically mentioned[13]:

1. The Brenner project is too expensive: "one train every two minutes would have to pass to amortise the investment";
2. Planning for the access routes in Germany and Italy has not even started.

Ad (1): We are not in a position to comment on the financial implications of the Brenner project as detailed information neither on up-to-date traffic forecasts nor on costs and revenues are publicly available.

Ad (2): The timely implementation of upgrading or in part newly constructing the Northern and Southern access routes is of major concern to the parties, i.e. the Austrian, German and Italian governments as well as the EU Co-ordinator. Studies are planned with TEN-T support financing and are in part underway. Whether the 12 years until the planned opening of the Brenner Base Tunnel are sufficient to implement all works on the access routes is largely a question of available funding.

[12] We have submitted the Brenner appendix of our first report of January 2012 to BBT SE for comments but have received none.

[13] See also: Trouble Spot: Brenner Base Tunnel: http://www.green-ten-t.eu/core-networks/corridor-5/brenner-base-tunnel/, last visited on 14 February 2014.

1.7. Conclusions

Our conclusions are essentially the same as in our first report:

- The main activities at present are the construction of exploratory tunnels in a geologically difficult environment.
- The financial investment costs for the Brenner project were occasionally reviewed and adjusted. The two most recent and major revisions took place in 2006 and 2010.
- Traffic forecasts were carried out and revised occasionally. The latest one was carried out in autumn 2012 but has not yet been released.
- A CBA was performed in 2004 and updated in 2007, before the financial and economic crisis. The CBA of 2007 is the only one available. A financial analysis is not publicly available. Therefore, it is not possible to judge the impact of the economic crisis of recent years on the economic and financial viability of the project.
- Environmental studies followed EU regulations.
- All in all, assessment studies are in line with European legislation; a separate Climate Impact Assessment is not legally required and has not been undertaken so far.

Progress has been slow although the project was already on the list of the 14 “Essen” projects and heavyweight political co-ordinators Karel Van Miert and Pat Cox have accompanied the process over more than a decade. Institutional and financing problems are delaying the planning and exploration process. Under the new TEN-T concept, the Brenner corridor (Munich – Verona) is part of the Scandinavian – Mediterranean Core Network Corridor N°5 (Helsinki/Finland – Valletta/Malta). Such strategic large-scale projects as the Fehmarn Belt Fixed Link and a bridge across the Straight of Messina, the latter being cancelled for the time being, also belong to this Corridor. At this point in time it remains to be seen how the implementation of the longest TEN-T core network corridor will be managed with an EU co-ordination team.

Appendix 1: Chronology

1971: The idea of a tunnel at the Brenner was revived. The International Union of Railways (UIC) commissioned a study on a new Brenner railway line with a base tunnel. By 1989 three feasibility studies had been drawn up which formed the basis for further planning of the Brenner Base Tunnel.

1994: The European Union included the Berlin-Naples corridor in the list of 14 priority projects. The European Council declared during a meeting in Essen that the Brenner Axis becomes project n° 1 on the list of TEN-T Priority Projects. The Priority Project Brenner Base Tunnel is hence one of the most important projects the European Council adopted in the context of the Trans-European Transport Networks.

1999: The BBT EWIV (Brenner Basistunnel Europäische Wirtschaftliche Interessenvereinigung – European Economic Interest Grouping EEIG) with Brenner Eisenbahn GmbH (BEG), working in Austria, and the Italian railway company Ferrovie dello Stato was founded with the goal of developing the preliminary project (geological survey and definition of the route).[14]

2001: White Book of the European Commission: TEN-Projects, with 14 priority projects, including the Brenner Base Tunnel. The European Commission formally guaranteed a very high level of support for priority project 1, assigning it 20% of the budget.

2003: Common declaration of the Austrian and Italian Ministers for Infrastructure and Transportation.

2004: Austria and Italy signed a State Treaty to build the Brenner Base Tunnel. In that same year, what is today the BBT SE, was established. Decision No. 884/2004/EG of the European Parliament and of the Council to modify Decision No. 1692/96/EG: the build-up of a trans-European transportation network priority Projects to be begun before 2010; TEN – Axis No.1: Berlin-Verona/Milan-Bologna-Naples-Messina-Palermo with the Brenner Base Tunnel.

2005: The phase for beginning the exploratory tunnel programme began.

2007: Establishment of the Brenner Corridor Platform under the coordination of Karel Van Miert with BBT SE and including the appropriate Ministries of Germany, Austria, Italy, the regions of Bavaria, Tyrol, the provinces of Bolzano, Trentino and Verona and the three railway companies DB, ÖBB with BEG and RFI.

2008: Completion of the final project and of the project documentation for the declaration of environmental compatibility and submission of same in Austria and Italy.

2009: Financial Approval for the infrastructure program including the Brenner Base Tunnel by the Austrian Parliament and Bundesrat.

2010: The Inter-Ministerial Committee for Economic Planning (CIPE) approves financing for the Brenner Base Tunnel in Italy.

2011: the EU approved, up to 2013, TEN-T funds amounting to EUR 592.65 million, i.e. 27%. The hope is that the EU will shoulder one third of the entire costs for the construction of the Brenner Base Tunnel and that Austria and Italy will equally share half of the rest.[15]

[14] Konrad Bergmeister (2011): Brenner Basistunnel, 49-50.

[15] http://www.bbt-se.com/en/project/history/ (09.11.2012).

Appendix 2: References

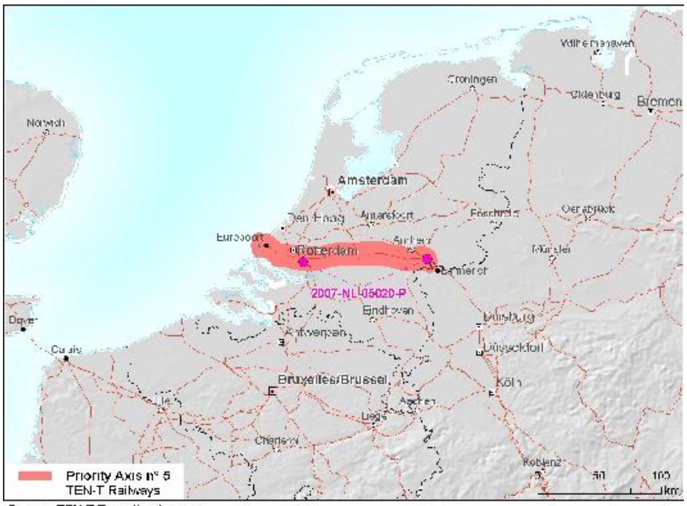
Year	Type	Title
2013	General	Pat Cox (2013): Annual activity report 2012-2013 for Priority Project 1 Railway axis Berlin-Verona/Milano-Bologna-Napoli-Messina-Palermo, Brussels
2012	Traffic	ProgTrans AG (2012): Betriebs- und volkswirtschaftliche Analyse der Betriebsphase des Brenner Basistunnels, Wirtschaftsforschungsinstitut Handels-, Industrie-, Handwerks- und Landwirtschaftskammer Bozen Abschlussdokumentation 24. Oktober 2012. (not published)
2012	General	http://www.bbt-se.com/en/project/history/ (08.11.2012)
2012	General/Financial	Trans-European Transport Network Executive Agency. Online : http://tentea.ec.europa.eu/en/ten-t_projects/ten-t_projects_by_country/multi_country/2007-eu-01180-p.htm (21.11.2012)
2011	General	Konrad Bergmeister: Brenner Base Tunnel: Project Status, in: Tunnel 2/2011, pp. 18-30
2011	General	Konrad Bergmeister (2011) : Brenner Base Tunnel, BBT SE, Innsbruck/Bozen.
2010	General	Brenner Base Tunnel: Stage reached by Construction: http://www.tunnel-Online.info/en/artikel/tunnel_tunnel_1_10_Brenner_Base_Tunnel_Stage_reached_by_Construction_827869.html (06.12.2012).
2010	General	Pat Cox (2010): TEN-T Trans-European Transport Networks. Annual Activity Report 2009-2010 for Priority Project 1 Railway axis Berlin-Verona/Milano-Bologna-Napoli-Messina-Palermo, Brussels
2007	CBA	Enrst & Young: Brenner Basis Tunnel BBT SE. Brenner Basis Tunnel Project Cost Benefit Analysis, July 2007.
2007	Traffic	Aktualisierung der Personen- und Güterverkehrsprognose für den Brenner 2015 und 2025 (2007).
2005	General	Österreichische Gesellschaft für Geomechanik (ÖGG): Richtlinie Kostenermittlung für Projekte der Verkehrsinfrastruktur unter Berücksichtigung relevanter Projektrisiken
2003	Environment	Brenner Base Tunnel SE: Non-technical Summary of the Environmental Impact Assessment of the Project, June 2003.

ANNEX 2. BETUWE LINE FOR RAIL FREIGHT

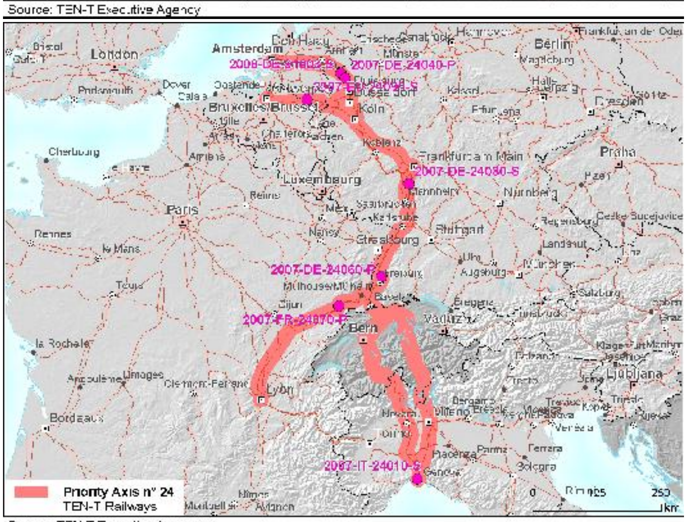
Table C2-1: Project summary Betuwe Line for rail freight

Aspect	Description	Aspect	Description
Project Title	Dedicated rail freight line to link Port of Rotterdam with the Dutch-German border	TEN-T code	PP 5 TENtec: 0500
Countries / area	The Netherlands (NL) plus cross-border section to Germany (NL-DE)	Start date	1998 (1997)
Mode(s)	Rail	End date	2008 (2007)
Managing authority	ProRail B.V. (The Netherlands) DB Projektbau GmbH (Germany)	Duration	10 years
		Delay (mth)	24-36
Included in TEN-T	Essen projects in 1994, also PP5 in 2004	TEN-T element	Core network
Investment cost (m€)	4 705	Length (km)	160 km
EC funding TEN-T (m€)	197	EC share	~ 4.2%
Funding 1	NL state budget	Value (m€)	4 404
Funding 2	NL regional budget	Value (m€)	8
Funding 3	Other sources	Value (m€)	97
Cost-benefit-analysis	Missing Simplified estimations of payback period	CBA ratio	
		Public y/n	Y
Transport scenario	Dutch rail operator	Dated from	1991
Externality covered	Missing	Ext. cost (m€)	
EIA	Air pollution (further aspects influenced route design)	Public y/n	(Y) Ex-post : Y
CIA	Missing	Public y/n	
Financial analysis	Knight Wendling 1992 CPB 1993	Payback	10-20 yr
		FIRR	
Ex-post evaluation	Ex-post EIA available since 2013 Ex-post socio-economic analysis lacking	Cost overrun (m€)	984 (27%)

Source: budget figures from TENtec Information System 2012, m€ = million Euro, own analysis.



Source: TEN-T Executive Agency



Source: TEN-T Executive Agency

The BETUWE line is a newly constructed railway line dedicated to rail freight, only. It connects the Dutch Port of Rotterdam with the Dutch-German border by a new 160 km long double track rail line.
The border crossing is located between Zevenaar (Netherlands) and Emmerich (Germany). A full exploitation of the potential to carry rail freight requires that the connections on the German side from Emmerich to Oberhausen are developed as well.

The BETUWE line itself being Priority Project 5 (PP5) of the TEN-T as defined in 2004, constitutes also an element of the larger Priority Project 24 (PP24) running from Rotterdam to Genua (Genua-Basel-Duisburg-Rotterdam) with branches from/to Lyon and Antwerp. Further the line is an element of European rail freight corridor A Rotterdam-Genua to be equipped with the European Rail Traffic Management System (ERTMS).

The initial impulse to build the Betuwe line seemed to come from a master plan for the future of the Port of Rotterdam in 1985, which instead of closing down the existing parts of the line suggested to renew/build it as a dedicated rail freight line (see e.g. Pestmann 2001, Vrijland 2004). In 1990 the Dutch government recognized the strategic importance of a modernization of the Betuwe line. The cost estimate for its construction was EUR 1.5 billion, expecting a demand of 50 million tons for the year 2010. After an initial approval of the project by government the project development was stopped by a change of the governing parties. However, the so-called Hermans Commission recommended to continue the project (Hermans et al. 1995), such that in 1995 the new government took the decision to implement the project at a cost of EUR 3.67 billion, of which 20% should be sourced from private investors. In 1996 the track plan was fixed and construction of the new sections of the Betuwe line started in 1998. Nevertheless, in 2000 the Netherlands Court of Audit stated “that a sound and comprehensive cost/benefit analysis of the Betuwe Route is missing.” (quoted after Vrijland 2004, p.4). At least since the beginning of construction there has been intense debate in the public in The Netherlands about the usefulness and the cost of the Betuwe line. The whole process was debated in parliament based on a 455 pages report describing in accurate detail how the decision on the Betuwe line was actually taken (TCI 2004).

In 2007 the Betuwe line was completed and started operations. Five tunnels with a length of 18 km had finally been built, 190 animal passages, 130 bridges and 95 km of the 160 km track were implemented in parallel to the A15 motorway to mitigate environmental and health impacts. The Betuwe Line is designed for a capacity of 10 trains per hour per direction. Between 2008 and 2011 KeyRail, the operator of the Betuwe line, reports about a quadrupling of demand reaching a level of 500 trains per weak in 2011 and having a long-term target to run 900 trains per week (Keyrail 2011).

Despite core infrastructure of the Betuwe line was completed in 2007 further EU funding is provided in the following years to both The Netherlands and Germany e.g. to extend the line to Maasvlakte West, to retrofit locomotives with ERTMS, to install ERTMS or to plan for a third track in the border crossing sections, such that actually total cost of the project still increase.

Despite the joint Dutch-German agreement about the construction of the Betuwe Line in 1992 (Agreement from Warnemünde) the progress on the German side for the 72 km of track connecting Emmerich at the border with Oberhausen has been very limited. In 2002 the Federal State and the State of North-Rhine Westfalia reached an agreement that the Federal State would pay for 64% of the infrastructure cost (at that time estimated to be EUR 895 million). The project has been divided into 12 sections, for which as of end of 2012 the first sections are undergoing the process of plan approval procedure, including public participation. The proposed plans foresee e.g. 47 km of new track, 74 km of noise protection walls and the replacement of 55 level crossings by 38 new/adapted bridges (DB Projektbau 2011, 2012). Mid 2013 the cost of these investments are estimated at EUR 1.5 billion and an agreement was achieved that the German Federal State would cover EUR 746 million, the Lander of Northrhine-Westfalia EUR 450 million. DB would cover a large share of the remaining investment (Tenta 2013). At the end of 2013 for all 12 sections the plan approval process has been started. However, it is expected that construction would start in 2015 and the completion of the project is expected for 2022, some 30 years after the Agreement from Warnemünde.

2.1. Methodology and remarks on CBA and project selection

The first assessment of the benefit and cost of the Betuwe line in 1992 concluded that the line would pay back the investment of EUR 2.36 million by the year 2000 and if the line had not been built until 2010 the state would face a loss of potential tax revenues of EUR 5.4 billion (Koetse/Rouwendal 2010 quoting Knight Wendling 1992). This result was obtained using a transport forecast consisting of two scenarios, a baseline and an ambitious scenario that assumed the Betuwe line was part of the ambitious scenario without actually simulating the impact of the Betuwe line. Rather the increase of freight rail demand was taken as given in this “CBA”. The TCI report notes about the two rail freight scenarios that it remains unclear how the different forecasts of 40 million t (baseline scenario) and 65 million t (ambitious scenario) have been estimated (TCI 2004, p. 43). Surprisingly the first assessments did either not take into account the environmental benefits of a rail freight line or did conclude that it would bring about very limited environmental benefits such that they could be ignored (Koetse/Rouwendal 2010, p. 9).

The Central Planning Bureau (CPB) also undertook economic analyses of the Betuwe Line. Interestingly the studies in 1993 (CPB 1993) and 1995 (CPB 1995) concluded rather the opposite. The earlier study estimated a payback period of 15 to 20 years. They were also building on the Knight Wendling studies of 1991/1992. The later study concluded that there might have been more beneficial projects than a new Betuwe Line and recommended a phased approach, i.e. start building profitable sections first (e.g. close to the Port of Rotterdam) and then assess again, which other sections would become beneficial (CPB 1995).

However, these assessments were incomplete (e.g. did not apply a proper transport forecast or did not build on a sufficiently detailed cost assessment as the project was not sufficiently specified) such that the Netherlands Court of Audit in the year 2000 still stated "that a sound and comprehensive cost/benefit analysis of the Betuwe Route is missing." (quoted after Vrijland 2004, p.4).

Some discussions about alternatives took place, e.g. to build the whole track in a tunnel or to improve inland waterway transport instead. However, Priemus (2007) argues that these alternatives to the Betuwe line have never been seriously considered by the government, though he acknowledges that various engineering variants of a rail track have been analysed in 1993. Actually the Betuwe line as it has finally been build can be understood as an alternative selection to the very first plans, which had been to renew the existing single track. Instead, most of the track was completely new constructed, which explains a significant part of cost differences in comparison to the very first cost estimates of 1990.

2.2. Methodology and remarks on environmental analysis

The environmental impact analysis concentrated on the emissions of air pollutants (e.g. CO, NOx), while issues like noise, safety or land use have been neglected. Thus the Netherland Court of Auditors concluded that "Decisions were made on the assumption that the Betuwe Line was strategically important to the economy and environment. Little priority was given to finding policy information to support that assumption." (Algemene Rekenkamer 2000).

However, the basic decision to build a new track instead of renewing the old track passing through 15 villages indicates that environmental and health concerns associated with settlements have been taken into consideration. Vrijland also reports that noise reduction plans and safety measures have been implemented to take such concerns into account (Vrijland 2004). In that sense, Vrijland also questions the findings of the Netherland Court of Auditors. At the end of 2012 an ex-post EIA was published confirming that the Betuwe line in general complied with environmental regulation. However, it was concluded that concerning noise/vibration 27 houses are affected above the legal limits (Moraves 2012).

2.3. Characteristic of the transport demand scenario and its economic drivers

The transport demand scenario underpinning the economic analyses of the Betuwe Line project seems to be the most flawed aspect of the whole assessment, at least during the 1990ies. Table C2-2 presents the transport forecast as it was used from the earliest assessment by Knight Wendling onwards in assessments of the Betuwe Line. The important number is the difference between 40 and 65 million tons of rail freight in 2010. This covered the whole rail freight and was not specifically estimated testing specifications of the Betuwe Line. Nevertheless, it seems that this general growth was proportionally assigned to the improved Betuwe Line to estimate benefit figures. However, Koetse/Rouwendal conclude that "an independent assessment that investigated the demand for freight transport over the Betuweroute under particular conditions of price and quality was never conducted." (Koetse/Rouwendal 2010, p.59).

Table C2-2: Transport demand scenario underpinning the Betuwe Line decision Dutch freight demand in [million t]

Scenario / Mode	1987	2000	2010
Baseline scenario			
Road	456	600	749
Rail	18	32	40
Waterway	234	288	317
Total	707	920	1 106
Ambitious rail scenario			
Road	455	581	715
Rail	18	48	65
Waterway	234	291	326
Total	707	920	1106

Source: TCI 2004, p. 43, quoting the forecast of the Dutch rail operator.

2.4. Investment cost and structure of financing

The first estimate of investment cost of the Betuwe line amounted to EUR 1 134 million in 1990. As Table C2-3 shows the cost continuously increased up to the total construction cost of EUR 4 705 million until 2008, which is an increase of 315%. The cost increased for different reasons, including extensions of the line, mitigating environmental impacts, adaptations of the engineering specifications (e.g. tunnels for double stack trains) and inflation during the planning and implementation. Close to 30% of the cost increase was due to inflation. A more detailed list of the construction-conditioned cost increases is presented by Pestmann (2001).

At the time of the government decision on the implementation of the Betuwe Line the cost estimate has reached EUR 3.67 billion. The cost increase to completion in comparison with that figure would have been EUR 984 million or roughly 27%. This could be split into 67% to consider inflation and about 17% for changes of scope of the project. Less than 10% should be attributable to shortcomings in design or estimations (Vrijland 2004, p.6). This positive evaluation of the implementation process was also confirmed by the NETLIPSE project that estimated that after the scope of the project was fully specified and planned the further cost increases amounted to 2%, only. Their analysis concluded that risk management was excellent during the implementation phase with 10% of budget assigned for contingencies, half of that to project managers and half of it to the project director, as well as due to the establishment of an independent risk management department (Hertogh et al. 2008).

Table C2-3: Cost development of Betuwe line (in EUR million)

No	Date	Issue	Extra cost	Total cost
1	06/1990	Cost estimate with 50% private financing		1 134
2	01/1992	Extension to Rotterdam-harbour (Maasvlakte)	+363	1 497
3	04/1992	Choice of trajectory Maasvlakte-Zevenaar	+838	2 335
4	05/1993	Adaptations to mitigate adverse effects on the environment (local resistance)	+497	2 832
5	09/1993	Mark-up for price inflation	+72	2 904
6	12/1993	Adaptation to parliamentary and provincial demands, Barendrecht now in the project	+335	3 239
7	04/1994	Mark-up for price inflation	+119	3 358
8	1996	Trajectory decision leading to adaptations including four new tunnels	+386	3 744
9	1996-2005	Change of scope due to political decisions (e.g., Dintelhaven bridge, double-stack ready tunnels etc.)	+321	4 065
10	1996-2005	Mark-up for price inflation	+783	4 848
11	01/2006	Cost forecast including risk	-195	4 653
12	12/2008	Reporting of total cost in the EC TENtec system	+52	4 705
		Total cost increase	315%	3 571
		Cost increase due to adaptations of route / engineering	229%	2 597
		Cost increase due to inflation	85%	974

Source: Vleugel/Bos 2008 after ProRail 2006, and own analysis.

Though the Betuwe Line is operating since 2007, several projects in connection with the Betuwe Line have been co-funded by the TEN-T funding afterwards. To mention some examples (in brackets the TEN-T EA codes):

- third track in The Netherlands to the Dutch border (2010-NL-92226-S, EUR 0.8 million),
- retrofitting locomotives with ETCS/ERTMS (2007-NL-60380-P, EUR 9 million),
- studies and works on the third track in Germany (2007-DE-24040-P, EUR 47 million).

2.5. Development since the last study

Two important developments could be identified for the Betuwe Line with respect to the analyses of this study. First, an ex-post EIA was published (Movares 2012) broadly confirming the compliance of the Betuwe Line with environmental regulations, with the exception of noise/vibration impacts affecting 27 houses along the line with levels not acceptable. The Minister of Transport declared to mitigate these adverse impacts in close collaboration with the affected citizens.

Second, progress concerning planning and funding the German connections to the Betuwe Line from Emmerich to Oberhausen was made in 2013. In July a funding agreement between the German Federal State and the Lander of North Rhine-Westphalia was achieved. Also the plan approval process of all 12 sections of the 73 km track has been started until the end of 2013. The cost estimate at that time amounted to EUR 1.5 billion.

2.6. Conclusions to be drawn

The Betuwe Line presents a prominent example of a political decision on a transport project, triggered by a stakeholder (i.e. the Port of Rotterdam). Of course, the project fitted in strategic plans promoting the concept of “Mainports”, in the Netherlands Schiphol airport and the Port of Rotterdam. But as a socio-economic ex-post analysis is missing, yet, we cannot decide if the project was actually beneficial in socio-economic and financial terms. A rough estimation of revenues using the last available figure of 500 trains per week running along the full length of the Betuwe Line at a tariff of 2.88 Euro/km calculates a total revenue of about EUR 12 million. This could be close to earlier estimates of operating cost (Gebbink 2009).

However, we have to note that both the transport demand forecast and the ex-ante economic analysis, both in itself and as it builds on a flawed transport forecast, were clearly insufficient to take an informed decision on funding of such a large project.

From the European perspective the project fits well into the strategic transport policy objectives as it promotes rail freight and makes it attractive for long-distance transport on major demand corridors connecting European freight/economic hubs. However, still the socio-economic benefit should be proven by an ex-post analysis, in particular as European funding is provided to complete further sections of the track on both ends.

A useful remark was made by the CPB (1995) who advocated a phased approach to develop the Betuwe Line in a sense that in earlier phases the less costly sections and obviously beneficial ones should be build enabling better informed assessment for the further sections. However, one should take into account still to consider the network topology when developing the first sections. Of course, such an approach should avoid to create new bottlenecks, as seems to happen with the connecting line in Germany where the third track between Emmerich and Oberhausen will only be completed by 2022.

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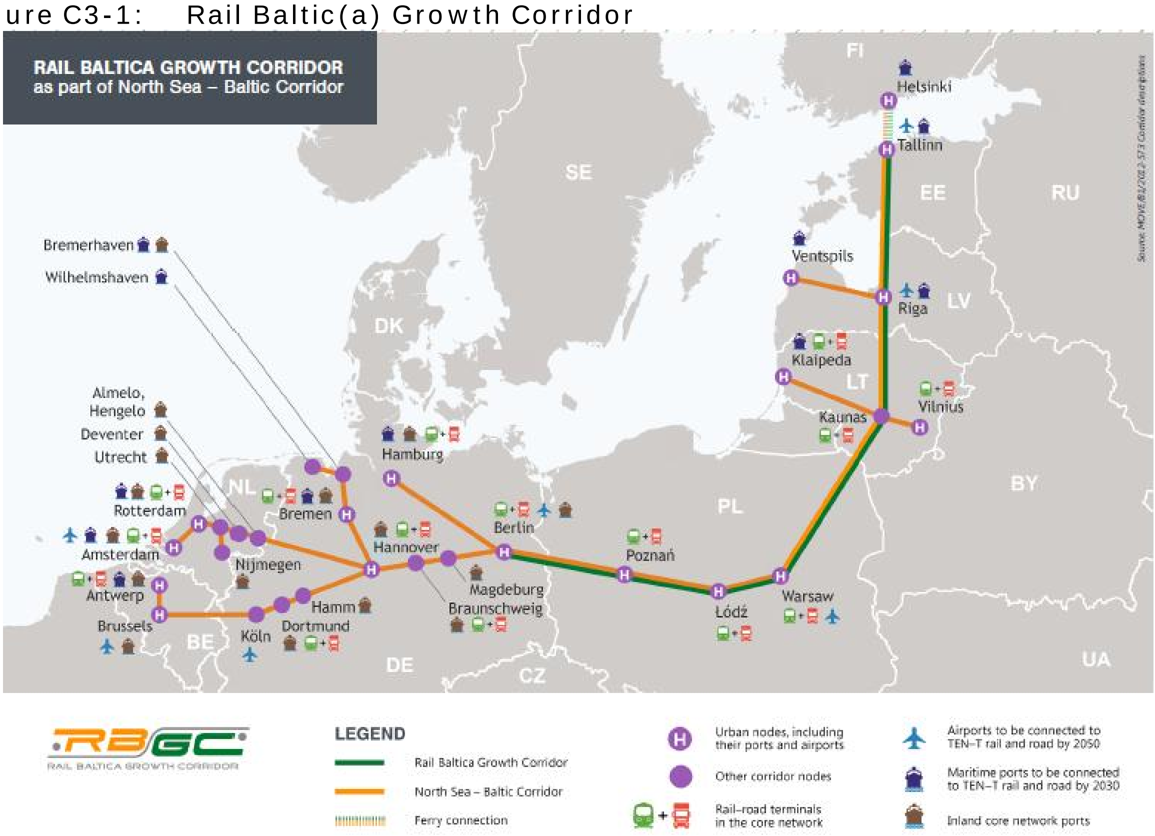
ANNEX 3. RAIL BALTIC(A)

This case study is divided into two main reports. The first corresponds to the previous project Rail Baltica of PP27, and the second is the updated report on the Rail Baltic project. There are problems distinguishing the two projects because they are so interrelated and sound so similar.

In order to make a clear distinction, we refer to Rail Baltica as the renewal and/or upgrade of the existing wide gauge rail network of the Baltics, which has largely taken place over the last 10 years, but is still undergoing improvements. Rail Baltic, as we understand it, is the new standard gauge rail network that will establish a fast north-south link from Helsinki through the three Baltic countries to Warsaw, and even as far as Berlin. In this updated study, we concentrate on Rail Baltic. For information purposes, the previous report on Rail Baltica is added to the end of this section.

In order to advertise the project, the Rail Baltica Growth Corridor (RBGC, online) was initiated by the cities of Helsinki and Berlin with 21 partners from Baltic Sea Region countries as part of a Flagship Project within the EU strategy for the Baltic Sea Region (EUSBSR) 2007-1013. It aimed at promoting transport policies for the development of multimodal logistics and a modern railway infrastructure in the Eastern Baltic Sea Region, focusing on improving passenger mobility and freight transportation along the Rail Baltica route, while fostering a multi-level dialogue with the different stakeholders. They highlight the importance of this project for: city and regional authorities, transport service providers, logistic centres, intermodal terminals, public transport authorities, and universities and research centres (RBGC, online). As a final step, the partners produced the Rail Baltic Growth Strategy (RBGS, 2013). It clearly explains how the Rail Baltica reconstruction plan has been transformed into the Rail Baltic project.

Figure C3-1: Rail Baltic(a) Growth Corridor



Source: RBGS (2013).

According to the new TEN-T guidelines (European Commission, online), the new core network will: “Connect the ports of the Eastern shore of the Baltic Sea with the ports of the North Sea. The corridor will connect Finland with Estonia by ferry, provide modern road and rail transport links between the three Baltic States on the one hand and Poland, Germany, the Netherlands and Belgium on the other. Between the Odra River and German, Dutch and Flemish ports, it also includes inland waterways, such as the "Mittelland-Kanal". The most important project is "Rail Baltic", a European standard gauge railway between Tallinn, Riga, Kaunas and North-Eastern Poland”.

3.1. The new Rail Baltic project

There is a general belief that the Rail Baltica project is almost complete, because it has achieved its goal of connecting the different Baltic States to Poland using both 1 520 mm and 1 435 mm gauge railways. The common understanding is that it will finally be finished during 2015 because some security systems have delayed its operation. According to different sources (see for example RBGS, 2013), it was while developing the Rail Baltica project that the new Rail Baltic project started to take shape when attempting to set a European electrified standard gauge of 1 435 mm so that it could be used with higher velocities (a maximum speed of 180 km/hr is mentioned which is a significant upgrade from typical speeds in the area) and freight traffic. The Rail Baltic project is regarded as more ambitious and more attractive than the earlier Rail Baltica one. It starts via ferry from Finland to Tallin (Estonia), continues on the European 1 435 mm gauge through Riga (Latvia) and Kaunas (Lithuania) to Poland (Bialystok, Warsaw) and then Berlin. The Rail Baltic project has not yet started, but the goal is for it to be completed by 2026.

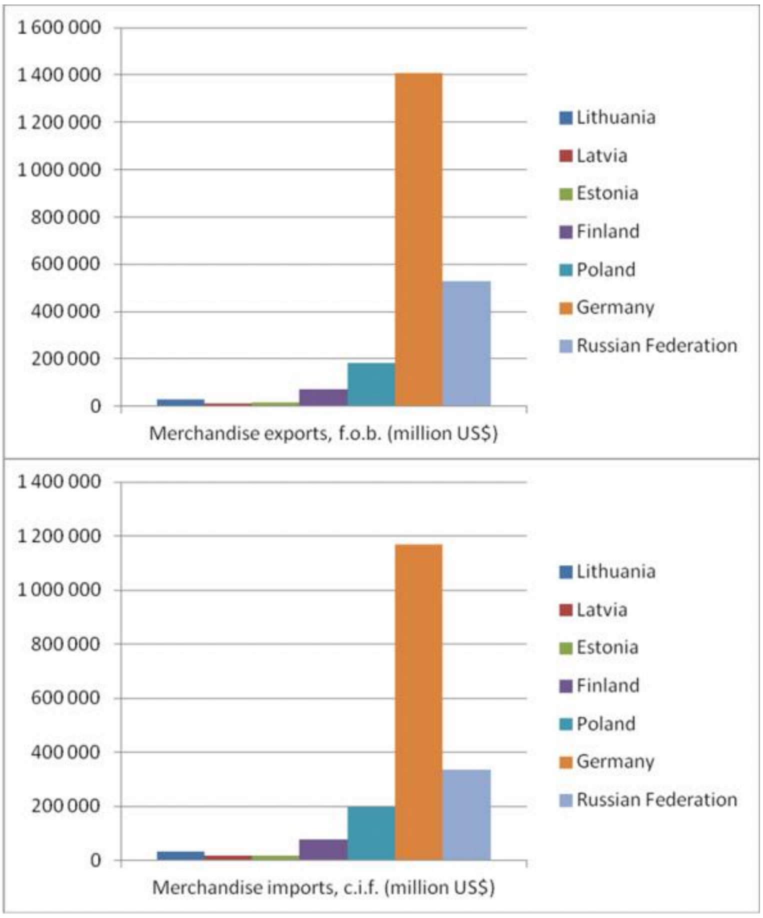
It is important to highlight that the Russian railway standard gauge is 1 520 mm, while the European one is 1 435 mm. This change of gauge is apparent at present on the Lithuanian-Polish border in a small village called Sestokai. The railway network from Estonia, Latvia, Lithuania, and Poland has been improved since they joined the EU in 2004 and the PP27 included many infrastructure reconstructions, both for 1 435 and 1 520 mm (RBGS, 2013).

This project would mean that there are cases where the two gauge systems work together for regional and international purposes. It is considered to be one of the most important transnational transport projects. It has an approximate cost of EUR 3.6 billion (RBGS, 2013). The problem lies in the different options to achieve interoperability of different rail gauge systems. The RBGS (2013, p.23) describes the different alternatives discussed along with the opportunities, drawbacks, and costs for both passenger and freight transport. One of the most important drawbacks highlighted is regarding the strong economic links running east and west between Russia, Ukraine and Belarus, and the Baltic countries in contrast to the now weaker north-south economic links (RBGS, 2013 p.28). Some people claim that the current N-S demand is already being met by road transport. According to a recent report (Hilmola, 2012 p.13), however, there are weight restrictions in place on many of the Baltic States’ and Polish roads which make it impossible to use combined trucks of up to seven axles or a gross weight of 60 tons similar to Finland or Sweden. Nevertheless the report does mention that transport units are rarely filled at total capacity.

Many countries prioritize other projects or simply lack strong political commitment. Therefore, the importance of rail as a sustainable form of transport, and the commitment to cooperation between different levels of authorities should be reinforced along with the agreement to build different key parts of this project (such as multimodal hubs in freight and passenger).

Figure C3-2 gives a clearer picture of the exports and imports of each country involved with the Rail Baltic project. The next sections also provide more details about the facts and situation of each of these countries.

Figure C3-2: Exports/Imports of countries involved in the RAIL BALTIC project



Source: WTO Statistics (2014). Own compilation.

3.1.1. The three Baltic states

A recent qualitative study carried out by Laisi and Saranen (2013) using semi-structured interviews describes the Baltic countries' vision of the Rail Baltic project. In general terms, the countries share the perception that being part of the EU has increased the level of funding and diminished cross-border problems. The following paragraphs briefly present their main findings.

In Estonia, the general vision of the Rail Baltic project is very positive. The project connects Tallinn to Tartu, the second largest city. The connection Tallin-Tartu-Valga has recently been improved. Estonia's national priority is the connection between Tallinn, Narva, Tartu and Pärnu. It is important to note that many people in South Estonia use Riga airport, so a rail connection here is important. Bus and rail stations are located at different places. With regards to freight, the main flows are east to west and are dominated by rail. They normally transport raw materials from Russia to Estonian ports which, it is noteworthy, are not city owned. North-south transport routes use the Via Baltica road route, and are not that intensive. People interviewed in the study believe that the Via Baltica will not be sufficient in the future. The general perception of Rail Baltic in the country is quite positive.

Rail is also the most used transport mode for east-west freight in Latvia (from Russia or Kazakhstan to Latvian ports), which is the most important freight route. The Via Baltica road is also used for north-south transport. Latvia's national priority is now to connect regions' logistic centres polycentrically. There seems to be a problem regarding the poor level of accessibility and infrastructure to the Riga port, although in general terms the rail infrastructure is reckoned to have a good level of service. Rail is mainly used for commuters around Riga, whereas at national level, passengers tend to move by bus due to the higher frequencies but similar costs and travel time. It was questioned how important the north-south rail freight connection could be because there is always a cheaper sea transportation option. Still, the connection to Finland could increase the feasibility of the project. The project is also seen as an opportunity to put the country on the international stage.

Lithuania benefits from its location: Latvia to the north, Poland to the south, Belarus to the east and Russia to the west. It has two strong economic centres: Vilnius (the capital) and Kaunas. The connection between the axis Klaipeda-Kaunas-Vilnius has been improved, as it is a national priority. The most important flow of freight is by rail from east to west although the links to both the south and the north (Poland and Lithuania respectively) are also important. Freight flows here are again mainly handled by road along the Via Baltica, which is seen as insufficient for freight (especially heavy freight flows), even if the road infrastructure is regarded as one of the best in Eastern Europe.

The connection between Kaunas and Vilnius has recently been improved and it now takes less than an hour to reach both cities by rail. Recently, Lithuanian law was changed so that public-private partnership (PPP) projects in the transport sector are now possible. Interesting to note that, according to this study, Lithuania sees the Rail Baltic project as an opportunity to improve the accessibility throughout the country.

3.1.2. The Helsinki-Tallinn connection

Helsinki and Tallin are separated by only 84 km and freight flows are normally transported in ROPAX vessels[16]. RORO vessels are not used because of the high frequencies (Hilmola, 2012). This report concludes that the link between these two cities will become more expensive the moment environmental policy increases internalisation of external cost for road and short sea shipping (for example, due to sulphur regulation due in 2015).

As mentioned in the report edited by Olli-Pekka Hilmola (2012 p.11), Finland faces great disadvantages in its interoperability with the rest of Europe regarding railway systems. It has a different gauge (1 524 mm) and different signalling systems, even though the electrical system is the same. Therefore, seamless and low-cost railway links using ships to Europe cannot be envisaged.

In fact, the Rail Baltic project is of high importance for the Finnish export industry. It is the last country in the freight chain and being well connected to the rest of Europe or even to Russia is very important. Finland is an observing country in the inter-ministerial Rail Baltic Task Force.

16 ROPAX (roll-on/roll-off passenger) describes a RORO vessel built for freight vehicle transport along with passenger accommodation. Technically this encompasses all ferries with both a roll-on/roll-off car deck and passenger-carrying capacities, but in practice, ships with facilities for more than 500 passengers are often referred to as cruise ferries (Wikipedia, 2014).

A tunnel has been on the agenda as a possible solution to rail links, but high costs and other difficulties have diminished its likelihood. It is difficult to justify this project from an economic perspective, but Finland and Estonia are still interested in the idea because of the multiple opportunities it would trigger. There are only a few reports or articles discussing the feasibility of such a tunnel (Saranen, 2010; Puzyns, 2010), for example, the one edited by Juha Saranen (2010) in the framework of intermodal transportation in emergency situations in the Gulf of Finland. They mention that a cost-benefit ratio of about 0.468 is expected (Saranen, 2010 p. 64), which would not indicate a viable transport investment, but could be used as a starting point to improve commerce with the rest of Europe, achieve greater competitiveness and reduce the risks of relying on only one infrastructure during emergency situations such as strikes, volcanoes, etc. A later research study (Hilmola, 2012 p. 98) discusses that, in the long term, the railway tunnel and railway freight connection would benefit from lower CO_2 emissions and hence fewer total costs.

3.1.3. The importance of the Russian bond

Regarding its opportunities, the Rail Baltic project highlights that transit among the Baltic countries is currently mainly based on road transport for both passengers (in private cars or buses) and freight. However, rail transport is used mostly to carry Russian freight to the Baltic seaports (almost 95%). In this respect, logistics will play a major role in this infrastructure and therefore for improving East-West connections commitment of other countries such as Russia, Belarus and Ukraine should be reinforced. Moreover, most of the tourists in this region come from Russia.

The city of Warsaw commissioned a study on the “Private transport market stakeholders in the area of Rail Baltica” (EU-Consult, 2011), which aimed to assess the opinions and attitudes of the private sector. It was conducted in Germany, Poland, Lithuania and Latvia. It included surveys of cargo dispatchers and cargo carriers, passenger carriers, shipping companies and logistics companies. As stated in this RBGC report (EU-Consult 2011, p.7), the new corridor presents different pictures. For example, Poland and Germany have well-developed land transport links with central Europe whereas the Baltic States are dependent on sea traffic and the Via Baltica road link. There are even differences in accessibility between Nordic countries. The results of this study show that, in general, the private sector expects the Rail Baltica to improve connections with Russia for trading, particularly to Moscow, a point which was mentioned by all the countries in this study. Poland would like to have direct links or better connections from their ports to Russia. They have already tested Kutno (central Poland) on the Rotterdam-Moscow route (via Belarus). Other countries also expect this link to improve trading with more distant countries than Germany. There was even interest in a container train that could reach China.

Studies have shown that most of the potential freight volume of Rail Baltic would come from Russia. To provide a clear picture of the importance of Russia in the region, Russia reported 8.5 billion tons of freight in 2012 in the whole Russian Federation (Laisi et al., 2013). The report by Karamysheva et al. (2013 pp. 23-30) reviews a good number of studies regarding the freight situation in Russia. It shows that, despite some positive trends in Russian transport sector development, there are still many negative aspects related to the lack of carrying capacity of road and railway transport, such as old rolling-stock, non-transparent tariff system, inefficient interoperability of transport modes, problems related to customs, and so on. In fact Russia has a very low position (95^{th}) on the Logistics Performance Index (LPI), close to countries like Kuwait or Ecuador, and a long way from countries like Germany, Sweden or Singapore. Pipelines are the most utilized mode of transport followed by road and rail (Laisi et al., 2013). The following paragraphs outline the main freight transport modes.

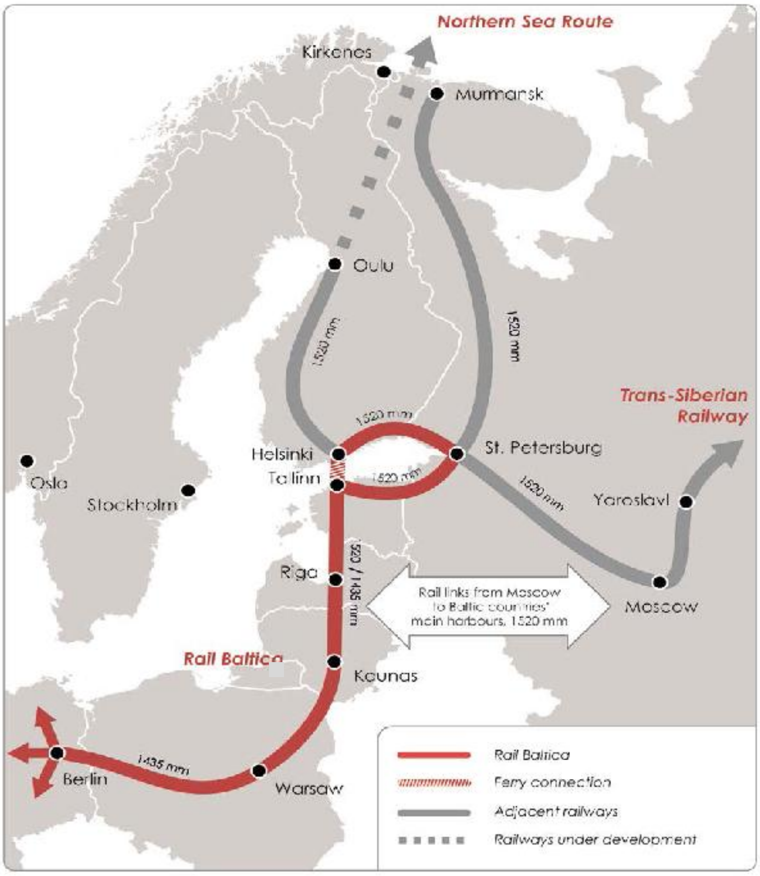
Air transport is only used for high-value cargo and has grown very slowly (approx.1% per year). Maritime transport is mainly for raw and bulk cargo. Russia did not have any major ports after the collapse of the USSR since these belonged to the Baltic States. Russia intended to overcome this drawback by developing new port facilities in the North-West and has invested a lot of resources here (e.g. in St. Petersburg). Maritime transportation only accounts for 0.5% of total freight transport in Russia and 2.1% of commercial revenues (Karamysheva et al., 2013). However, a later report shows that the North-West Russian seaports increased from 27 million tons in 2001 to 181 million tons in 2012 (Laisi et al., 2013).

According to the report by Karamysheva et al. (2013), road transportation has the largest volume with around 67% but a minor turnover of up to 4%. It has experienced continued growth since 2009. Nevertheless, most of the road network was constructed during the USSR era and was therefore designed for a much lower capacity than the current one. Moreover, the fleet is very old and the organization chain of logistics distribution is known to be very inefficient. In terms of the volume transported, pipelines are in third place, although they are first with regard to revenues. Most of the exports are sent to European countries such as Germany, the Netherlands and Poland. This means of transport depends on Eastern European countries as the infrastructure passes through these countries.

Finally, railway transportation accounts for around 30-35% of the total volume of commercial freight and 40-45% of commercial revenues (Karamysheva et al., 2013). This study cites raw materials as the goods most transported by rail. It is interesting to compare tons transported by rail to other modes: rail transport volumes in Russia increased from 1.0 billion tons in 1995 to 1.4 billion tons in 2012. Russia must follow certain trading rules since it joined the World Trade Organization (WTO) in 2012, among other issues, and is obliged to unify railway tariffs to improve the system. The system is currently undergoing deregulation and, with respect to the link to west (Europe), is a good competitor with road transportation.

Due to all the issues already explained, the Rail Baltica Growth Corridor- Russia (RBGC-Russia) was founded (RBGC-Russia, online) as pictured in Figure C3-3 and Figure C3-4. It seeks to promote transport and logistics networks between North-West Russia (Leningrad Oblast and St. Petesburg) and the EU-states in the eastern Baltic Sea region. It is a sister project to RBGC and intends to foster the political dialogue regarding the Rail Baltic project. It is financed by the Delegation of the European Union to Russia. The report by Karamysheva et al. (2013) states that the rail transit corridor between the Baltic States and Russia could be competitive if prices, frequencies, and improved times are achieved. Russia should tackle interoperability problems and capacity problems at border-crossing points to make this project feasible. The study of Laisi et al. (2013), which collected data in the public transport sector, also states that both road and rail networks need more investment to attain minimum standards. Interviewees highlighted problems regarding border crossing, the harmonization of legislation, customs procedures and information technologies. They also agreed on the importance of improving rail services in Russia in order to make the Rail Baltic project successful. Public sector respondents were doubtful about the Rail Baltic project. Shifting freight to rail from ports would be neither easy nor profitable. They pointed out that each separate Baltic State (Estonia, Latvia and Lithuania) on its own does not generate enough cargo flows for a mega project like Rail Baltic. The freight to their ports comes from Russia. Moreover, eventually prioritizing either passenger or cargo transport could be an issue. Authors of this report mention that the Sulfur Directive may force all the stakeholders to cooperate in order to find new transport solutions. The project is more appealing to European actors, while the Russian actors do not regard it as promising and do not want to waste the money already invested in ports.

Figure C3-3: The Rail Baltic Growth Corridor - Russia



Source: Laisi et al. (2013).

3.1.4. The Joint Venture

Last summer (2013) there was a political agreement between the countries involved in the Rail Baltic project and the European Commission to use a Joint Venture (JV) to Build, Manage and Operate the infrastructure in order to access cohesion funds and other economic resources. This is especially beneficial to countries like Latvia, Estonia and Lithuania, since they do not have the infrastructure to do it by themselves. In spring 2014, the JV had to submit a financial proposal to the European Union in order to access funds of up to 85% of the costs. Moreover, with its new policy on priority projects, the EU plans to allot a total of € 10 billion to projects in cohesion countries. The report "Rail Baltic Joint Venture Study" was published last year (TRINITI, 2013) and covers different issues such as legal ones, taxes, financing, along with different European experiences. However, it still refers to the study carried out by AECOM (2011). Most importantly, it highlights the many risks associated with a large and cross-border infrastructure. These are mainly related to the differences in laws and governments between countries but there are also rail-specific and environmental planning risks. Others include cost estimation risks, tender procurement risks, contractual risks, risks related to the permissions or licenses that have to be obtained, land acquisition and financing risks. There are also cultural and communication problems, construction and timetable risks, risks related to nature and resources, and the chance some governments will change the long-term goals of the project framework (TRINITI, 2013 p.160).

According to Malla Paajanen Consulting (online), there have been different activities in order to push the Rail Baltic project. For example, a kick-off conference in Brussels on January 8-9, 2014, hosted by the European Commission, DG MOVE for the nine Core Network Corridors. The European Coordinator for the North Sea-Baltic Corridor continued to be Pavel Telička with James Pond as advisor, but only until mid 2014 when the former became elected MEP. The Proximare Consortium includes Tõnis Tamme (Triniti), Juergen Werner (Norton Rose Fulbrignt), Gerard Bruil (Goudappel Coffeng), Martin Heiland (IPG-Potsdam) and Malla Paajanen. This consortium is in charge of carrying out a study on the development of the Rail Baltic connection including environmental and economic feasibility studies. Up to now, the only available study is the one carried out by AECOM (2011), which, as stated before, was the one used in the TRINITI report.

3.1.5. Arising concerns

Interest varies among countries. Poland's interest is greater and the border with Lithuania and the resulting bottleneck is an important issue for both countries. The RBGC report (EU-Consult, 2011) states that the interest of Latvia has diminished. According to this study, public and private road transportation companies feel threatened by the Rail Baltic project, and they need to know how they stand to benefit from it in order to cooperate. It should be further developed the awareness of price and duration of rail transport with industry so they can understand and realize a benefit from switching to rail transport.

Figure C3-4: Picture of the long-term Rail Baltica / Rail Baltic Growth Corridor - Russia

Source: EU-Consult (2011).

During the last TEN-T days in October 16-18, 2013, the EU said it will invest around EUR 26 billion to co-fund transport projects specially intended to improve cross-border transport, to overcome bottlenecks and improve the network. Later, a “Rail Baltic Express Conference” was held to discuss the experiences and findings from the RBGC (The Wall Street Journal, online). Information about the RBGC-Russia was also presented. In Tallin, Commissioner Siim Kallas signed an agreement worth EUR 11.3 million for the cooperation project between the ports of Helsinki and Tallinn, known as the TWIN-PORT project. This aims to improve ferry operation in both ports and the ferry capacity between Helsinki and Tallinn (Malla Paajanen, online).

Finally, the Lithuanian situation poses a problem. In the official project (PP27), the rail connection passes through Kaunas, but the authorities expect the new Rail Baltic project to pass through their capital, Vilnius, as is the case in the rest of the countries. This is not the current plan, however, and would therefore increase costs. Some countries state that Lithuania should fund the link from Kaunas to Vilnius themselves, especially when taking into account that the country could get Cohesion Funds because of its status as an eligible country for cohesion funding. Moreover, the rest of the partners resent the delayed opposition to the project by Lithuania, since the design has been under discussion for several years.

In our understanding, the AECOM study (2011) refers to what today is called “Rail Baltic”. Figure C3-5 shows the concept used in this study. Therefore we use the AECOM analysis to assess Rail Baltic (see Table C3-1 and Figure C3-5).

Figure C3-5: Rail Baltic as defined by the AECOM study

Source: AECOM (2011).

3.2. Conclusions regarding the Rail Baltic project (Updated version)

It seems evident that Russia plays an important role in this area; therefore, more attention should be paid to link the Rail Baltic project with this country.

It is true that freight flows east to west, the question is how to make a profitable line with only one-way full capacity. Will the way back remain empty? The same applies to the link north-south. Finland may benefit from this new link, but it seems necessary to plan a profitable link south-north as well.

In order to make this project happen, the EU must focus on discussing it with Russian counterparts. An earlier approaching of Russiawith regards to the Rail Baltic project means more flexibility of project designs and thus more bargaining opportunities to the EU.

As we understand it, there have been no recent concrete studies on the feasibility of the Rail Baltic project; an updated and improved version of the AECOM study is necessary. Table C3-1would be helpful for a new study by filling gaps or updating information.

Ensure the Rail Baltic line provides comfortable links to main cities and major centres of employment. Transport hubs should be constructed within the Rail Baltic project to function as interchange stations between different transport modes (for example, airports and bus stations). Therefore, transport plans for such interchange stations are needed and coordination between transport authorities is required. Another reason to plan interchange stations is to ensure high local accessibility using different modes, especially by public transport.

One suggestion is to observe the planning process of the “Sectoral Plan AlpTRansit” of the New Railway Link through the Alps (NRLA), where Federal, Cantonal and local authorities discussed and integrated their spatial planning activities. There was a binding document for all levels that must be taken into account for future planning. This document is seen as one of the key success factors for the NRLA (Hertogh et al., 2008).

New sidings for warehouses and industrial sites should be planned to enhance the use of the Rail Baltic project for railway freight services in the long term.

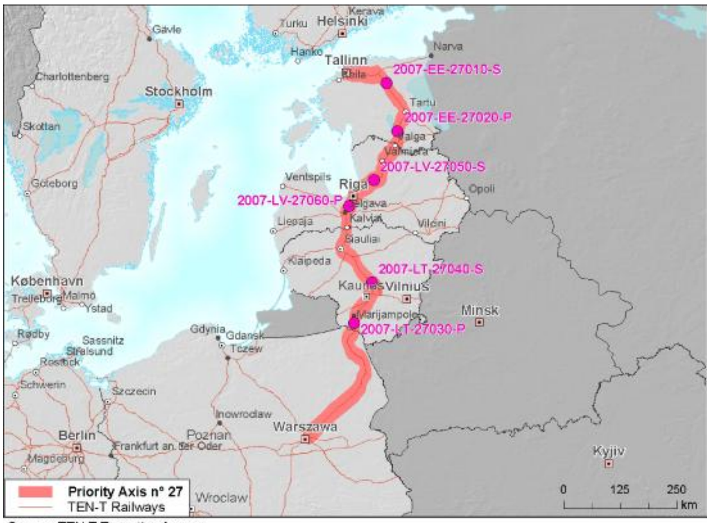
The export/import figures are a cause for concern. There are different scenarios that are not positive for all the countries. For example, the fact that trains may be full from east to west (from Russia to Germany or to the Baltic countries) or north to south, but not on their return journeys is not cost-effective. Another possible scenario is that the project will primarily function as a bridge between Russia and central Europe, and in this case, the efforts and investments of the Baltic countries would not be profitable. Therefore, clear and practicable strategies are required to promote commercial trade between all the countries involved.

A rail network that solves interoperability, coordination and border-crossing problems would definitely improve the performance of the project (for example, one train driver could operate in the different states on the Rail Baltic line). For this to happen, all the states involved in the project have to define common standards and guidelines for a Rail Baltic railway authority. The former is an outstanding goal that has so far not been achieved in a European rail network.

As a positive point, there has been a huge effort recently to produce many research studies improving knowledge about the impact of the Rail Baltic project and the vision of the different stakeholders. On the negative side, however, the concrete figures needed for a detailed picture of the Rail Baltic project are still missing.

Taking the above comments and conclusions into account, it is not surprising that the outgoing TEN-T coordinator for Rail Baltic, Pavel Telička, concluded his last report by stating "that a unified, collective effort is required from all the partner countries in the next five years if the project is to be successfully achieved." (Telička 2013).

3.3. Rail Baltic(a) and the feasibility studies



Source: TEN-T Executive Agency

"Rail Baltica" is a strategic rail project linking four new EU Member States - Poland, Lithuania, Latvia and Estonia. In addition, it is the only rail line connecting the three Baltic States themselves to Poland and the rest of the EU. To the north, Helsinki is connected by rail ferry services across the Gulf of Finland. The existing rail tracks in the three Baltic States are wide gauge. The basic direction of the networks is East-West to enable links to the Baltic ports and from and to Russia.

The length of the current track is approximately 1 200 km by the most direct existing route from Tallinn to Warsaw. A variety of track and operating systems are currently in use: single and double track, electrified and non-electrified (of which single track non-electrified is the most common system). Rail Baltic(a) is thus facing a number of specific challenges, like to combine renewal of tracks with upgrades and new construction (e.g. of double tracks), combining standard gauge with gauge or connecting these two types of networks or improving electrification and signalling along the line.

As it was mentioned in the previous report, there are two major feasibility studies. The most recent, carried out by AECOM (2011) and the other one carried out by COWI et al. (2007). The next sections discuss each of these studies in detail.

Rail Baltic project summary of investment and cost

Table C3-1: Project summary of Rail Baltic: AECOM study (2011)

Aspect	Description	Aspect	Description
Project Title	Rail Baltic (new standard gauge line)	TEN-T code	PP27
Countries / area	(Poland,) Lithuania, Latvia, Estonia The study refers to the Baltic part of the Rail Baltica corridor	Start date	Open
Mode(s)	Railways	End date	Open
Managing authority	Various for the different sections (e.g. National Ministries, railway operators), Mr Pavel Telička (European Coordinator)	Duration	Not applicable
		Delay (mth)	Not applicable
Investment cost (m€)	EUR 3 539 million ('best feasible option') without design and planning, project management, site supervision and VAT. With above positions: EUR 3 780 million.	Length (km)	728 km ('best feasible option')
EC funding TEN-T (m€)	Underlying assumption: EU grants 56.3% of the total investment costs (85% of the investment costs to which co-financing rate for priority axis applies)	EC share	56.3%
EC funding Cohes. (m€)	Underlying assumption: EU grants 56.3% of the total investment costs (85% of the investment costs to which co-financing rate for priority axis applies)	EC share	56.3%
Funding agent 1	EU (various sources)	Value (m€)	EUR 1.992 billion (without design and planning, project management, site supervision and VAT)
Funding agent 2	National funds by Baltic States, other sources	Value (m€)	EUR 1.547 billion(without design and planning, project management, site supervision and VAT)

Aspect	Description	Aspect	Description
Cost-benefit analysis	AECOM	CBA ratio	1.75
		Public y/n	y
Transport scenario	There are four different draft alignment schemes on the corridor, but the main assessment results refer to the identified 'best feasible option'	Dated from	2011
Externality covered	Air pollution; safety (accidents); climate change	Ext. cost (m€)	EUR 828 million benefits (discounted)
EIA	The study contains a chapter on environmental considerations, in which effects are discussed on Natura 2000 sites, noise impacts, impacts on rivers, water courses and cultural heritage.	Public y/n	y
CIA	Impacts on CO_2 emissions are estimated.	Public y/n	y
Financial analysis	Financial analysis carried out from the perspective of following three agents: • Infrastructure manager • Operator of passenger trains • Operator of freight trains	Expected RoI	Economic IRR : 9.3% Financial IRR (from the perspective of the infrastructure manager) : 0.05%, without EU contribution
Ex-post evaluation	Not applicable	Cost overrun (m€)	Not applicable

Source: own analysis.

3.4. Methodology and remarks on CBA and project selection

The study embraces an economic assessment (CBA approach) and financial assessment, and relates to the Baltic part of the Rail Baltic corridor between the Lithuanian/ Polish border and Talinn.

The methodology applied is in line with the method set out in DG Regio's Guide to cost-benefit analysis of investment projects, and incorporates "in some way" input from the Railway Project Appraisal Guidelines by the EIB, the HEATCO project and the IMPACT study, the latter both carried out on behalf of the European Commission. The elements of the applied CBA are as follows:

- Capital costs
- Maintenance costs

- Track access charges
- Residual value of the project
- Operating and maintenance costs
- Revenues from customers
- Travel time savings
- Accident costs
- Air pollution
- Greenhouse gases.

The financial assessment focuses on cost and revenues from the perspective of three different agents:

- Infrastructure manager
- Operator of passenger trains
- Operator of freight trains.

The considered cost and revenue elements of infrastructure managers are as follows:

- Investment costs
- Residual value
- Access charges from operators
- Maintenance costs.

For the financial analysis, the following components are considered from the perspective of operators of passenger (freight) trains:

- Revenues
- Operating costs (including track access charges).

The obtained results are subject to a risk analysis, including sensitivity tests, the identification of critical variables, and the application of probability distributions to key variables.

The ‘best feasible option’ is identified on the basis of passenger and freight demand (volumes, revenues, time savings, CO_2 / GHG savings) and other ‘key factors’. The identified option represents the most direct and shortest route from the southern-most point to the northern-most point of the corridor.

3.5. Methodology and remarks on environmental analysis

The study contains neither an EIA nor a CIA.

However, the study does have a chapter on environmental considerations, in which impacts are described on Natura 2000 sites, noise, rivers, water courses and cultural heritage.

3.6. Characteristics of the transport demand scenario and its economic drivers

The transport demand scenario takes into account the following exogenous developments: population, GDP, GVA and trade/ commodity flows. Exogenous trends were derived from data from the national statistical offices of each Baltic State, Eurostat and the UN. Passenger demand forecasts are driven by changes in the number of inhabitants and GDP per capita, whereas freight demand forecasts are determined by GDP growth. The reference infrastructure scenario underlying the appraisal results is not presented separately in detail.

Current transport services for all modes were assessed using a five point scoring system.

The study was carried out after the financial crisis. The applied GDP growth rates seem realistic.

Nevertheless, the results for passenger transport development are substantially higher and for freight transport modestly higher than in the COWI-study (COWI et al., 2007). This is hard to understand, because matrix information on the OD-flows is not provided in a comprehensive form. Furthermore, it is not clear which assumptions were made regarding the infrastructure provision for competing transport modes (car, air). As the population will decline, the forecasted growth of passenger transport would be due in the first instance by increased travel distances (change of destination) and increased preference for rail transport (change of modal split). However, the study does not give precise answers to these questions.

3.7. Investment cost and structure of financing

The estimation of construction costs is based on the CAPEX Unit Cost Methodology. To apply this approach, the whole route is divided into 27 segments of various lengths. The costs for land acquisition differ by type of territory (forest, field, swamps), major cities along the route, and villages.

Maintenance costs are estimated taking the following cost components into consideration:

- maintenance of the track
- maintenance of the signalling and telecommunication installations
- maintenance of the overhead line
- maintenance of surrounding areas.

56.3% of the project is assumed to be financed from various EU funds.

The Economic IRR is estimated at 9.3%.

The Financial IRR amounts to 0.5% from the perspective of the infrastructure manager and under the assumption that no EU contribution is made.

3.8. Cost developments over the life-cycle of the project

The investment and maintenance cost estimations are listed in the section above. Infrastructure operating costs were based on the maintenance cost components, whereas revenues from infrastructure charges were estimated based on demand forecasts. Access charges are determined on the basis of the EU document on the establishment of a single European railway area (2010/0253(COD)). The operating costs of operating companies are driven by fuel costs, labour costs, the total cost of rolling stock, overhead costs and track access. The cost figures of the two studies are not comparable because of different infrastructure alternatives and demand/operation figures.

Rail Baltica project summary of investment and cost

Table C3-2: Project summary of Rail Baltica: COWI Feasibility Study (2007)

Aspect	Description	Aspect	Description
Project Title	Rail Baltica (wide gauge renewal) (Study financed by DG Regional Policy)	TEN-T code	PP27
Countries / area	Poland, Lithuania, Latvia, Estonia	Start date	open
Mode(s)	Railways	End date	open
Managing authority	Various for the different sections (e.g. National Ministries, railway operators), Mr Pavel Telička (European Coordinator)	Duration	Not applicable
		Delay (mth)	Not applicable
Investment cost (m€)	EUR 0.98–2.37 billion (2006)	Length (km)	1 190
EC funding TEN-T (m€)	Underlying assumption: EU grants 60% of the total investment costs (TEN-T and cohesion funds)	EC share	60% (TEN-T and cohesion funds)
EC funding Cohes. (m€)	Underlying assumption: EU grants 60% of the total investment costs (TEN-T and cohesion funds)	EC share	60% (TEN-T and cohesion funds)
Funding agent 1	Member States	Value (m€)	EUR 0.39-0.95 billion (2006)
Funding agent 2	EU (cohesion fund and TEN-T fund)	Value (m€)	EUR 0.59-1.42 billion(2006)
Cost-bene-fit-analysis	COWI Consult	CBA ratio	1.9-2.8 with high values of time ; 40% lower with national VOT
		Public y/n	y

Aspect	Description	Aspect	Description
Transport scenario	Three investment scenarios; one reference scenario (forecast year: 2040 (2034))	Dated from	2005
Externality covered	Air pollution; CO_2 costs; accident costs	Ext. cost (m€)	EUR 246-421 million benefits (2006)
EIA	The study highlights main problems and conflicts caused by the proposed investments. Findings need to be studied in more detail in EIAs.	Public y/n	y
CIA	Impacts on CO_2 emissions are estimated	Public y/n	y
Financial analysis	Financial analysis carried out from the perspective of the following three agents: • Infrastructure manager • Operator of passenger trains • Operator of freight trains	Expected RoI	Economic IRR : 9.0-13.3% Financial IRR (on own capital, perspective of infrastructure manager) : 2.6-4.7%, under the assumption of 60% EU contribution for investment costs; without EU finance, none of the options are financially viable
Ex-post evaluation	Not applicable	Cost overrun (m€)	Not applicable

Source: own analysis.

3.9. Methodology and remarks on CBA and project selection

The Feasibility Study embraces an economic assessment (CBA approach) and financial assessment. It refers to the whole scope of the Rail Baltica corridor from Warsaw to Tallinn.

The economic assessment is based on a traditional CBA approach, following the recommendations in DG Regio's Guide to cost-benefit analysis of investment projects, as well as recommendations of the HEATCO project. The elements of the applied CBA are as follows:

- Travel time savings (passenger)
- Carriage time savings (freight)
- User costs (passenger)
- User costs (freight)

- Investment costs (rail)
- Scrap value (rail)
- Change in operation and maintenance (road)
- Access charges by operators
- Net operation and maintenance on the rail line
- Net ticket revenues
- Net operation and maintenance for rolling stock
- Access charges for infrastructure managers
- Air pollution
- Climate change (CO_2)
- Accidents

The financial assessment follows the recommendations outlined in DG Regio's Guide to cost-benefit analysis of investment projects and focuses on cost and revenues from the perspective of three different agents:

- Infrastructure manager
- Operator of passenger trains
- Operator of freight trains

The considered cost and revenue elements of infrastructure managers are as follows:

- Investment costs (including scrap value)
- EU funding
- Access charging from operators
- Maintenance costs.

For the financial analysis from the perspective of operators of passenger (freight) trains, the following components are considered:

- Net ticket (tariff) revenue
- Net operating costs and maintenance costs of rolling stock
- Access charges to infrastructure manager.

In order to assess the robustness of the obtained results, sensitivity analyses are carried out.

The study does not intend to select a specific option, but rather to explore the feasibility of different options from a strategic point of view. It concludes with recommendations for three specific sections (Talinn-Riga; Riga-Kaunas; Kaunas-Warsaw) which take investment costs, impacts on passenger and freight transport, and environmental issues into consideration.

3.10. Methodology and remarks on environmental analysis

The Feasibility Study contains neither an EIA nor a CIA.

However, the study highlights the main problems and conflicts caused by the proposed investment packages. The obtained findings need to be studied in more detail in EIAs conducted during the detailed design studies.

3.11. Characteristics of the transport demand scenario and its economic drivers

The Feasibility Study covers three investment scenarios for infrastructure developments along the Rail Baltica corridor and a reference scenario (forecast year: 2034). The infrastructure assumptions of the reference scenario are compiled on the basis of national investment plans. The assumptions in the investment scenarios are based on all the infrastructure changes of the reference scenario plus the investments related to Rail Baltica. The assumed infrastructure scenarios reveal heavy investments in the road network in all Baltic States and Poland.

Each infrastructure scenario features a common socio-economic scenario covering the main demand triggers: number of inhabitants, motorization, GDP per capita, GDP per economic sector and user costs for transport services. The socio-economic scenario is elaborated by the consortium by applying the results of EU funded projects (TEN-STAC, PRIMES, SCENES) and publications by the European Commission ("European Energy and Transport Trends to 2030").

Transport demand forecasts are generated by the Vaclav model (passenger demand) and the NEAC (freight demand) model.

The study was carried out before the financial crisis. Therefore, from a current perspective, the applied GDP growth rates are too optimistic.

3.12. Investment cost and structure of financing

The investment costs are estimated on the basis of

- country-specific costs for land acquisition
- country-specific unit costs for track renewal (upgrade of an existing link to 120 km/h)
- unit costs to upgrade existing track to 120 km/h
- unit costs to upgrade existing track to 160 km/h
- new line (broad gauge)
- new electrified line (standard gauge)
- salaries.

The assumed unit costs were verified by a member of the UIC working group involved in regular updates of the report "Infracost – The Cost of Railway Infrastructure" (UIC, 2002).

Maintenance costs are estimated by considering the following cost components:

- maintenance of the track
- maintenance of the signalling and telecommunication installations
- maintenance of the overhead line
- maintenance of surrounding areas.

60% of the project is assumed to be financed from EU funds (TEN-T and cohesion funds).

The Economic IRR is estimated to be in the range of 9.0-13.3% (depending on the investment option).

The Financial IRR on own capital is estimated to be 2.6-4.7%, depending on the investment package. It is calculated for the perspective of the infrastructure manager, assuming that 60% of the investment costs are covered by EU budgets. Without EU financing, none of the options are financially viable.

3.13. Cost developments over the life-cycle of the project

The investment and maintenance cost estimations are listed in the section above.

Operating costs were considered on the basis of the maintenance cost components, whereas revenues were estimated on the basis of demand forecasts and applied access charges in Poland.

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ANNEX 4. IRON RHINE

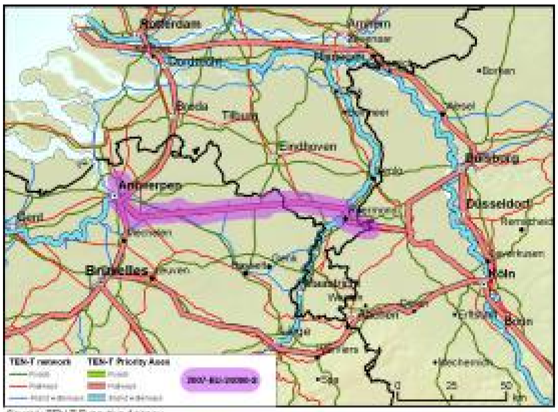
Table C4-1: Project summary Iron Rhine

Aspect	Description	Aspect	Description
Project Title	Iron Rhine (Railway link Liers/BE – Rheydt/Mönchengladbach/DE)	TEN-T code	2007-EU-24090-S
Countries / area	Belgium, Netherlands (and Germany)	Start date	January 2007
Mode(s)	Rail	End date	December 2009 (reduced scope)
Managing authority	Infrabel (Belgian Rail Infrastructure Manager)	Duration	36 months
		Delay (months)	-
Included in TEN-T	2007 (part of priority Project 24)	TEN-T element	Comprehensive network
Investment cost (m€)	Preliminary studies: 5.26 Works: not determined (preliminary estimates up to over EUR 1 100 million)	Length (km)	162.3 km
EC funding TEN-T (m€)	Preliminary studies: 2.63 (Source: http://inea.ec.europa.eu/download/project_fiches/multi_country/fichenew_2007eu24090s_final_1.pdf)	EC share	50% (studies)
EC funding Cohes. (m€)	d.n.a.	EC share	d.n.a.
Funding agent 1		Value (m€)	to be determined
Funding agent 2		Value (m€)	-
Cost-benefit-analysis	TML/TNO (2009): Social cost-benefit analysis Iron Rhine, commissioned by Infrabel, Final Report, Leuven/Delft, 13 February 2009 4 variants considered	CBA ratio	n.a. (negative NPV for all variants)
		Public y/n	y
Transport scenario	(TNO/TML (2007): Vervoersprognose IJzeren Rijn (Traffic forecast Iron Rhine), commissioned by Infrabel, Final report, Delft/Leuven, 8 May 2007 (in Dutch with English Summary)	Dated from	2007

Aspect	Description	Aspect	Description
Externalities covered	Emissions Noise Accidents External safety Recreation Vibrations Loss of living environment Landscape Ecology Soil and water	Ext. cost (m€)	
EIA	none so far	Public y/n	-
CIA	None	Public y/n	-
Financial analysis	not yet carried out	Expected RoI	
Ex-post evaluation	d.n.a.	Cost overrun (m€)	-

Source: own analysis.

Figure C4-1: Iron Rhine



Source: TEN-T Executive Agency

"Part of Priority Project 24, railway axis Lyon/Genova – Basel – Duisburg - Rotterdam/ Antwerpen, the "Iron Rhine" is a historic railway line that runs from the Port of Antwerp in Belgium through The Netherlands to Duisburg, Germany. This project concerns studies to reactivate the line in order to create a direct freight rail link for the Port of Antwerp to its hinterland connections)." [17]

Background: The Iron Rhine railway line was built between 1868 and 1879. The Treaty of London between Belgium and the Netherlands had guaranteed Belgium the right of transit (by rail or canal) through Dutch territory. The Treaty of the Iron Rhine of 1873 provided for a 99-year concession. While parts of the line are still used for passenger and short-distance freight transport, transit freight trains between the port of Antwerp and the Ruhr area ceased operating in 1991. Since then, the "Montzen route" is predominantly used, which is about 50 km longer via Hasselt, Montzen and Aachen; an alternative route to the North is via the new Betuwe line. Nevertheless, Belgium has continually manifested its interest in reviving the Iron Rhine line for long-distance, cross-border freight transport. In 2000, the governments of Belgium and The Netherlands signed an agreement to carry out preliminary studies to reutilise the historic route and, in 2004, Belgium formally requested its reopening in view of Antwerp port's growing importance for the Ruhr area in Germany. The 24 May

[17] http://inea.ec.europa.eu/download/project_fiches/multi_country/fichenew_2007eu24090s_final_1.pdf, last accessed on January 9, 2014

2005[18] ruling of the Permanent Court of Arbitration confirmed that the 1839 treaty still gives Belgium the right of transit through the Netherlands along the historic line. The ruling also recognises Dutch concerns regarding the line crossing the De Meinweg nature reserve that was classified as a national Park in 1994: the costs of a tunnel under the park would have to be borne by both parties. A traffic forecast was completed in 2007, followed by a CBA in 2009 (both studies were carried out with EU co-financing).[19] No further studies have been carried out since 2009. The next step would be the signature of a memorandum of understanding by the governments of Belgium and The Netherlands, but there is no indication at present that negotiations are about to conclude. The Belgian authorities stated the following:

"During the last few years, in particular since the meeting between Belgian and Dutch Ministers on July 4th, 2011, there have been intensive negotiations between the administrations of both countries concerning the execution and funding of the Iron Rhine project. To a lesser extent, Germany has also participated when the discussions concerned the section on their territory or general decisions like electrification. These negotiations have led to a draft for a Memorandum of Understanding (MoU), to be signed between Belgium and The Netherlands. A few matters remain open for discussion, mainly regarding the VAT on works carried out on Dutch territory. The Netherlands want Belgium to pay VAT on the investments we will have to finance on their territory; to our view, based on an in-depth juridical advice, paying VAT would be in contradiction to the Treaty texts and international law on VAT. At the moment, the Belgian Minister of Public Enterprises and Secretary of State for Transport is waiting for the green light of our Council of Ministers to resume the formal negotiations with their Dutch colleagues. A preparatory contact between BE and NL Ministers is foreseen for early February 2014."

"Once the MoU has been signed, trilateral negotiations with Germany will start. These should lead to a trilateral agreement or treaty. Subject to this trilateral agreement, an update has to be performed on the planning and duration of the construction. Based on current knowledge, the modernized line could be put into service 13 years after the trilateral agreement has been reached."

Hence the project is on hold for the time being. It should be noted that it has not been included in the TEN-T core network.

4.1. Methodology and remarks on CBA and project selection

The cost-benefit analysis was carried out by a Belgian-Dutch consortium of consultants appointed by Electrabel, the SNCB infrastructure manager. The CBA report – TML/TNO (2009) – does not outline or comment on the general methodology of the appraisal. There is no reference to a binding national CBA methodology for Belgium or The Netherlands or to any other standard method such as RAILPAG, the Railway Project Appraisal Guidelines of the European Investment Bank. It is only at the level of individual CBA components that reference is made to research and policy publications. As the consortium members TML and TNO are well reputed Europe-wide as transport consultants, the methodology applied is EU

[18] International Arbitral Tribunal (2005): Award in the Arbitration regarding the Iron Rhine ("Ijzeren Rijn") Railway between the Kingdom of Belgium and the Kingdom of the Netherlands, decision of 24 May 2005, in: United Nations: Reports of International Arbitral Awards, Volume XXVII, New York 2005, pp.35-125

[19] Three earlier studies are of interest: (1) Prognos (1991): The Iron Rhine Railway link between Antwerp and the Rhine-Ruhr area, Basel; (2) Tractebel Development n.v. / Technum n.v. / Prognos AG (1997): Study of the transport potential of the Iron Rhine, Final Report, January 1997; (3) ARCADIS (2001): Comparative cross-border study on the Iron Rhine, Draft Report, 14 May 2001

research based and can generally be considered state-of-the-art, notwithstanding certain weaknesses (for example the enumeration of taxes which are transfer payments, i.e. neutral in socio-economic terms).

In the course of our review, we have not identified any significant gaps. However, because the early stage of the project lacks important technical studies, we would tend to qualify this study as on a “prefeasibility” level. The study results do not reflect the impact of the economic and financial crises in Europe since 2008.

Besides a reference scenario, the CBA considers several project alternatives:

1. regarding the alignment:
   a) the rehabilitation of the historic Iron Rhine line between Lier (BE) and Rheydt (DE);
   b) the rehabilitation of the historic Iron Rhine line in Belgium and The Netherlands and a new alignment in Germany along the A52 motorway between the Dutch border and Rheydt;
2. regarding electrification:
   a) for the operation of diesel-powered trains only (no new electrification works)
   b) fully electrified line

The combination of these 2 x 2 solutions yields four alternative options. In addition, two alternative economic scenarios were considered that do not differ in their assumptions about economic growth, but only with regard to transport policies: the alternative economic scenario assumes additional taxation of all modes of transport as well as improvements in the costs and travel times for rail transport. This scenario is only applied in the case of the reference alternative and the historical route with diesel traction.

The identified and estimated external costs include:

- Emissions
- Noise
- Accidents
- External safety
- Recreation
- Vibrations
- Loss of living environment
- Landscape
- Ecology
- Soil and water

This selection of categories of external costs is satisfactory. The result of the CBA is clear: for all four project alternatives, the discounted net present value is significantly negative. More optimistic sensitivity runs do not reverse this result.

No other assessment approaches were applied. The question of a European added value of the project has not been considered.

A separate traffic forecast and a CBA have been carried out for the German section of the project[20] with the alternatives of rehabilitating and upgrading the historical Iron Rhine route (21 km) or constructing a new route along the A52 motorway (28 km). The CBA methodology is the same as the German Federal transport infrastructure plan (Bundesverkehrswegeplanung); it is applied assuming that the Belgian and Dutch sections have been implemented. The main result is a cost-benefit ratio of 1.1 for the A52 alignment (estimated investment cost: EUR 483 million) and of 3.5 for the upgraded historical Iron Rhine route (estimated investment cost: EUR 150 million). The difference results of course from the higher investment costs and the longer route of the first alternative.

As the Iron Rhine project is the revitalisation of an existing railway line, a selection process is not relevant. The political choice will be whether or not to go ahead with the implementation or to postpone the decision to a much later point of time.

4.2. Methodology and remarks on environmental analysis

No environmental assessment has been carried out so far.

4.3. Characteristic of the transport demand scenario and its economic drivers

Three traffic forecasts carried out for the Iron Rhine project prior to the CBA are mentioned in the CBA report:

- Port of Antwerp EOS 2005 study (not available)
- Vervoerprognoses IJzeren Rijn by NEA/UA, April 2007
- Vervoerprognose IJzeren Rijn by TNO/TML, May 2007

The two forecasts arrive at similar transported freight volumes; the volumes forecast by NEA with the University of Antwerp are consistently somewhat higher than the TNO/TML forecasts.

For obvious reasons, the TNO/TML forecast was used in the CBA by the same consortium. The TNO/TML traffic forecast was elaborated in 2006, making use of the TRANSTOOLS model developed for the European Commission. TRANSTOOLS is a multi-modal transport network simulation and forecast model for land-based modes of transport, i.e. rail, road and inland waterways. As TRANSTOOLS uses statistical data for regions according to the EU NUTS classification, the port of Antwerp is part of the Antwerp region (this is a general weakness of the EU NUTS classification system for transport purposes, relating to all major ports in the EU). Because the port of Antwerp is the main single source of cargo for the Iron Rhine, more reliable results of the modelling exercise would have been obtained by separating the port from other regional transport demand generation. Apart from this, we maintain our earlier statement that “the TRANSTOOLS model is still not mature and does not generate reliable data for multi-modal transport planning”[21].

[20] BVU/ITP (2010): Überprüfung des Bedarfsplans für die Bundesschienenwege (Review of needs-based planning for federal railroads), commissioned by the German Federal Ministry of Transport, Final Report, November 2010, pp.9-346 – 9-356

[21] ISI/KIT/ProgTrans (2013): TEN-T Large Projects - Investments and Costs, prepared for the TRAN Committee of the European Parliament, Final Draft, 8 January 2013

For the CBA, an updated transport demand forecasting exercise was developed, again using the TRANSTOOLS model. The methodology and input parameters are described in the CBA report. Rail cargo is modelled separately according to train type (bulk, container, etc).
The main drivers of freight transport demand are the demographic and economic development in the vast hinterland of the Port of Antwerp, in particular in the relevant parts of Germany connected with intercontinental trade. Other factors are less relevant. The Iron Rhine would attract mainly cargo from the existing Montzen route and from road and inland waterways to a small extent.

In the CBA study, two scenarios were selected out of the many variants calculated in the preceding TNO/TML Iron Rhine traffic forecast study. These two scenarios are based on the combination of an economic scenario and a transport policy scenario[22].

- Scenario 2A: This scenario has moderate economic growth and some moderate policy options derived from the European Commission's transport plans.
- Scenario 2B: This scenario also has moderate economic growth. It has more extended transport policy options that assume further effects of the liberalization of the rail market in combination with a toll on European motorways.

The CBA does not contain a sensitivity analysis with alternative socio-economic growth parameters. There have been no recent updates of the transport demand and traffic forecast to reflect the impact of the economic and budgetary crises in Europe. An update is not necessary at the present stage of the project.

4.4. Investment cost and structure of financing

The investment costs have been estimated individually for each country for the CBA. The investment costs in €2007 prices are summarised in Table C4-2 below:

Table C4-2: Estimated investment costs of the Iron Rhine upgrade project

		Total investment costs (in million €$_{2007}$)
Iron Rhine – historical route		
	non-electrified	588
	Electrified	707
Iron Rhine via A52		
	non-electrified	649
	Electrified	751

Source: TML/TNO (2009), p.149.

The authors mention that, according to DB Netz, the Deutsche Bahn infrastructure manager, investment costs in Germany only could be around EUR 900 million rather than the EUR 480 million quoted as part of the electrified route via the A52, i.e. EUR 420 million higher.

22 Annual GDP growth assumptions by country are shown below (copied from TML/TNO (2009), p. 179); they are taken from the EC publication: European energy and transport outlook 2030 – update 2005:

	2020-2005	2030-2020	2030-2005
BE	2,18%	1,55%	1,93%
NL	1,94%	1,45%	1,74%
DE	1,75%	1,03%	1,46%
Total EU25	2.30%	1.63%	2.03%

Only the results of the cost estimates are shown in the CBA report; the calculations cannot be verified.

- As the investment cost estimates are only preliminary, no financial return can be derived.
- It is premature to consider funding options.

The investment figures in Table C4-3 for Belgium are taken from the most recent TENtec database; they seem to be outdated (the figures for 2010 are marked “estimated” and those for 2011 are marked “foreseen”).

Table C4-3: Investments in the Belgian section of the Iron Rhine upgrade project (in EUR million)

	State budget	TEN-T contribution	Total
Total cost	818.59	3.26	821.85
Up to 2008	5.54	2.71	8.25
2009	0.61	0	0.61
2010	0	0.55	0.55
2011	3.92	0	3.92
2012-13	41.08	0	41.08
2014-2020	767.45	0	767.45

Source: TENtec.

4.5. Cost developments over the life-cycle of the project

Not applicable

4.6. Conclusions to be drawn

The Port of Antwerp is one of the main proponents of the project. For Germany, the project is of major importance because of shorter rail transport distances and times, in particular for the Rhine-Ruhr area and the Port of Duisburg.

All the studies carried out for the Iron Rhine project are preliminary. The Iron Rhine project has not yet been submitted to the EU for TEN-T funding. The Iron Rhine route is not part of the core network. This limits the co-funding level by the European Union.

4.7. References

Year	Type	Title
2010	Traffic, CBA	BVU/ITP (2010): Überprüfung des Bedarfsplans für die Bundesschienenwege (Review of the needs-based planning for federal railroads), commissioned by the German Federal Ministry of Transport, Final Report, November 2010, pp.9-346-9-356
2009	CBA	TML/TNO (2009): Social cost-benefit analysis Iron Rhine; commissioned by Infrabel, Final Report, February 2009
2007	Traffic	Commission of independent experts Iron Rhine (2007): Transportprognoses en Capaciteitsplanning IJzeren Rijn - Bevindingen en Advies (Traffic forecasts and capacity planning – Findings and Recommendations), 8 June 2007
2007	Traffic	TNO/TML (2007): Vervoerprognose IJzeren Rijn (Traffic forecast Iron Rhine), commissioned by Infrabel and ProRail, Final Report, May 2007
2007	Traffic	NEA/UA (2007): Vervoerprognoses IJzeren Rijn (Traffic forecast Iron Rhine), commissioned by Infrabel and ProRail, Final Report, April 2007
2005	Juridical	International Arbitral Tribunal (2005): Award in the Arbitration regarding the Iron Rhine ("Ijzeren Rijn") Railway between the Kingdom of Belgium and the Kingdom of the Netherlands, decision of 24 May 2005, in: United Nations: Reports of International Arbitral Awards, Volume XXVII, New York 2005, pp.35-125
2001	General	ARCADIS (2001): Comparative cross-border study on the Iron Rhine, Draft Report, 14 May 2001
1997	General	Tractebel Development n.v. / Technum n.v. / Prognos AG: Study of the transport potential of the Iron Rhine, Final Report, January 1997
1991	General	Prognos (1991): The Iron Rhine Railway link between Antwerp and the Rhine-Ruhr area, Basel 1991

ANNEX 5. HIGH-SPEED RAIL PROJECT STUTTGART-ULM

5.1. Project definitions and project summaries

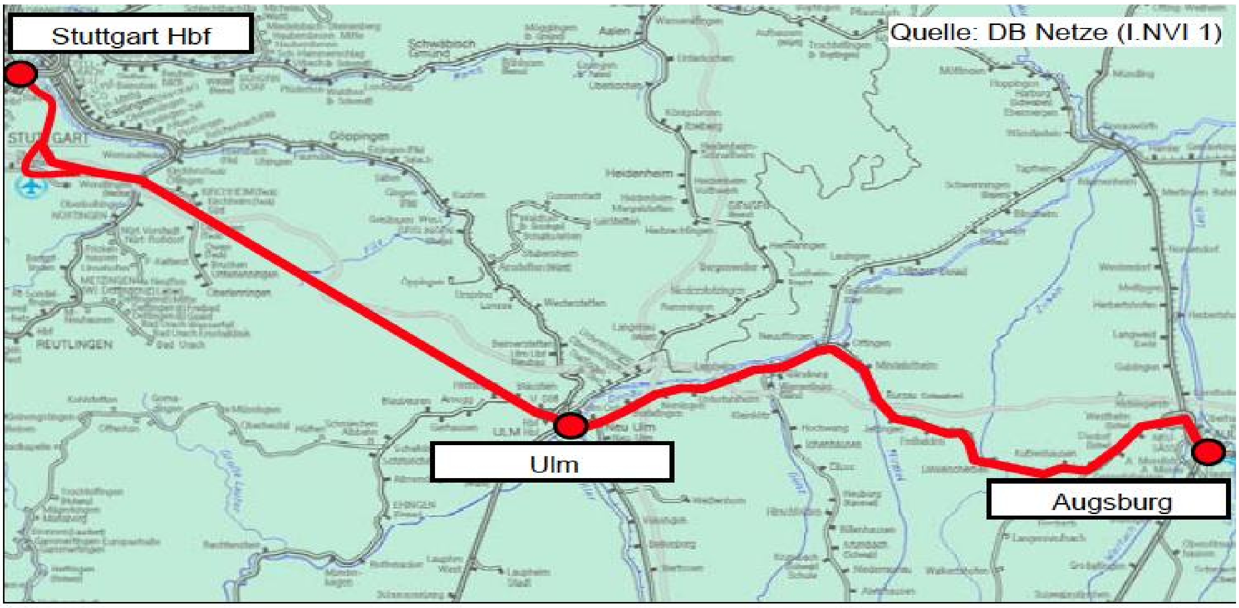
5.1.1. Federal project: Railway link Stuttgart-Augsburg

The federal railway link Stuttgart-Augsburg is a project of the Federal Transport Investment Plan and was re-evaluated by the Federal MoT in 2010. It comprises upgrading the rail link between Augsburg and Ulm (v_{max}=200 km/h), constructing a new HSR link between Ulm and Wendlingen (v_{max}=250 km/h) and implementing the HSR/intercity link between Wendlingen, Airport Stuttgart and the new Stuttgart Central Station. The investment costs are calculated as EUR 3705 million, consisting of

- Augsburg-Ulm EUR 251 million
- Ulm-Wendlingen EUR 2 890 million
- Intercity share of Stuttgart 21 EUR 564 million

For this project a CBA has been prepared by Intraplan and BVU (2010) for the Federal MoT for which the results are given in Table C5-1

Figure C5-1: Railway project Stuttgart-Augsburg



Source: DB Netze.

Table C5-1: Project summary federal railway link Stuttgart-Ulm-Augsburg

Aspect	Description	Aspect	Description
Project Title	Railway project Stuttgart-Ulm-Augsburg: Upgrade Augsburg-Ulm (200 km/h) New HSR Ulm-Stuttgart (250 km/h)	TEN-T code	2007-DE-17200-P 2007-DE-17010-P Etc.
Countries / area	Germany	Start date	2012
Mode(s)	Rail	End date	2021
Managing authority	DB Projekt Stuttgart-Ulm GmbH	Duration	10 years
		Delay (mth)	
Included in TEN-T	Part of PP17 included in 2004	TEN-T element	Core network
Investment cost (m€)	3 705	Length (km)	155 km
EC funding TEN-T (m€)	216 for budget 2007- 2015	EC share	13% for budget 2007-2015
Funding 1	Federal budget	Value (m€)	3445
Funding 2	State budget, pre-finance of 950 mill. €	Value (m€)	(950)
Funding 3	Deutsche Bahn AG	Value (m€)	150
Cost-bene-fit-analysis	Standard CBA of Federal Transport Investment Planning for parts under federal responsibility	CBA ratio	1.5
		Public y/n	Y
Transport scenario	Intraplan/BVU on behalf of the MoT	Dated from	2010
Externality Covered	Yes	Ext. cost (m€)	246
EIA	Air pollution, noise, climate	Public y/n	(Y)
CIA	Included in EIA	Public y/n	
Financial analysis	Disc. Benefits: 3670 Discounted costs: 2531	Payback / EIRR	
		FIRR / SDR	
Ex-post evaluation	-	Cost overrun (m€)	-

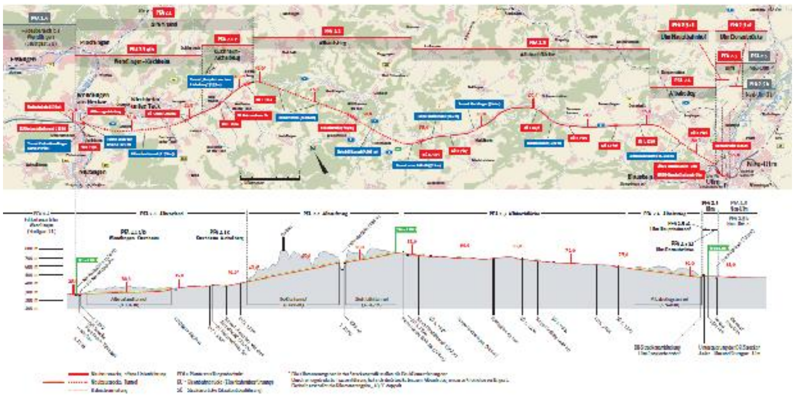
Source: Own compilation.

5.1.2. Mixed federal/regional/city railway project Stuttgart-Ulm

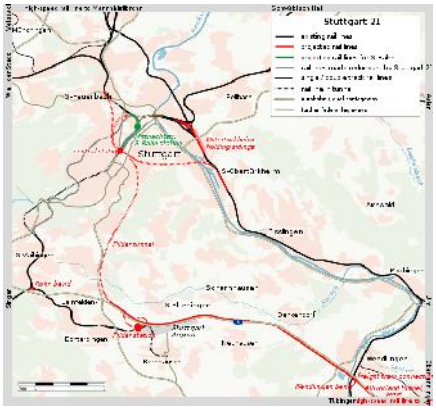
The railway project Stuttgart-Ulm, which is the most heavily debated rail project in Germany, consists of the HSR link Ulm-Wendlingen (the major section of the federal project Stuttgart-Augsburg, see above) and the mixed federal/regional/city project Stuttgart 21. The link Ulm-Wendlingen was evaluated by a standardised CBA within the federal project Stuttgart-Augsburg in 2010 (see section 1.1). The urban rail links (without the planned railway stations) were evaluated in 2006 by means of the standardised evaluation scheme for urban transportation projects. This evaluation scheme uses a multi-criteria approach of which a CBA is one element, but not comparable to the federal evaluation approach, such that the regional/urban CBA-results cannot be added to the federal results. For the comprehensive railway project Stuttgart-Ulm, consisting of the two constitutive parts, a macro-economic evaluation has been prepared on behalf of the State Ministry of Interior Affairs by IWW et al. (2009). These characteristics indicate that the railway project Stuttgart-Ulm is a most complex project, consisting of various components and evaluated by different methodologies for different public and private bodies. Therefore the description of the project will start by expounding the historical background beginning with the original ideas of the promoters in the early 90s, followed by explaining the reasons for the increasing resistance of particular stakeholders before and after the start of the construction work.

Figure C5-2: The railway project Stuttgart – Ulm

HSR link Ulm-Wendlingen



Stuttgart 21 project



Source: Deutsche Bahn AG.

Table C5-2: Project summary Railway Project Stuttgart-Ulm

Aspect	Description	Aspect	Description
Project Title	1. New HSR Ulm-Wendlingen (250 km/h) 2. Stuttgart 21 (Intercity, regional, urban links, 3 stations incl. a new under-ground Central Station & a new Technical Service Station)	TEN-T code	
Countries / area	Germany	Start date	2010
Mode(s)	Rail	End date	2021
Managing authority	DB Projekt Stuttgart-Ulm GmbH established in 2013	Duration	11 years
		Delay (mth)	
Included in TEN-T	Included in TEN-T as PP17 in 2004 (only intercity parts)	TEN-T element	Core network
Investment cost (m€)	9390	Length (km)	70+30 km
EC funding TEN-T (m€)	216 for budget 2007-2015	EC share	13% for budget 2007-2015
Funding 1	Federal budget	Value (m€)	3240
Funding 2	State budget (of which 950 are pre-finance)	Value (m€)	2110
Funding 3	Region and City of Stuttgart	Value (m€)	390
Funding 4	Deutsche Bahn AG	Value (m€)	3450
Funding 5	Stuttgart Airport	Value (m€)	230
Cost-benefit-analysis	Standard CBA of Federal Transport Investment Planning	CBA ratio	1.5
		Public y/n	Y
Transport scenario	Intraplan/BVU on behalf of the MoT IWW et al. on behalf of the State Min.	Dated from	2010
Externality covered	In the single parts	Ext. cost (m€)	
EIA	For the single project parts	Public y/n	(Y)
CIA	Included in EIA	Public y/n	(Y)
Financial analysis	Applied for the public budget	Payback / EIRR	55 years for 2.5% inter. Rate
		FIRR / SDR	
Ex-post evaluation	-	Cost overrun (m€)	-

Source: Own compilation.

The intercity link Augsburg-Stuttgart-Ulm is part of the TEN-T corridor P17 (TEN-T definition of 2004) and TEN-T core network corridor 9 (Rhine-Danube, definition of 2013).
In the following we briefly summarise the characteristics of the railway project Stuttgart-Ulm. As the heavy debate about the project and the protest movements against it can only be understood after a comprehensive description of the history and the particular specificities of the project we add an appendix which gives more detailed information.

5.2. Summary of impact assessment and evaluation

5.2.1. Methodology and remarks on CBA and project selection

a) Railway project Stuttgart-Augsburg

The link Stuttgart-Augsburg, including its major component Stuttgart-Ulm, has been evaluated using the standardised CBA methodology of the Federal Transport Investment Planning. This methodology comprises 9 benefit criteria (including among others time, operation costs, infrastructure maintenance and external costs), which are measured according to the with/without principle for a project. Furthermore, the methodology foresees checking the projects with respect to their spatial impacts and their environmental risk. For these criteria non-monetary scoring is applied.

The transport input data are generated by a multi-modal transport forecast for passenger and freight transport. The overall assessment approach is consistent with the EU assessment guidelines. The large number of criteria, which grows even more complex by the definition of many sub-criteria, leads to the problem that several criteria/subcriteria are measured through similar impact indicators, predominantly by transportation time or cost. Although small time savings are partly eliminated by a slack function there still remains the problem that relatively small time savings are multiplied by large transportation figures, in particular in road transport, such that monetised time savings dominate the picture of CBA. Due to the double counting of time savings in several criteria the benefits can grow large with the result that the German CBA produces outcomes, which cannot be compared to private business profitability rates. This means that high benefit-cost ratios - of 10 and more - can occur such that a threshold value of 3 (in the last plan even 4) had to be applied to adjust the investment programme to the available public funds.

The benefit-cost ratio of 1.5 of the project seems modest but one has to keep in mind that the time savings for many user groups are comparatively large and can substantially affect the activity programmes of people and generate wider economic impacts.

b) Urban public transport links of Stuttgart 21

Urban components of the overall investment have been evaluated by the standardised evaluation method for public urban transport projects (developed by the University of Stuttgart and Intraplan (2006)). This method clusters the measured impacts of a project into

- Monetary effects
- Effects which can be monetised
- Non-monetary effects.

The first two impact categories are summarised by a CBA for which the threshold is set > 1.

c) Railway project Stuttgart-Ulm

The railway project Stuttgart-Ulm, which consists of the HSR link Ulm-Wendlingen and the mixed federal/regional/urban project Stuttgart 21 (exact definition given in the appendix) has been evaluated by a macroeconomic approach by IWW et al. (2009), in a study launched by the State Ministry of Interior Affairs. The focus was on the wider economic benefits as the standardised CBA methods had been applied to the federal and urban components with a positive result. Two methodologies have been applied: First a regional production function was constructed in which an accessibility indicator was integrated in addition to the production factors labour and capital. The parameters of this function were estimated by a statistical cross section analysis for all EU NUTS 3 regions plus Norway and Switzerland. Secondly a regional “quasi production function” was defined with regional potential factors as explanatory variables. Regional infrastructure quality, education level, environmental quality and cultural attractiveness were defined as potential factors and estimated by a cross section analysis for the NUTS 3 regions. Regions for which the actual GVA was greater than the potential GVA were investigated for overused potential factors such that regions could be identified for which infrastructure quality came out as a bottleneck factor for development. The second methodology led to lower results with respect to estimated additional regional GVA and additional employment induced by the transport investment. Additional aggregated GVA for Baden-Württemberg came out between EUR 440 and 530 million per year after the realisation of the project, and the additional employment as 8,000-9,500 permanent jobs. The impacts of the alternative use of 106 ha of land which is presently covered by the dead-end station and its access links was estimated to deliver 2 600 permanent jobs. According to the consultant Srf, Vienna University, this effect should be added while consultant IWW, Karlsruhe University, argued that this effect is a part of the overall estimated impacts so that adding it up would lead to double counting.

5.2.2. Methodology and remarks on environmental analysis

EIA has been applied for the two project components separately, but not SEA. External costs of the environment have been considered in the standardised evaluations for the two project components. VWI, Technical University of Stuttgart, estimated the climate impact for the comprehensive railway project Stuttgart – Ulm and ended up with 177,000 saved tons of CO_2 per year. A full CIA has not been carried out.

5.2.3. Characteristics of the transport demand scenario and its economic drivers

Transport demand scenarios have been performed

- for the federal intercity/HSR project Stuttgart-Augsburg by Intraplan and BVU (2010)
- for the regional and urban transport links by VWI (2006)
- for the comprehensive railway project Stuttgart-Ulm by IWW et al. (2009).

For the federal project different assumptions have been tested:

- realisation/non-realisation of a competing network project,
- lower transport development (-15% of original transport figures due to the economic crisis).

For the regional and urban project components no alternatives were investigated after the principle decision in favour of the project was made and neither a sensitivity nor a risk analysis has been performed. The third comprehensive project has not been analysed for alternative transport developments, e.g. for upper, middle and lower values of critical parameters. The impacts of the economic crisis have been considered. A sensitivity analysis has been performed for alternative investment costs.

5.2.4. Investment cost and structure of financing

Investment costs have been estimated by Deutsche Bahn AG. For the railway project Stuttgart-Ulm these estimations showed a dynamic increase:

- estimation for the financial agreement 2009: EUR 3 billion for Stuttgart 21 and EUR 2.1 billion for the HSR link Wendlingen-Ulm; financial reserve of EUR 1.5 billion.
- estimation end of 2009: EUR 4.5 billion for Stuttgart 21 and EUR 2.89 billion for the HSR link Wendlingen-Ulm
- estimation end of 2012: EUR 6.5 billion for Stuttgart 21 incl. financial reserves and EUR 2.89 billion for the HSR Wendlingen-Ulm (EUR 3.2 billion incl. escalation/inflation).

In addition to this cost volume “political costs” have occurred through the construction delay which account for about EUR 300 million. Therefore the recent cost estimate for the comprehensive project Stuttgart-Ulm is EUR 9.4-9.7 billion.

The federal part of the project, the HSR link Wendlingen-Ulm, is financed by the Federal Government, the State of Baden-Württemberg (pre-finance to achieve an earlier start), the Deutsche Bahn AG and the European Commission (EUR 101.5 million for the budget 2007-2015).

The regional/urban part, Stuttgart 21, is financed by the Federal Government, the State of Baden-Württemberg, the city of Stuttgart, the Association of Stuttgart regions, the Airport Stuttgart Company and Deutsche Bahn AG. Eu co-finance for the budget 2007-2015 is EUR 114.5 million. Detailed figures are given in the appendix. Until now no agreement has been achieved with respect to financing additional costs compared with the financial agreement of 2009.

The study on macroeconomic impacts was carried out under the assumption that the total cost of the project was estimated at EUR 5.1 billion. Under this assumption the pay-back period for the public capital invested was calculated at 20 years for a real interest rate of 3.5%, putting in the forecasted macroeconomic impact of EUR 440 million of GVA per year. This was evaluated to be a positive performance for a large scale public project. After the substantial changes to cost calculations, increasing the cost budget from EUR 5.1 to 9.4 billion, revised calculations have been performed for the communication bureau of the project Stuttgart-Ulm. The results show that an investment in this order of cost magnitude can only pay back if the real interest rate is set below 3%. For instance, if the real interest rate is fixed at 2.5% then the pay back period will be about 55 years.

This raises the question of the appropriate rate of social discount. Before the crisis relatively high growth rates of the economy had been expected which relates to higher rates of social discount. After the crisis the growth expectations for industrialised countries have been decreased. Furthermore, there are economic arguments that the long-term environmental benefits of projects should be excluded from discounting. If such considerations are accepted then the Stuttgart-Ulm project can be still economically viable in the long run.

5.2.5. Conclusions to be drawn

The railway project Stuttgart-Ulm is a highly complex project because of the multiple and interdependent impacts for intercity, regional and urban transport, the technical requirements in topographically and geologically difficult areas, the distributed planning competences and financial responsibilities. It has a long planning history which reveals that the specification of the project design was already decided in an early phase while ruling out realistic alternatives at a time when the knowledge base was still incomplete. After the decision on Stuttgart 21 in 1996 only one concept was followed and the main concern was to bring the project through all parliamentary barriers and to establish the partnerships for finance. While all parliamentary decisions have been taken with a large majority, because the Christian Democratic, Liberal and Social Democratic parties were in favour, there was a growing opposition, which tried to bring in constructive suggestions for project change at the beginning of the planning process and expanded into massive protest movements when the construction work started in 2010. Although a “referendum” (in the legal sense it was an opinion survey), which was held in the fall of 2011, came out with an unexpectedly high endorsement of the project (59% in favour) by Baden-Württemberg’s citizens, the project is still critically observed by the now ruling Green Party, opposing NGOs and informal stakeholder groups.

The strengths and weaknesses of the project from the viewpoint of the consultant team are summarised below.

Strengths

(1) The railway project Stuttgart-Ulm has been treated as an integrated and comprehensive project by the state BW authorities from the beginning, fragmentation has been avoided, synergetic effects have been considered.

(2) All economic evaluations of the project components were positive, based on the configuration of figures, incl. financial figures, of 2009/2010.

(3) The project generates a step-change of attractiveness for regional and intercity passenger transport and increases the capacity for freight transport.

(4) The project gives a chance for city development in the central city area in an order of magnitude of 106 ha of land gained after substituting the dead-end station at grade by a through-bound underground station.

(5) Financial agreements have been taken including a number of involved parties on the public and semi-private side (publicly owned private enterprises).

(6) A responsible project company was established in 2013.

(7) The project is integrated in the context of European TEN-T network planning and a part of TEN-T corridors 2004 and TEN-T core network corridors 2013.

(8) Information for the public has been provided by an exhibition in the tower of the main entrance building of Stuttgart central station ("Turmforum") since 1998.

Weaknesses

(1) After the decision on Stuttgart 21 no alternative configurations have been investigated by federal or state authorities since 1996.

(2) Planning was not prepared in enough detail to generate reliable figures on necessary actions (e.g. groundwater management, rough reference cost values for construction work), which resulted in most optimistic figures on project costs.

(3) Project costs had to be re-estimated several times, starting with EUR 5.1 billion (financial agreement 2009) and (not?) ending with the present estimation of EUR 9.4-9.7 billion.

(4) Evaluation of the project was scattered according to the planning competence of the main partners. There was no integrated approach for evaluating the comprehensive project with a standard CBA. A macroeconomic evaluation has been performed focusing on the wider economic benefits which is helpful as an additional element of evaluation but should not substitute a standard CBA.

(5) There was no integrated approach for financial analysis because the leading company Deutsche Bahn AG insisted on their status as a private stockholding company and did not allow inspection of the private financial figures. A project company has been established three years after starting construction work which seems much too late.

(6) The public authorities focused primarily on the formal administrative challenges and on preparing the complex agreements with the involved partners, neglecting to continuously inform other stakeholders and the public.

(7) Interested stakeholder groups have not been integrated and their suggestions were not taken up concerning alternative configurations of the central station, better environmental integration and design according to security and social requirements.

(8) Deutsche Bahn AG had not prepared detailed planning of operation schedules, arguing that such planning would come after making the decision on investments, such that massive criticism on the presumed capacity increase and warnings with respect to potential bottlenecks were brought forward by the project opponents, which were well founded.

The argument of opponents to the project that there will be no benefits for freight rail transport will be treated in the appendix.

References will be given at the end of the appendix.

Appendix 1: Background information on the railway project Stuttgart - Ulm

A1. History of the Stuttgart Central Railway Station and the railway link Stuttgart-Ulm

A1.1 History of the Stuttgart Central Railway Station and present situation

The first Stuttgart Central Station was established with four rail tracks in the year 1845 together with the first railway links in the former Kingdom of Württemberg to the North, South and East. It was located in the middle of today's city centre and was a barrier to the development of the city in the early 20th century. Against the background of rapidly increasing railway traffic the decision was taken in 1907 to move the Central Station to another location and to increase its capacity. A number of alternatives were investigated, as for instance to move the station to Bad Cannstatt (4 km from the present location with much easier access) or to construct a through-bound station with underground access because of the difficult topographical location of the City of Stuttgart at the bottom of a valley. Finally it was decided to construct a dead-end station outside the city gate ("Königstor") and to remove the latter. The famous architects Bonatz and Scholer were charged with the design of the buildings for a new Central Station with 16 railway tracks. The first part was opened in 1922 and the second part in 1928. The buildings were partly destroyed in World War II and re-constructed according to the original design. The development of the city road system around the downtown area separated the station from the city centre, visually and physically, which has been criticised by city planners. Nevertheless the station building of Bonatz and Scholer was regarded an architectural master piece.

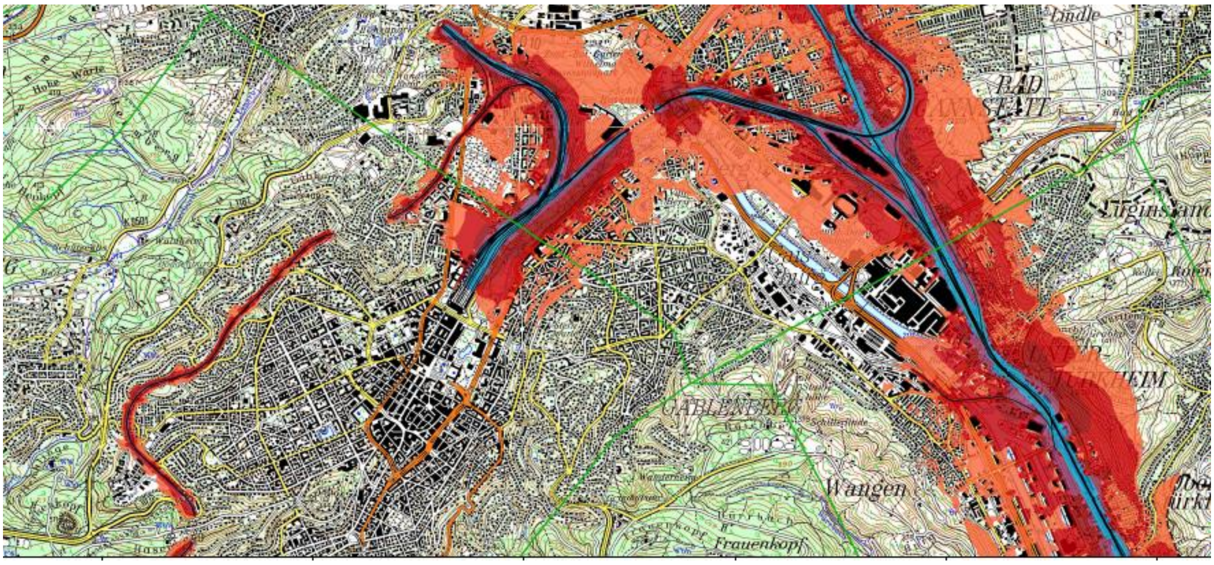
The dead-end station was constructed in a park area comprising a part of the castle gardens and a part of the Rosenstein Park with a land take of altogether 106 ha. The access rail links to the station separated the park area furthermore and the increasing traffic on the access links including the railway bridge crossing the river Neckar between the Central Station and Bad Cannstatt caused pollutant emissions and noise intrusion (see Figure C5-3). But such environmental considerations played only a small role in the 1920ies and 1950ies. A dead-end station was also regarded a good operational solution because the terminals in large cities were used for changing locomotives and personnel. The steam locomotives used at that time needed refilling with water and coal such that changing locomotives was a necessary operational activity and the waiting time for passengers caused by the change of locomotives and drivers did not appear to be a big disadvantage in particular for Stuttgart where most of the passengers started or ended their intercity journey (see footnote 2).

Presently Stuttgart Central Station is equipped with 16 tracks at grade and 2 tracks underground for the S-Bahn. The number of rail passengers is about 240 thousand per day or 87 million per year. Although it is located in a corridor between Frankfurt and Munich the share of intercity transit and passengers, who are changing trains, is only around 30% while 70% of the passengers start or terminate their intercity rail trip in the Stuttgart region.[23] Therefore the interconnection with the regional and urban transport systems is

[23] When the decision was taken in favour of a dead-end station in the 1920s, this share was as high as 95%.

most important and with this regards the Central Station is well integrated into the regional, S-Bahn , and U-Bahn systems such that a change to these systems is possible within or close to the station area ("Klett-Passage").

Figure C5-3: Noise emissions alongside the railway access tracks to Stuttgart Central Station



Source: Deutsche Bahn AG

A1.2 History and present state of the railway link Stuttgart-Ulm

This link with a length of 94 km was part of the so-called "Eastern railway corridor" between Heilbronn, Stuttgart, Ulm and the Lake Constance. It was opened in 1850 for one track and in 1862 for two tracks. It was electrified in 1933 and extended to 4 tracks in the Stuttgart region up to Plochingen. In the year 1970 the link Stuttgart-Plochingen was one of the busiest railway corridors in Germany with a traffic volume of 430 trains per day. On the link between Plochingen and Ulm the traffic volume was also high with about 300 trains per day. A main barrier to modernisation was and still is the steep gradient between Geislingen and Amstetten ("Geislinger Steige") to climb the Swabian Alb (582 m of altitude with a gradient of 22.5 o/oo).

In the first decades passenger trains had to be pulled and pushed by two locomotives which is still the case today for freight trains. Because of the narrow curvature (radius of 278 m) the maximum speed at the "Geislinger Kurve" is 70 km/h. Therefore the travel time between Stuttgart and Ulm is 60 min. by IC and 55 min. by ICE trains and the average speed is 94 or 102 km/h, respectively, which is a very low standard for intercity rail transport.

A2. History of the plans for a new Stuttgart Central Station and a high-speed link Stuttgart-Ulm

In contrast with other countries the planning competence in Germany is with the Federal Government for the federal railway network and with the Federal States for railway stations and interconnections between federal, regional and local networks. Therefore it was natural that the two projects were planned by different authorities although there is a strong interface between them and the macroeconomic evaluation study treated the two major components as one integrated project.

A2.1 New Stuttgart Central Station and access links (Stuttgart 21)

Discussion of a new Central Station in Stuttgart was initiated in 1988 by a study by Prof. Heimerl (University of Stuttgart) who suggested constructing a new intercity railway station under the existing dead-end station and to use the latter after re-designing it for regional and local trains. Heimerl planned 4 tracks for intercity trains with the associated access links underground according to the so-called Zürich model for which the planners had developed a similar concept for separating the operations of intercity and regional/local trains. This provides a good interconnection between both local and intercity trains for passengers and the possibility of synchronised time tables.

At the same time a number of alternatives have been discussed, as for instance to extend the existing dead-end station or to move the Central Station to the north (Rosenstein). This was a low cost solution with a connection to the existing long-distance railway line (no connection to Stuttgart airport) but like the Heimerl model it did not meet the visions of city politicians and planners who were interested in re-designing the whole station area and in re-structuring the land-use in the inner part of the city because the central city development had meanwhile reached the station area.

The city of Stuttgart strongly promoted the idea of building a completely new Central Station underground (not only the intercity part) such that after removing the dead-end station and its access links an area of 106 ha which was covered by the dead-end station could be used for further developing the city centre. Influential real estate agents supported this idea and promised that a substantial part of the costs could be recovered by selling the land to investors. The costs for the station and its access links were calculated at EUR 2.5 billion in 1995 while the revenues from land sales were estimated at EUR 1.1 billion. Furthermore, Deutsche Bahn AG expected high cost savings for re-investment for the ramps and switches as well as for signal control installations in front of the station, which would become necessary in the case of no-investment. Framework agreements were signed on that basis at that time between the public partners and the Deutsche Bahn AG which later became legally relevant when project opponents went to court.

Deutsche Bahn AG (which was established in 1992 as a private stock holding company owned by the Federal State) originally agreed with the plan to build an underground station and acted as partner of the framework agreements. After a change of CEO in 1997 the company changed its position, found the project too expensive and stopped the planning process. It was also found that the HSR link Stuttgart-Ulm did not have first priority. A further change of CEO in 1999 lead to a revival of the project after the state of BW had agreed to contribute to financing the project. Opponents of the project suspected that the state government of BW had influenced the positive decision by the Deutsche Bahn by offering favourable conditions for a long-term contract on regional transport service. Nevertheless, the poor situation for the public budgets on the federal and the state level caused a three year-phase of financial negotiations which ended with the signing of a financial agreement between 6 partners in 2009: Federal Government, State Government of BW, City of Stuttgart, Association of Communities of the Stuttgart Region, Stuttgart Airport Company and Deutsche Bahn AG.

While the costs were estimated at EUR 3 billion in early 2009, the agreement has already foreseen an upper limit of EUR 4.5 billion which shortly afterwards became the relevant cost figure following a revision of cost estimates at the end of 2009. Three years after the start of construction in January 2010 the cost estimation was revised again to EUR 6.5 billion which includes all costs of delays caused by the interruption of project works in

2010/2011 but is in the first instance caused by a more detailed and careful cost analysis of Deutsche Bahn AG.

Box A1: Chronology of the planning of Stuttgart 21

- Study by Prof. Heimerl: 1988
- Official presentation of project idea: 1994
- Agreement of partners (Fed., State, City, Region, Deutsche Bahn AG): 1995
- Start of planning process: 1996
- 1997 Central Station: Decision of a jury in favour of the design of architect Christoph Ingenhoven
- Interruption by DB AG 1997 after new assessment
- Resuming negotiations by the end of 1999
- Agreement on pre-financing by the State BW, 2001
- Start of legal approval process in 2001, end in 2006 for relevant parts
- Agreement of Federal Government for co-funding 2005
- Negotiations between all partners on finance 2006-09
- Signature of Financial Agreement Jan. 09 (Partners: Federal Government, State Government BW, City of Stuttgart, Association of Communities of the Stuttgart Region, Stuttgart Airport Company, Deutsche Bahn AG); estimate of financial needs: EUR 3 billion without risk, upper limit EUR 4.5 billion incl. risk.
- Revision of cost estimates Nov. 2009; estimate of financial needs: EUR 4.5 billion incl. a financial reserve for risks, corresponding to the upper limit of the financial agreement
- Start of construction work Jan 2010
- Interruptions 2010/2011
- Revision of cost estimation in December 2012: EUR 6.5 billion incl. risk excl. political costs

A2.2 HSR link between Stuttgart and Ulm

Because of the poor service quality of the link Stuttgart- Ulm the Federal Transportation Investment Plan of 1985 had foreseen an HSR connection Stuttgart-Ulm to complement the HSR link Mannheim-Stuttgart, which was under construction at the time (opened in 1991). Deutsche Bahn AG favoured a combined solution for passengers and freight (as had been planned for the first German HSR links Hanover - Würzburg and Mannheim – Stuttgart), named K-variant after the name of its developer, DB engineer Prof. Ernst Krittian). Contrasting to this K-variant Prof. Heimerl from the Technical University of Stuttgart presented a plan (so-called H-variant) in 1988 to construct a HSR only for passenger and light freight transport alongside the existing motorway with less tunnels and bridges at the costs of much higher gradients (up to 25 o/oo).

In 1992 the State Government BW and Deutsche Bahn AG decided in favour of the H-variant because it appeared to be a much less costly and less risky solution. This is because the Swabian Alb consists geologically of limestone formations which are perforated by underground creeks and caverns such that it provides high challenges and risks for the engineering works. The H-variant minimises the length of tunnels in the geologically most difficult area and follows the motorway for the sections at grade such that it also minimises environmental intrusion. The disadvantage that it would not be possible to operate heavy freight trains on the HSR link appeared not too serious after the experiences of the two first

combined German HSR links which were not encouraging. Furthermore, the link Stuttgart-Munich does not lie in a busy rail freight corridor.
Although the HSR link is a project of the Federal State, the State of BW has agreed to pre-finance the project such that it could be started earlier than possible according to the federal budget plans. The process of legal approval started in 2006 and is still continuing for some sections. Nevertheless construction works began in 2012 and major tunnel works are being prepared at the beginning of 2014.

The costs of the project were planned at EUR 2 billion in the financial agreement of 2009 which was increased in 2012 to EUR 2.89 billion or EUR 3.2 billion incl. escalation. As this estimation was given before the main tenders were processed it is unclear whether this order of magnitude can be regarded as the upper limit, in particular because of the difficult geological area.

A2.3 Project Management Company

Against the background of the dramatic cost evolution Deutsche Bahn AG established a new project management company in August 2013. The "DB Projekt Stuttgart-Ulm GmbH" will be responsible for both project parts and is expected to co-ordinate, improve and simplify the complex planning processes and streamline the risk and contract management.

A3. Components of the railway project Stuttgart-Ulm in more detail

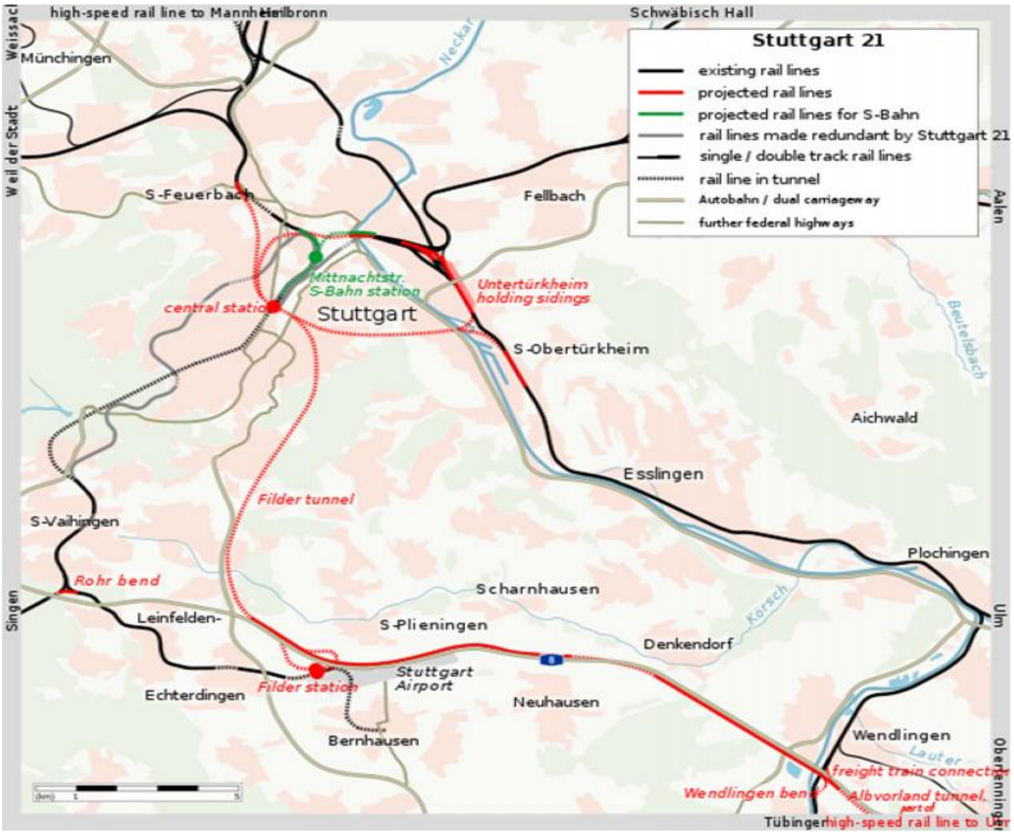
A3.1 Stuttgart 21

The project Stuttgart-Ulm consists of two main components: Stuttgart 21 (S 21) and the HSR link Wendlingen-Ulm. The first component S 21 is illustrated in Figure C5-4. It consists of the following sub-components:

- a new through-bound underground central railway station
- changed and upgraded regional railway links and underground access to new central station
- new airport railway station
- new downtown metro station
- re-configuration of holding sidings
- land-use planning for free area of the abolished dead-end station at grade.

The complexity of the whole planning design is underlined by the following two figures exhibiting the planned railway lines for accessing the new underground station and the disposable area of the existing dead-end station.

Figure C5-4: Rail Network Components of Stuttgart 21



Source: Deutsche Bahn AG.

The components of the rail network construction work are:

- 57 km of new tracks
- 20 km of new tracks for HSR (red lines in Figure C5-4)
- 33 km of tunnels (altogether 16; dotted lines in Figure C5-4))
- number of new passenger railway stations: 3
- number of new sidings: 1

The new railway stations are:

- underground central station
- underground station Stuttgart Airport (Filderstation)
- underground S-Bahn station Mittnachtstrasse.

The Central Station will be linked through a ring system to all interregional and regional rail networks. HSR will be aligned from Wendlingen (the point of connection with the HSR link Wendlingen-Ulm) to Stuttgart Airport with the possibility to connect the airport through access links and followed by a 7 km tunnel to the Central Station location. The HSR and intercity connection to the north is planned through a tunnel from the station to Stuttgart-Feuerbach where it connects with the HSR link to Mannheim.

Figure C5-5 illustrates the planned change of land-use in the area around the new underground station. The reclaimed land is encircled by a yellow line.

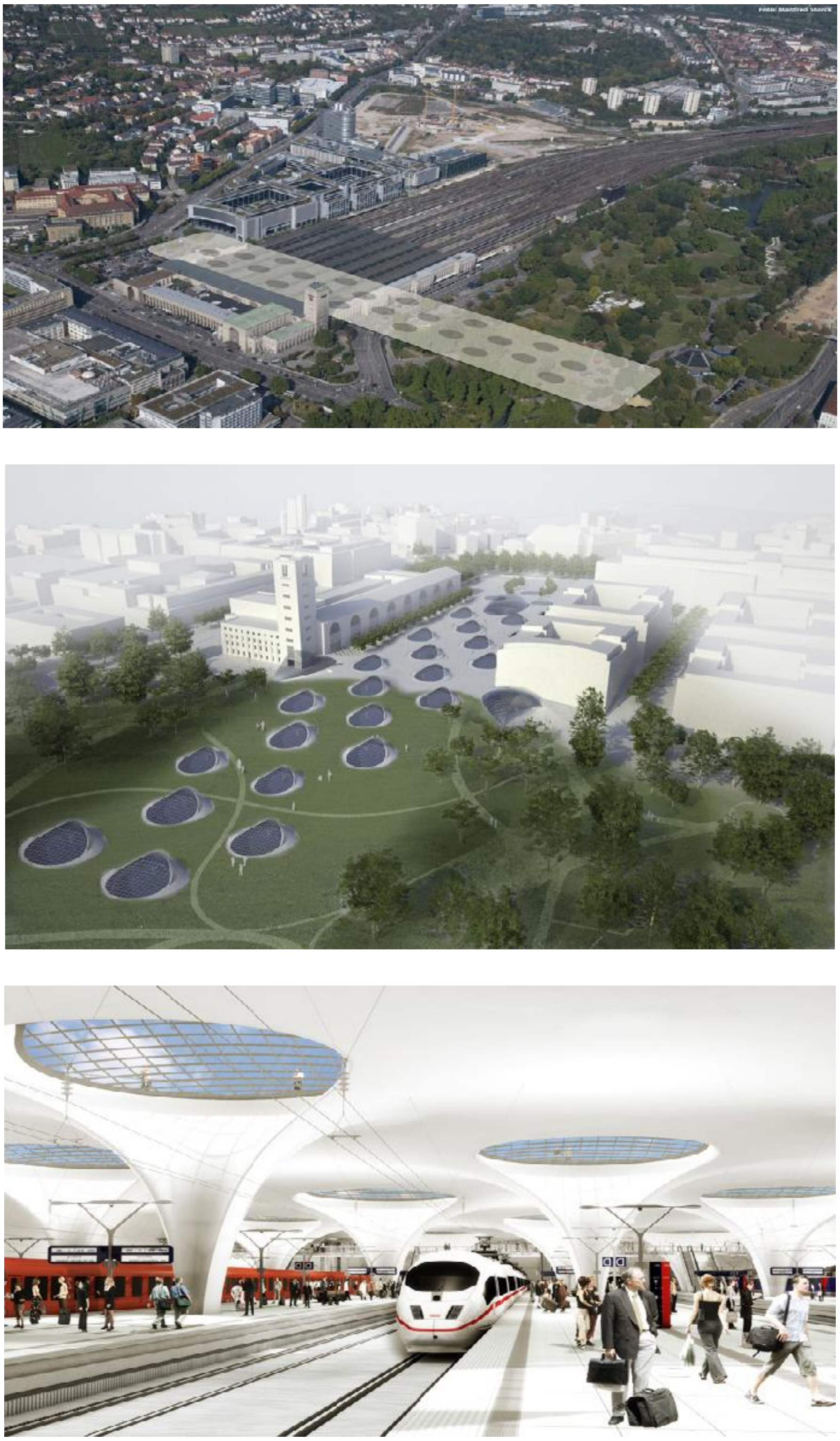
Figure C5-5: Gained area after abolishing the Stuttgart dead-end station

Source:
https://www.google.de/search?q=Stuttgart+21&tbm=isch&tbo=u&source=univ&sa=X&ei=SmKAU4rIOtP64QSxjYHAAg&ved=0CHUQ7Ak&biw=2560&bih=1270

The dead-end station covers an area of 106 ha which after abolishing the rail facilities can be used for city development. According to the original plans about one half of this area was planned for residential and business purposes while the other half was planned for the extension of the park area. The land-use plans could already partly be realised after removing the freight station (area north-west to the passenger station in Figure C5-5, “Europaviertel”). According to the city planning office a new residential area for altogether 11,000 inhabitants could be provided and new business areas offering workplaces for 24,000 employees, close to the centre and with perfect access to all urban, regional and interregional public transport services.

The project promoters regard the design of the Central Station, developed by architect Christoph Ingenhoven, as most innovative and a symbol of the innovative power of the region, its industry and its inhabitants. The upper picture of Figure C5-6 shows the location of the station which is rotated by 90 degrees compared to the present track direction. The rail tracks are planned 11 m under the surface. The roof at the surface is interspersed with bull-eye panes such that daylight can illuminate the underground building. The middle picture of Figure C5-6 illustrates how the station roof is integrated into the park area. It is foreseen that people can walk on the roof and walking paths will cross the building. The main station hall designed by architect Bonatz in the 1920s will be preserved and serve as an entry hall, while two side buildings (northern and southern wings) will be removed. The lower picture depicts the interior space of the station with the railway platforms and installations. It underlines the architect’s aim to create a lucid, transparent and attractive atmosphere for the users, which is in harmony with the high tech train technology which will be operating in the station.

Figure C5-6: Design of the planned underground Central Station in Stuttgart

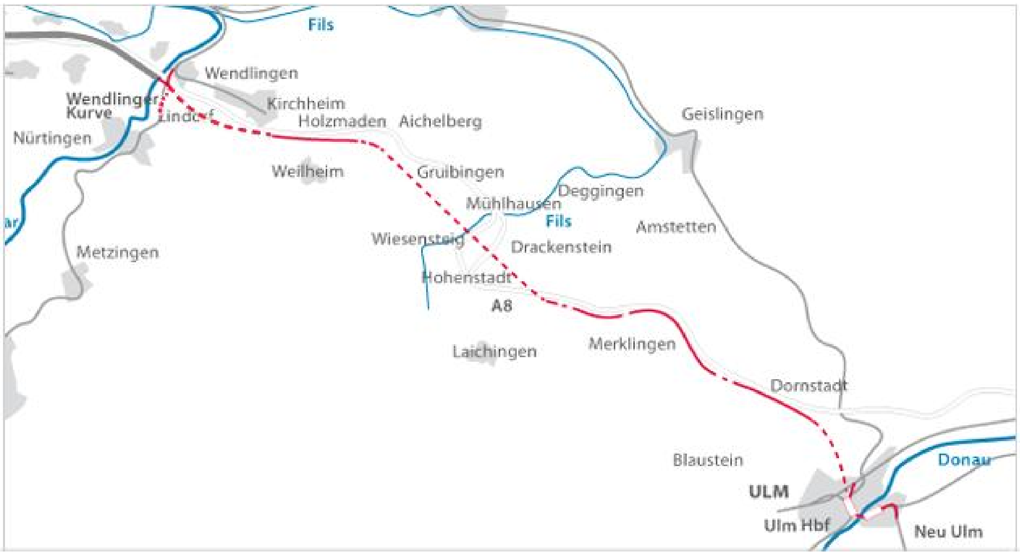


Source:
https://www.google.de/search?q=Stuttgart+21&tbm=isch&tbo=u&source=univ&sa=X&ei=SmKAU4rIOtP64QSxjYHAAg&ved=0CHUQ7Ak&biw=2560&bih=1270

A3.2 HSR Wendlingen-Ulm

The HSR Wendlingen–Ulm passes the steep gradient of the Swabian Alb hills by tunnels and follows the guide way of the motorway A8 in the sections at grade, see Figure C5-7.

Figure C5-7: HSR Wendlingen-Ulm



Source: Deutsche Bahn AG.

Some parameters of the link:

- length: 60 km
- length of tunnel links: 30 km (length of pipes 60 km)
- railway crossings: 17
- road crossings: 20.

The design speed for HSR is 250 km/h. The maximal gradient is 25 0/00 such that only passenger and light freight trains can use the link (gradient of the access ramp to the Central Station is 35 0/00).

A4. Expected impacts on the railway transportation system

A4.1 Time gains of users

In the context of the macro-economic evaluation of the railway project Stuttgart-Ulm IWW et al. (2009) have modelled the change of transportation times for the users for Baden-Württemberg, Germany and the neighbouring European regions. Naturally the main time savings are calculated alongside the corridor Stuttgart-Ulm-Augsburg. But also the corridors Stuttgart-Singen and Ulm-Friedrichshafen/Lake Constance show high time savings. This is because it has been assumed that also the plans to upgrade the latter railway corridors are realised such that synergy effects occur. All in all about 75% of inhabitants of Baden-Württemberg can enjoy direct benefits from the main and supplementary projects as railway users. Other regions of Germany, like the Bavarian corridor between Neu-Ulm and Munich or the Rhine corridor also benefit (see Figure C5-8).

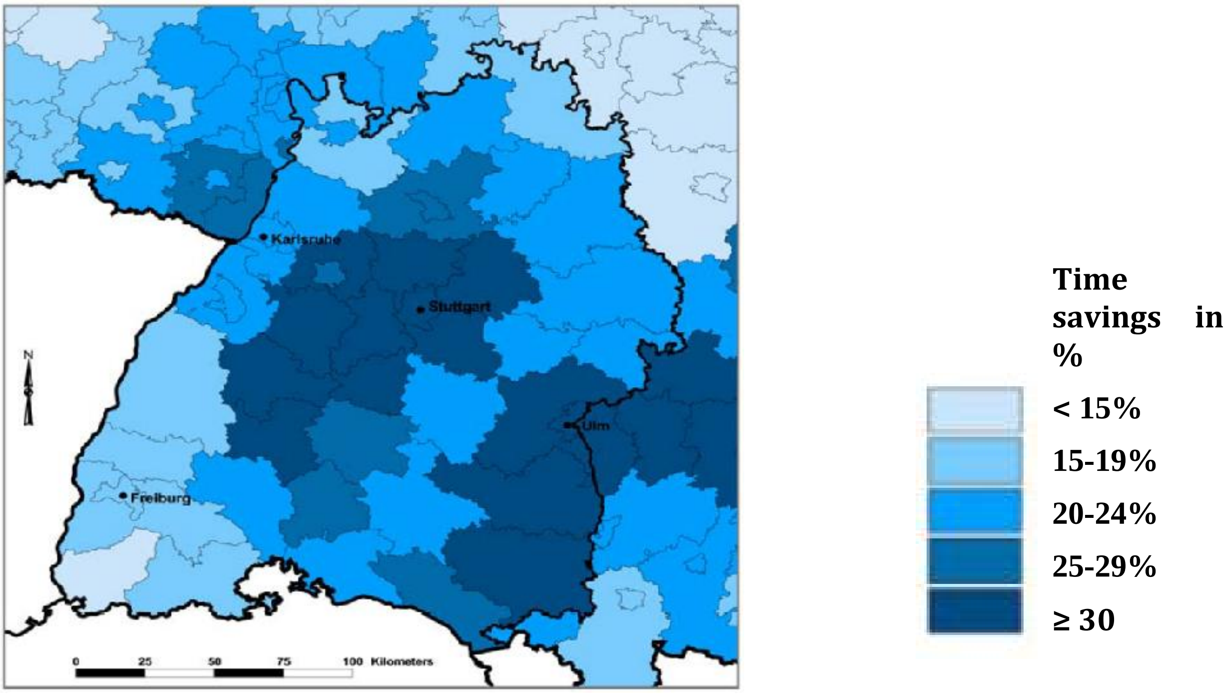
The Communication Bureau for the project published statistics of time savings for all regions of Baden-Württemberg in 2011 from which some examples are extracted (Table C5-3). This is to demonstrate that for many OD relationships the time savings are substantial and in an order of magnitude that people can use the time saved for alternative activities and the attractiveness of regions for commercial purposes increases.

Table C5-3: Travel time comparisons for selected OD relationships

OD-Relationship	Travel time without project (min)	Travel time with project (min.)	Travel time savings (min)
Ulm-Stuttgart	56	28	28
Friedrichshafen-Stuttgart	135	99	36
Konstanz-Stuttgart Airport	194	119	75
Singen-Stuttgart Airport	162	93	69
Calw-Ulm	151	105	46
Donaueschingen-Stuttg. Airp.	162	101	61
Schwäbisch Hall-Freudenstadt	217	156	61
Mannheim Stuttgart	36	33	3
München-Paris Est	326	293	34

Source: Kommunikationsbüro Bahnprojekt Stuttgart-Ulm e.V.

Figure C5-8: Time Savings of the rail project Stuttgart-Ulm



Source: IWW et al. (2009).

A4.2 Improvement of service integration

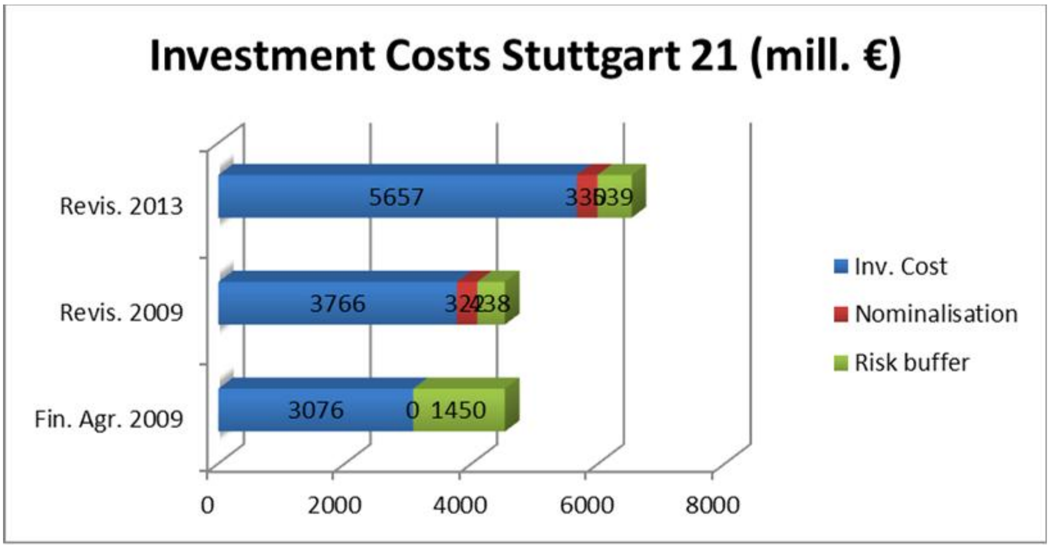
The new through-bound station allows for developing an improved network of rail services for regional and local public transport. The supply of train services can be increased by 30% in the new regional network. All major cities in the region ("Oberzentren") will be interconnected at least with an hourly frequency. On the main axes between Stuttgart and Karlsruhe, Ulm, Tübingen, Heilbronn Aalen the frequency of synchronised rail services is even higher. The new links and stations will be used by 6 ICE lines and 4 IC lines. The time savings for ICE trains with a maximum speed of 250 km/h will be about 30 min., stemming from the higher speeds, the lower waiting times in the station and the more efficient deceleration on the access links. The increase in passenger-km in intercity transport is estimated about 30%.

The increase of capacity is estimated at 30% by Deutsche Bahn AG which mentions additional advantages in form of the unbundling of operations for intercity, regional and local services, better use of rolling stock and improvement of crew scheduling. Furthermore, capacity is gained on the presently used track which might be exploited in the future by additional freight service.

A5. Financial arrangements

Both major components of the railway project Stuttgart-Ulm are associated with severe financial problems and gave rise to the development of unusual financial arrangements. Because of the different legal competences for the components different financial schemes had to be developed. Figure C5-9 shows that the cost estimations for the most problematic component Stuttgart 21 have increased rapidly from EUR 3 to 6.5 billion within 3 years. For the HSR Stuttgart-Ulm the cost estimation is still EUR 2.89 billion but it seems probable that this will be revised in the near future and that the total costs of both components will approach EUR 10 billion . In the financial schemes for both components the State of Baden-Württemberg (BW) is participating with a high financial commitment. While BW is not competent and responsible for the HSR component it is highly interested in an accelerated implementation such that it has been decided to pre-finance the construction works of the first years until the federal funds are available.

Figure C5-9: Development of the cost estimations for Stuttgart 21



Source: Own representation of data from Kommunikationsbüro Bahnprojekt Stuttgart-Ulm e.V.

Table C5-4: Investment cost allocation for rail project Stuttgart-Ulm (without cost escalation for HSR, ca. EUR 300 million)

Major project components	Partner	Status 12/2009 in EUR million incl. risk	Status 12/2012 in EUR million incl. risk
HSR	Federal State and EU	1 790	1 790
Wendlingen-Ulm	State of BW	950	950
	DB AG	150	150
SUM HSR		2 890	2 890
Stuttgart 21	Federal State	1 230	1 450
	State BW	930	1 160
	DB AG	1 750	3 300
	Stuttgart Airport	230	230
	City and Region	390	390
SUM S12		4 530	6 530
Sum total		7 420	9 420
Sum « private »		2 130	3 680
Sum public		5 200	5 740

Source: Own compilation of data from Kommunikationsbüro Bahnprojekt Stuttgart-Ulm e.V. and State Ministry of Interior Affairs.

It follows from Table C5-4 that the overall costs of the project are estimated presently between EUR 9.4 and 9.7 billion. While the cost allocation of 2009 is covered by the financial agreement the recovery of additional costs of EUR 2 billion is still being negotiated[24]. The state of Baden-Württemberg and the city of Stuttgart insist that their cost contributions are limited to the figures of the financial arrangement of 2009, while the Deutsche Bahn AG argues that a clause in the financial arrangement provides legal grounds for further public co-financing, in particular for the costs of plan changes and of construction stops, for which Deutsche Bahn AG does not feel responsible. The last meeting of the Project Steering Group in November 2013 did not reconcile the conflict.
The tremendously high costs of the project and the missing transparency of the cost calculations were among the main reasons for protest movements against Stuttgart 21 and the HSR project (see section A7).

24 The co-financing of the EU for the budget 2007-2015 is EUR 101.5 million for the HSR and EUR 114.5 million for Stuttgart 21.

A6. Cost-benefit analyses and estimation of wider economic impacts

Due to the different legal competences for the main components of the projects different assessment studies have been performed:

- a CBA by the Federal MoT for the HSR project Stuttgart-Ulm-Augsburg
- an MCA for components of Stuttgart 21
- a study for the State BW Ministry of Interior Affairs for the macro-economic impacts of the comprehensive project
- a study for the city partnership "European Mainline" on the impacts on a European scale.

Deutsche Bahn AG has elaborated internal business assessment calculations for the comprehensive Stuttgart-Ulm project which are not available. On the basis of the investment cost figures of 2009 the resulting net rate of return was reported positive, for the 2013 figures the results were interpreted in the way that the net earnings would be not satisfactory but would still outweigh the losses from stopping the project. It follows from this heterogeneous information base that a consolidated assessment has been prepared only for the macro-economic impacts while is no consolidated CBA exists for the comprehensive project Stuttgart-Ulm including all components.

A6.1 CBA and MCA assessment studies

A6.1.1 CBA for the HSR Stuttgart-Ulm-Augsburg

As the Federal Government is responsible for the intercity rail links the HSR link Stuttgart-Ulm has been analysed in the context of the Federal Transport Investment Plan (BVWP). The project is defined as the HSR link between Stuttgart and Ulm (without all regional components and stations of Stuttgart 21) plus the upgrade of the link between Ulm and Augsburg. This project has been re-assessed and in the "Investment Needs Plan" which has been approved by the Parliament and is the legal basis of public funding for federal transportation projects.

In the last "Check of Investment Needs Planning" 2010 of the Federal MoT the intercity rail project Stuttgart-Ulm[25] the CBA result came out positive with a benefit-cost ratio of 1.5 (see Table C5-2). This reconfirmed that the Federal Government could stick to the agreements taken and finance the major part of the project while the State of Baden-Württemberg would partly pre-finance while the EU would co-finance a small share of the project. In the case of an alternative priority setting for projects in the HSR network (prioritising the so-called Eastern corridor from Munich via Nuremberg – Würzburg – Aschaffenburg to Frankfurt) the benefit cost ratio of the Stuttgart-Ulm project would drop to 1.2.[26] A sensitivity analysis, which assumes a decrease of 15% of traffic compared with the forecasts made before the economic crisis, would end up with a benefit-cost ratio of 1.0.[27]

25 The federal project Stuttgart-Ulm comprises the link Augsburg-Ulm-Wendlingen (the second major component of the rail project Stuttgart-Ulm) plus the intercity link from Wendlingen through to Stuttgart Airport to the Central Station. The costs for the intercity tracks have been appropriately allocated.

26 This was the preferred strategy of Deutsche Bahn AG 1997- 1999.

27 The sensitivity analysis reflects the adjustment to the reduced economic prospects after the economic crisis, see Rothengatter et al. (2010).

Some details from the traffic forecasts by Intraplan and BVU (2010):

- Diverted pass. km/a: 710 million
- Diverted tonkm/a: 420 million
- Diverted air trips/a: 0.9 million
- Increase of passenger transport volume in the corridor Stuttgart-Ulm: from 10.6 million trips/a to 17.5 million trips/a, stemming from traffic diversion (car, air), induced traffic and changed routing of trips
- Additional freight trains: 16 on existing track, 16 on new track (by night, max. 1050 tons)
- Time savings in passenger transport: 3.1 million hrs/a business,
- 6.3 million hrs/a other purposes
- Share of international passenger transport: 23%
- Share of international freight transport: 32%
- Share of passenger transport of total benefits: 76%
- Share of freight transport of total benefits: 24%
- Sum of discounted monetary benefits incl. external costs: EUR 3 670 million
- Sum of discounted costs: EUR 2 531 million
- Sum of net benefits: EUR 1 139 million; benefit/cost ratio: 1.5

A6.1.2 MCA for Stuttgart 21 components

The state of Baden-Württemberg, the region and the city of Stuttgart are responsible for the regional and urban components as well as the station buildings while the Federal Government can add co-financing. Therefore this part of Stuttgart 21 has not been evaluated by the standardised CBA scheme of the Federal MoT. Instead the urban parts were analysed in 2006 using a multi-criteria scheme which is obligatory for local public transport investments. These investigations have been undertaken on behalf of the Federal Agency for the Railways (Eisenbahnbundesamt), the responsible regulator for railway investments, and the former Ministry of Interior Affairs, Baden-Württemberg. The results have not been made public. In the meantime, the Federal MoT has requested to adjust the calculations to the development of economic trends after the crisis.

A6.2 Impact study for the European Mainline Paris-Budapest/Bratislava

When the Federal MoT and Deutsche Bahn AG started in 1997 to rethink the Stuttgart-Ulm project and to favour an alternative Eastern corridor from Munich to Frankfurt the "Magistrale für Europa" (European Mainline) partnership of cities[28], took the initiative to stress the priority of the Western corridor through Ulm and Stuttgart. The Magistrale partnership had been established in 1990 and included the major cities on the corridor Paris-Strasbourg-Karlsruhe-Stuttgart-Ulm-Augsburg-Munich-Salzburg-Vienna-Bratislava/Budapest. In 1999 it launched a study on the spatial integration economies of the project in an international context as the corridor included five EU countries: France, Germany, Austria, Slovakia and Hungary. This study was the basis for promoting the corridor for European and national support and the latter was integrated into the TEN-T in

[28] Including some chambers of commerce and associations of regional communities.

2004 as project P17 (EU Commission, 2005). In 2011/2013 after the re-definition of TEN-T and introducing the core network concept this corridor (starting at Strasbourg now) is a part of the Rhine-Danube corridor (core network corridor 9, see EU Commission, 2013).

Figure C5-10 illustrates the challenges to bring the corridor onto a high standard railway level. The main construction components are:

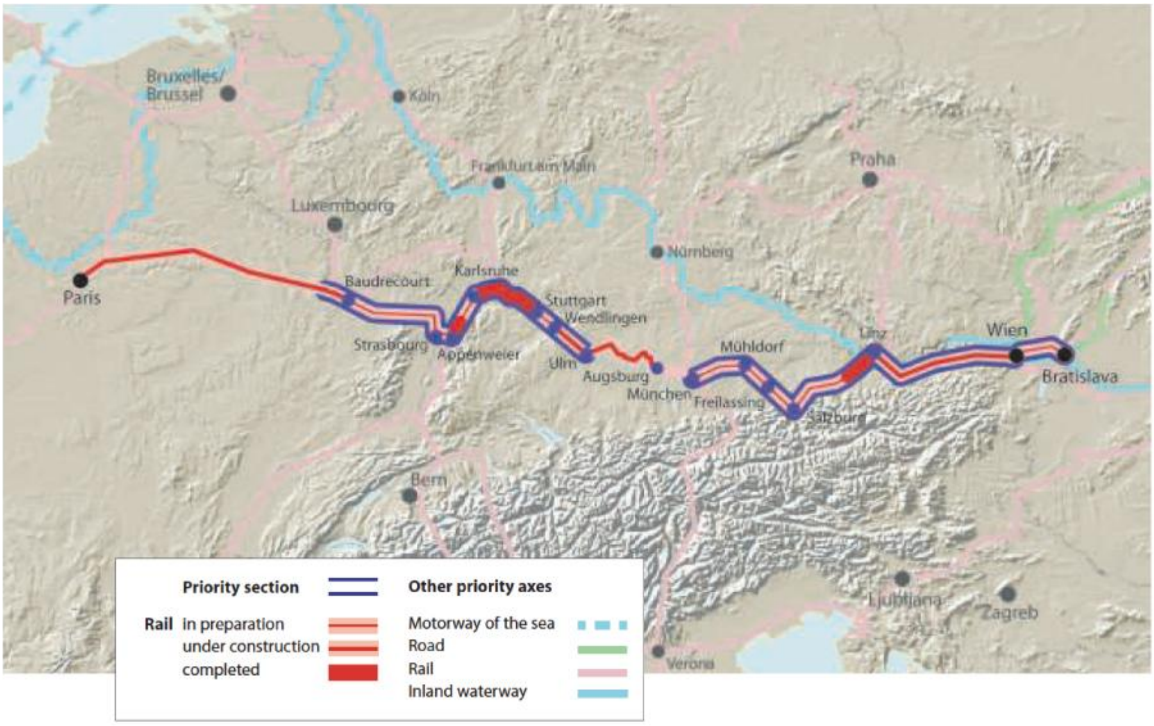
- Beaudrecourt-Strasbourg (meanwhile under construction)
- Appenweier-Karlsruhe (partly under construction)
- Stuttgart-Ulm-Augsburg (construction started)
- Munich-Salzburg
- Salzburg-Vienna (construction started)
- Vienna-Bratislava

With these measures the average speed on the 1400 km rail corridor increases from 90 to 130 km/h (including stops). For some city connections the speeds increases are much higher, e.g. for Paris-Strasbourg with 240 km/h. Other sections (e.g. Munich-Salzburg) provide much lower speeds where one has to take into account that the traffic volumes in the border area between Germany and Austria are comparatively low. Some results of multi-modal transport modelling are:

- The total number of rail trips increases from 47 to 61 million trips per year.
- 8.9 million trips are diverted from road and air.
- 3.7 million trips are induced by choices of destination (1st order induced traffic).
- 1.9 million trips are induced by increased economic activities in the corridor regions (2nd order induced traffic).

The last bullet point indicates that a model of wider economic impacts (in the terminology of the SACTRA Committee, 2000) has been applied. The model of the Institute of City and Regional Planning of the Vienna TU (Srf) is based on a cross section analysis for NUTS 3 regions of Europe and estimates the influence of transport improvements on the economic activities by introducing an accessibility indicator into the regional production functions, differentiated by economic sectors. Accessibility, in this way, is treated as a production factor like labour and capital. The model generated the result that an additional gross value added of about EUR 1 billion can be expected on the corridor which links 34 million inhabitants and that high-tech sectors are strengthened for the benefit of higher competitiveness of the regions.

Figure C5-10: “European Mainline” Paris-Bratislava/Budapest



Source: European Commission, Transeuropean Transport Network 2005.

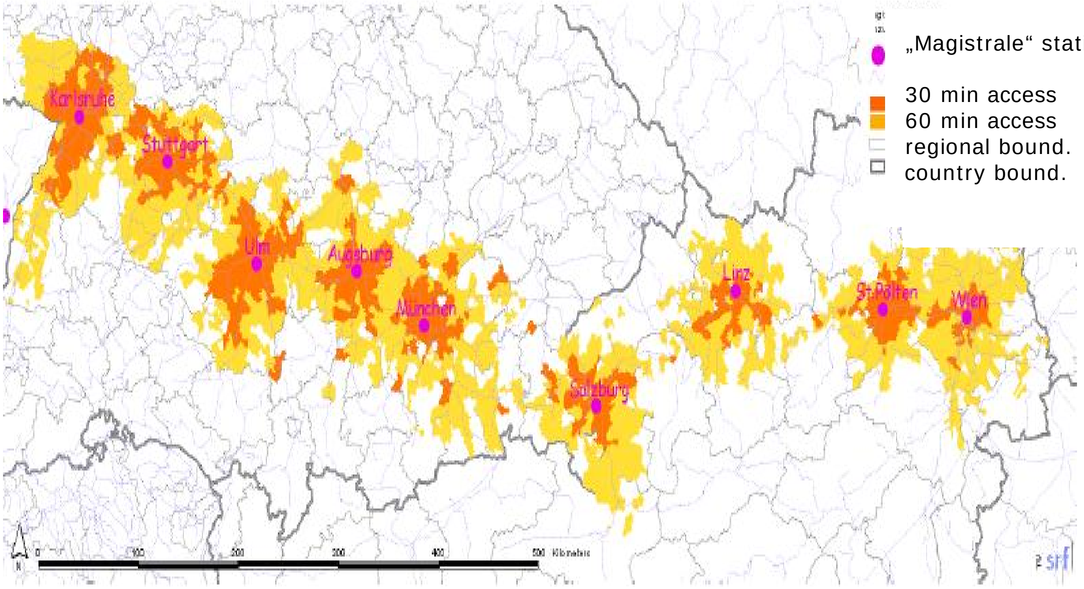
In this context it is important that the focus is not only on the provision of high speed rail links but also on a good interconnection between intercity, regional and urban rail networks.

The study reveals that the problem of providing seamless changes between intercity and urban public transport has been successfully tackled by some cities, as for instance in Karlsruhe by providing integrated regional and urban service by hybrid train technology.

Figure C5-11 shows in which way the benefits of high speed can spread to the regions by efficient transit networks.

This type of approach gives answers to the question of how transport investments can stimulate economic growth and employment, all indicators generated are compatible with the national accounts and can be zoomed to the lower regional level of NUTS 3. But certainly there is some risk of over-interpretating the results because “accessibility” is the only production factor besides labour and capital such that this variable might measure also other effects implicitly.

Figure C5-11: Quality of regional transit networks around intercity stations



Source: IWW, SMA and Srf, 2000.

A6.3 Macroeconomic impact study for the railway project Stuttgart Ulm

In 2009 IWW, Srf and VWI presented a study on the macro-economic impacts of the rail investment Stuttgart-Ulm, integrating the two components of the project. This study followed the approach applied in the "Magistrale" report of 2001. Basic methodology was a cross section analysis of NUTS 3 regions in the EU plus Norway and Switzerland. Two alternative models were tested: First the model of Srf which had been applied in the "Magistrale" study and introduced "accessibility" as a production factor of regional production functions and applied a sector-based differentiation and secondly the model of IWW which followed Biehl's theory (1991). According to this theory, the regional economic development is dependent on "potential factors" which are immobile, non-substitutable, indivisible and polyvalent. Transport infrastructure is one of these potential factors, others can be geographical features (e.g. relevance for tourism), education level or soft factors like cultural attractiveness. Furthermore, Biehl suggests to test the regions for bottlenecks before deciding on investing in transport infrastructure, because such an investment would be useless or even negative (generating regional backwash effects) if there were no bottlenecks in the transport system. This means in brief terms: transport infrastructure cannot generate economic growth alone, it has to interact with other potential factors and the production factors labour and capital to induce new economic structures and contribute to growth.

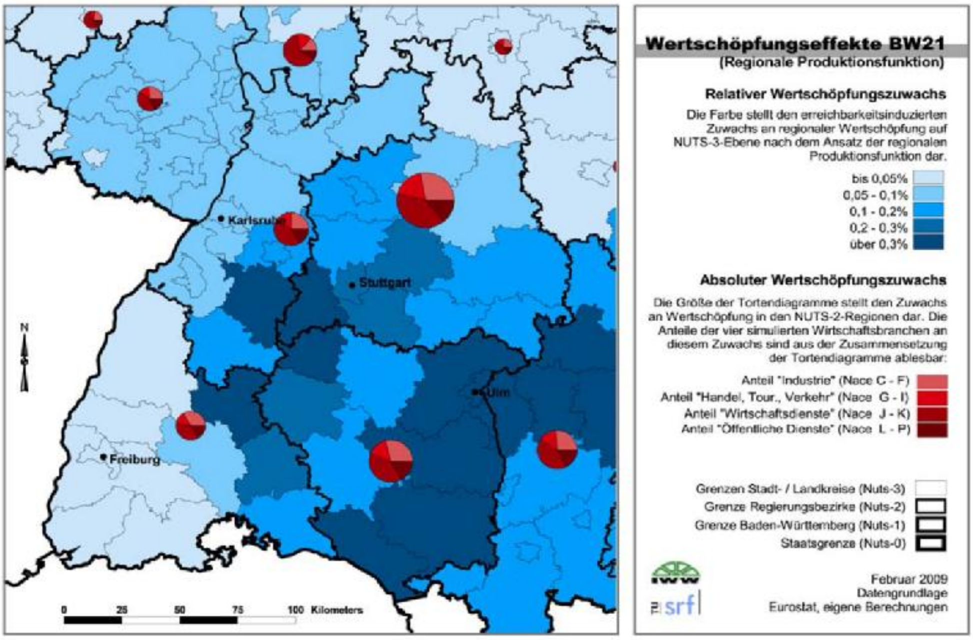
The results of the study are:

- Srf approach: additional value added for Baden-Württemberg of EUR 530 million/a.
- Srf approach: additional employment for Baden-Württemberg of 9 500 workplaces
- IWW approach: additional value added for Baden-Württemberg of EUR 440 million/a

- IWW approach: additional employment for Baden-Württemberg of 8,000 workplaces[29]
- The induced urban development leads to an estimated employment effect of 2,600 jobs. This has not been added to the job balance because IWW argued that the urban effects are included in the overall statistical macroeconomic impact measurement.
- All environmental indicators are positive, in particular noise, air pollution and CO_2 emissions (reduction of 177 000 tons/a)
- For both studies holds: fostering of development of high quality work places
- Fostering the relative strength of the production sector for Baden-Württemberg incl. production related services.

Figure C5-12 presents the regional results of the analysis. Although the Stuttgart region will receive the highest absolute benefits there are high growth effects to be expected alongside the corridors from Stuttgart to Ulm/Augsburg, to Singen/Lake Constance and to Friedrichshafen/Lake Constance.

Figure C5-12: Impacts of the rail investment Stuttgart-Ulm on regional GVA



Dark/light blue: high/low benefits
Dark/light red: benefiting service/industry sectors

Source: IWW, Srf and VWI, 2009.

The above calculations have been performed under the assumption that the overall investment cost of the comprehensive project is EUR 5.1 billion and lead to a positive result with an acceptable rate of return and pay-back period (around 20 years) for the public capital. But the question arises whether this result is still valid under the present condition of an almost doubled investment cost budget. A sensitivity analysis with the recent budget figures comes out with the result that the project is only viable for very low interest rates (2.5% and lower) and very high pay-back periods (55 years and more). As could be learned from statements of the board of the Deutsche Bahn AG the commercial profit rate

[29] For comparison: For the Seine-Nord Europe canal project SETEC (2013) has estimated an employment effect of 10,000 jobs in the construction phase (double value of the Stuttgart estimation) and 50,000 jobs in the year 2050 (more than five times the Stuttgart estimation for about half of the total invested sum).

of the project is approaching zero. Putting these pieces of information together results in the conclusion that every change towards higher costs will induce a high risk that the project will become unprofitable for the company and not beneficial for the public. The newly established management company for the railway project Stuttgart-Ulm has announced to apply strict cost discipline and to keep the cost of the Stuttgart 21 part under EUR 6 billion, but still there is no clear indication that this will be successful.

A6.4 Impact of the project on rail freight transport

The opponent stakeholders of the project have argued that the project will not provide any benefit for rail freight transport. The steep gradient of the new link Wendlingen-Ulm (24.5% on average) would make it impossible to operate the full range of freight trains. (see an article in VerkehrsRundschau from March 8, 2013, which refers to arguments of Michael Cramer, Spokesman for Transport of the Green Party in the EP). Nevertheless, the benefit calculations for the HSR link include the positive impacts of an increased capacity of 32 freight trains per day, of which 16 would use the existing track and 16 the new link (see section 6.1.1 of this Appendix). According to Cramer's arguments the small benefit surplus over costs would vanish if the unrealistic benefits for rail freight transport were cancelled.

Deutsche Bahn AG and the Federal Ministry of Transport have responded to this argument as follows:

- The new track can be used by freight trains with a gross weight of less than 1050 tons. Presently about 40% of freight trains in Germany is lighter than 1050 tons and in the future this share will increase because structural change of consignments is going on, developing towards increasingly lighter unitised and container cargo.

- The shift of passenger transport from the existing to the new track will increase the capacity on the existing track to accommodate more freight trains.

It is still an unsolved question whether the use of the new HSR track for freight trains by night will be an economically attractive option. As long as freight trains would have to pay the high track charges for using HSR tracks, comparable to passenger trains, there will be limited interest of the commercial rail freight companies to prefer the new track. This assumption is underlined by the experience of the HSR-link between Ingolstadt and Munich. Also for this link benefits had been calculated stemming from rail freight transport. Since the opening in 2006 the HSR-link has not been used for freight transport. From this example one can conclude that at least changes of the present track pricing system will be necessary to divert freight trains to the new track.
In the context of the controversial discussion the opponent stakeholders have also brought forward the argument that a new railway link between Stuttgart and Ulm would only make sense if it could accommodate all categories of freight trains. In section A2.2 it is pointed out that such an alternative ("K-variant") had been preferred by Deutsche Bahn AG at the beginning of the planning process. The decision against this alternative was motivated by:

- the limited importance of the Stuttgart-Ulm-Munich corridor for rail freight transport,
- the very high additional costs for keeping the gradient below 13 o/oo compared with a passenger/low-weight freight alternative with a gradient of 24.5 o/oo, and
- the higher construction risks in the geologically most difficult area of the Swabian Alb.

A7. Protest movements against Stuttgart 21 (S 21)

A7.1 History of protest

While the parliamentary decisions in favour of S 21 had been taken with wide majority (in 1995, 41 : 16 votes pro S 21) a strong opposition developed from the beginning. The project was a central topic of the Stuttgart Lord Mayor elections in 1996 when the Christian Democratic candidate won against the Green candidate with 43 votes?: just 39% of votes. The Green candidate was against the project and had suggested that a referendum would be held. The main arguments against the project were the huge investment costs which could better be used for other public projects, the high construction risks because of the difficult topography and geological conditions, the illusion of financing a major part by land sales, the plans for developing the gained area and doubts in the capacity calculations and operational programmes of Deutsche Bahn AG. In a later phase a number of further indications for weaknesses were added, beginning with the sacrifice of old trees in the castle garden and not ending with insufficient security measures and emergency facilities. After his re-election in 2004 the Lord Mayor refused to follow a petition for a referendum in 2006 which had been signed by 67,000 citizens. Instead, a voting of the State Parliament of Baden-Württemberg was organised which ended up with a wide majority in favour of the project (115 : 15 pro).

The years until 2009 were characterised by the changed position of Deutsche Bahn AG such that the opponents were convinced that the project plans were buried. When Deutsche Bahn AG showed interest again a binding financial agreement was signed in 2009 between the State BW, the Federal Government, city and region of Stuttgart, Stuttgart Airport Company and Deutsche Bahn AG. As most sections of the project had been legally approved Deutsche Bahn started construction works in February 2010.

In the meantime several private organisations had formed against the project which gathered under the name “Action Alliance against S21” and were supported by the Green Party, NGOs and parts of trade unions. Protest gatherings were organised, following the example of citizen protests against the socialist regime in Leipzig 1989 which were called “Monday demonstrations”. When the construction works started by pulling down the north wing of the station and cutting trees in the castle park area protest movements of up to 50,000 people came together which culminated on September 30, “Black Thursday” when the police intervened and a number of people were injured, two of them seriously.

A7.2 Mediation process, state elections and referendum

After “Black Thursday” the state and city governments agreed on starting a mediation process to bring all arguments together in a transparent way and to reconcile the situation. All parties agreed to appoint elder statesman Heiner Geissler, a former Christian Democratic minister and secretary general, as a mediator. The mediation (in the legal sense: arbitration) process started on October 6 and ended on November 30 after 9 rounds of an open exchange of arguments. The opponent parties were given the opportunity to support their arguments by expert studies which were paid by the State BW. Therefore the opponent parties were able to bring forward a number of arguments revealing weak points of the project and propose alternatives. The main points were:

- The capacity of the station was not sufficient and lower compared with the existing dead-end station.
- Severe bottlenecks would be generated on access links underground.
- The facilities for handicapped people were not sufficient.

- The facilities for emergency management and fire protection were not sufficient.
- Serious environmental deficiencies were revealed, as for instance neglecting air interchange in the sensitive Stuttgart valley, cutting trees on which rare species live.
- Much too low estimations of investment costs.
- An upgrade of the present dead-end station would be a cheaper and more efficient solution (K 21 instead of S 21).
- Better opportunities to spend the money, e.g. on the freight transport link alongside the Rhine valley between Karlsruhe and Basel.

The final statement of mediator (arbiter) H. Geissler included the following essentials:

- Continuation of S 21: The alternative concept K 21 includes good arguments but does not have a legal planning base. A compromise solution K 21 /S 21 is not feasible. A stop of S 21 would be very costly without bringing benefits.
- A number of improvements of S21, as for instance:
  - land use plans to be changed
  - relocation of trees from the castle gardens to other places instead of cutting them down
  - security for users, incl. handicapped people
  - solution of capacity and operation problems; preparation of a "stress test" with the involvement of neutral experts.

The statement also includes recommendations for carrying out mediation processes and referendums early enough such that alternatives can be discussed at a time when there is a realistic chance for implementation. It refers to the Swiss process of decision making for public investments which guarantees transparency and participation of citizens.

The "stress test" was carried out in spring and early summer 2011 and audited by the Swiss consultancy SMA. The aim was to prove that the new underground station with 8 tracks offers a 30% bigger capacity compared with the present dead-end station with 16 tracks. This implies a capacity for operating 49 trains in peak hours. The Deutsche Bahn AG demonstrated that this is realistic under preservation of a sufficient quality of service, and this was testified by the auditor SMA and presented to the public on July 29, 2011. This result is still not accepted by the project opponents.

Despite of the successful stress test the auditor SMA found that the capacity of the new station was limited against the background of future demand development and that a combined solution of a dead-end and an underground station might be preferable for smooth railway operations with synchronised time tables. Also the mediator H. Geissler supported this "Zürich"-solution finally. However, these suggestions were not followed by Deutsche Bahn AG to avoid a restart of the complex legal approval processes.

On March 2011 the state elections were held in BW. They ended up with a majority for a green/social democratic government in which the Green Party had the majority of votes such that they could claim the position of Prime Minister. The ruling parties agreed on a public voting on S 21 (often called a "referendum", although the outcome was not legally binding). The "referendum" was held in November 2011 and ended with 58.9% in favour and 41.1 against the project.

A7.3 Political situation at the beginning of 2014

The Green Party had been the (relative) winner of the state elections, announcing that they were clearly against the Stuttgart projects, which attracted votes from the project opponents. of voters. This may explain why Deutsche Bahn AG is complaining about missing political support and unnecessary delays while the State MoT is arguing that they are But the opponents lost the "referendum" which came out with the clear issue to continue with the project. This has caused a dilemma situation because the new Green Minister of Transport has been one of the most prominent opponents of an underground station (also of a combined underground station) in Stuttgart since the nineties and is now responsible for transposing the decision doing their job of strictly supervising the project and preventing the citizens from further failures with the project (e.g. increases of government funding requirements). Since October 7, 2012, Stuttgart has a Green Lord Mayor. Under this political configuration the State BW and the city of Stuttgart strictly refuse any increase of financial contributions to the project which have been claimed by Deutsche Bahn AG after their drastic revisions of cost estimations. Therefore, while construction work is going on, the final allocation of costs is still open.

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ANNEX 6. FEHMARN BELT FIXED LINK

Table C6-1: Project summary Fehmarn Belt Fixed Link

Aspect	Description	Aspect	Description
Project Title	Fehmarn Belt Fixed Link (planning and preparatory works)	TEN-T code	2007-EU-20050-P
Countries / area	Denmark, Germany	Start date	June 2008
Mode(s)	Rail, road	End date	December 2015
Managing authority	Femern A/S	Duration	90 months
		Delay (months)	-
Included in TEN-T	Since 2004; priority project N° 20 since 2007. In March 2009 the Danish Parliament passed a legal act adopting the treaty between Denmark and Germany and committing Denmark to the implementation of the coast–to-coast fixed link.	TEN-T element	Core network (Scandinavian-Mediterranean corridor Helsinki-Valetta)
Investment cost (m€)	Coast-to-coast fixed link: 1999 estimate (1996 prices) Cable-stayed bridge: 3 040 Immersed tunnel (4+2 solution): 3 780 2011 estimate (2008 prices): Immersed tunnel (4+2 solution): 5 500 Construction costs: 3 800 Other works: 300 Project management, operational preparations: 700 Reserves: 700 Same estimate (in current prices, inflated to future years): 7 228 Present (preparatory) phase: 486	Length (km)	17.6 km
EC funding TEN-T (m€)	Present (preparatory) phase: 339 reduced to 193, now increased to 204.9 2008: 19.7 2009: 10.3 2010: 50.8 2011: 22.7 2012: 30.2 2013: 71.2 2014-2020: 1,954 Source: EC	EC share	Studies: 50%; Works: 23.89%, increased to 30%; average: 42%
EC funding Cohes. (m€)	d.n.a.	EC share	d.n.a.
Funding agent 1	Femern A/S (state owned), from private market and Danish National Bank	Value (m€)	to be determined

Funding agent 2		Value (m€)	-
Cost-benefit-analysis	(1) PLANCO/COWI (1999): Economic and financial evaluation of a fixed link across the Fehmarn Belt, Final Report, June 1999: Value of time: ECU 9.0/36.5 per hour of leisure/business trip (year not specified) CO2 value: DEM 180 per tonne (year not specified) Social Discount Rate: 3% (2) Danish Ministry of Transport & COWI (2004): Economic Assessment of a Fixed Link across the Fermern Belt. Summary Report. June 2004. CO_2 value: EUR 16 per tonne Social Discount Rate: 6%	CBA ratio	Economic benefit-cost ratio (BCR) between 0.84 (bored railway tunnel) and 2.6 (immersed tunnel); EIRR : between 2.2 and 7.8% respectively (immersed tunnel) Cable-stayed bridge: BCR: n.a. EIRR : 7.0% NPV: EUR 1.9bn Immersed tunnel: BCR: n.a. EIRR: app. 6% NPV: EUR 0.1%
		Public y/n	Y
Transport scenario	(1) FTC (Fehmarn Belt Traffic Consortium) (1999): Fehmarn Belt Traffic Demand Study, Final Report (2) Update: FTC (2003): Fehmarn Belt Forecast 2002, Final Report, April 2003	Dated from	(1) June 1999 (2) April 2003
Externalities covered	• Emissions of poisonous exhaust gases • Climate relevant emissions of CO_2 • Traffic noise • Separation effects of road traffic in build-up areas • Other impairments from road traffic in build-up areas	Ext. cost (m€)	Solution Model 1 (Scenario 0+2): 21.4 m€ (2010)
EIA	In progress see Scoping Report: Proposal for environmental investigation programme for the fixed link across Fehmarn Belt) Femern A/S: Transboundary Environmental Impact Assessment; Documentation for the Danish Espoo Procedure (Espoo-report), June 2013	Public y/n	yes http://vvmdocumentation.femern.com/
CIA	No separate CIA: Climate change avoidance costs integrated in CBA	Public y/n	-
Financial analysis	(1) PLANCO/COWI (1999): Economic and financial evaluation of a fixed link across the Fehmarn Belt, Final Report, June 1999: (2) Femern A/S (2008): Financial Analysis (3) Femern Sund & Baelt (2011): Consolidated construction estimate for the Fehmarnbelt Fixed Link – August 2011.	Expected RoI	(1) FIRR between 1.7% (2-track immersed rail tunnel) and 9.1% (immersed 2-lane road and 1-track rail tunnel) (2) Payback time for the emerged tunnel is about 33 years. (3) Payback time: 39 years
Ex-post evaluation	d.n.a.	Cost overrun (m€)	-

Source: own analysis.

Figure C6-1: Fehmarn Belt Fixed Link

Source: TEN-T Executive Agency

The Fehmarn Belt Fixed Link project is part of the global project Fehmarn Belt railway axis (Priority Project 20). As an extension of the Öresund crossing (Priority Project 11) and the Nordic triangle road and rail links (Priority Project 12), it is a key component of the main north-south route connecting the Nordic countries to the rest of Europe. The decision whether to build an immersed tunnel or a cable-stayed bridge is still pending, though the tunnel is the most probable solution.

The studies cover environmental, geotechnical and navigational investigations, safety assessments as well as design activities and adaptations for use in the plan approval process of the authorities. The geotechnical investigations are confined to the planned link corridor, whereas the environmental investigation will cover wider areas of the entire Fehmarn Belt and most of Kieler Bucht and Mecklenburger Bucht. The studies also constitute the basis for identifying the best technical solution (bridge or tunnel).

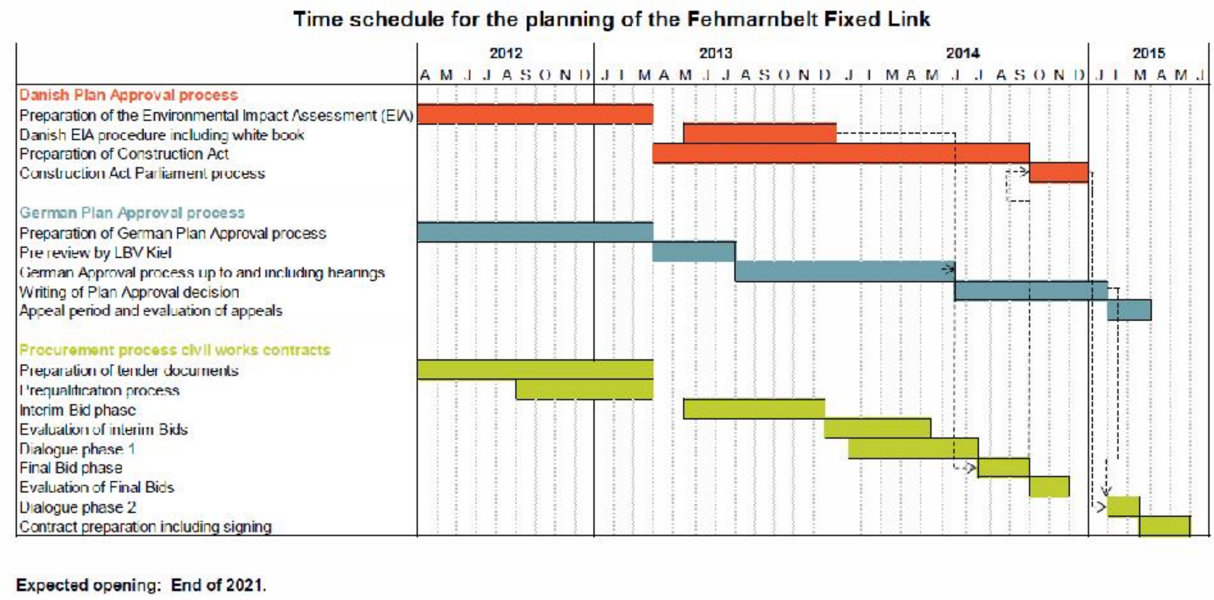
During the TEN-T programme period 2007-2013, extended to 2015, the construction activities will primarily be the establishment of the prefabrication areas for the production of tunnel elements or bridge caissons, piers and girders.

Activities in the present TEN-T budget cycle are preparatory studies and works for the construction of the coast-to-cost fixed link scheduled for 2015 to 2021. Besides, the planning processes are underway for rail access in Germany (2007-DE-20010-S: Studies for connecting the German hinterland to the future Fehmarn Belt fixed link, rail section Lübeck-Puttgarden; EUR 25.4 million - EU contribution: 50%) and in Denmark (2007-DK-20060-S: Studies for the capacity improvements of the section between Copenhagen and Ringsted; as well as 2007-DK-20070-S: Studies for upgrading the railway access lines to the future Fehmarn Belt fixed link - from Ringsted to Rødby and the intersection in Kastrup; both together EUR 45.4 million - EU contribution:50%).

The Fehmarn Belt fixed link with access rail and road routes has been retained as part of the TEN-T core network for financing during the 2014 to 2020 cycle.

The most recent schedule (April 2012) of the preconstruction preparatory activities is shown in Figure C6-2 below.

Figure C6-2: Planned time schedule for the Fehmarn Belt Fixed Link project



Source: Femern A/S.

6.1. Methodology and remarks on CBA and project selection

In 1999, in the context of the feasibility studies concerning the fixed link across the Fehmarn Belt, an economic analysis was carried out. The analysis was done by consultants of the German and Danish Ministries of Transport[30], based on the methodology of the German BVWP methodology with adaptations to Danish methodological recommendations. At the time, no officially recommended methodology for the evaluation of EU supported projects existed. The CBA could be considered as “state-of-the-art” at the time.

In 2003, a new CBA was requested by the Danish Ministry of Transport in accordance with Danish requirements.[31]

Regarding the Economic Analysis which was carried out for the Fehmarn Belt Fixed Link in 2004 the following elements were considered:

- Investment costs: For the fixed link and for the necessary railway investments on land.
- Operating costs of the fixed link
- User benefits: Time savings and changes in vehicle operating costs arising from benefits for existing users as well as from new and transferred users.
- Environmental costs: Including air pollution, noise and accidents, and CO_2-Emissions.
- Revenue from the fixed link.
- Consequences for other operators: Including railway track managers, railway operators, the Great Belt and the Öresund fixed links.

[30] PLANCO/COWI (1999): Economic and Financial Evaluation of a Fixed Link Across Fehmarn Belt, Final Report, June 1999.

[31] Danish Ministry of Transport (2004): Economic Assessment of a Fixed Link across the Fehmarn Belt, Summary report, p. 8.

The above elements are traditionally the key elements in analyses of transport investments, and they are considered decisive as to whether a fixed link is economically profitable. Besides the above elements, a fixed link may also have other effects such as reduced barrier effects, loss of undisturbed nature, and inconvenience during construction etc. These effects are not included as it has not been possible to quantify them. No further CBA has been ordered by the Danish government.

Throughout the complex process of planning, the Fehmarn Belt project always had the political endorsement by the Danish government and the Danish parliament.

As far as we could establish, no specific selection procedure took place at national level. The project was proposed by the Danish government and negotiated with the German government. As Germany was reluctant to invest in the fixed link, Denmark decided to implement the coast-to-coast infrastructure alone while Germany agreed to upgrade and electrify the railway line Lübeck-Puttgarden.

When the TEN-T programme for 2007-2013 was negotiated, the Danish and German governments requested the Fehmarn Belt project to be added to the list of priority TEN-T projects. Both the German and the Danish government considered the project to have a goal of common interest. The project was retained on the basis of the different studies and assessments which had been carried out. The Danish government always had the Fehmarn Belt Fixed Link project on its priority list.

This choice can be supported by four arguments which represent the common interests of the EU.

- EU Transport Policy

One reason for putting the Fehmarn Belt Fixed Link on the TEN-T Priority list has to do with the goals of the European Transport Policy. One of these goals is to transform the existing patchwork of European transport infrastructure into a unified, high-quality Trans-European Transport Network (TEN-T) that can handle the expected continuous increase in traffic volumes; connecting the peripheral regions to the central areas, removing bottlenecks, upgrading infrastructure and improving cross-border transportation for passengers as well as for goods.[32]

Integrating the European Regions is the second reason for prioritising the Fehmarn Belt Fixed Link for EU funding. The Fehmarn Belt Fixed Link is an integral part of the EU's priority transport project no. 20 "Fehmarn Belt Railway Axis" and also of the EU's priority core network corridor 5 - a North-South corridor that runs all the way from Helsinki in Finland to Valletta in Malta. Once completed, the corridor will contribute to the political goal of further integrating Europe's regions: as travel and transport times diminish and transnational interaction increases, disparities between regions are expected to decrease.[33]

[32] http://www.femern.com/home/region-3/the-european-dimension/eu-transport-policy (14.11.2012)
[33] http://www.femern.com/home/region-3/the-european-dimension/eu-funding (14.11.2012)

- EU Internal Market

Furthermore, the project contributes to the European objectives of strengthening the competitiveness of the Internal Market and of increasing integration of Member States and regions. By reducing the travelling time in the Danish-German cross-border region, the fixed link also enables the emergence of new mobility and logistics patterns. Passengers travelling between Copenhagen and Hamburg will save at least one hour, freight trains about two hours and 160 km compared to the present route via Jutland/Great Belt. This facilitates an increased exchange across the belt between continental Europe and Scandinavia, thus strengthening the competitiveness of the Internal Market.[34]

- EU Climate Change objective

In addition the positive impact on climate change is also an important factor in the selection of the Fixed Link as a priority project. The Fixed Link across Fehmarn Belt is, first and foremost, part of a trans-European goods train corridor and will strengthen the relative competitiveness of CO_2-efficient freight trains. Both the reduction of ferry emissions and the shortening of the route between Scandinavia and continental Europe by 160 km for freight trains will directly result in reduced energy consumption and thus in lower emissions of pollutants and GHG. The Fehmarn Belt fixed link thus directly contributes to the EU climate change objective of reducing transport-related greenhouse emissions by 60% until 2050.[35]

Total changes in GHG emissions for the immersed tunnel alternative compared with the do-nothing alternative are estimated as follows[36]:

- Construction of the fixed link: 1,977,000 tonnes
- Operation of the fixed link: 5,900 tonnes per year
- Traffic 2025: -198,500 tonnes per year
- Traffic 2025: -50% Scenario: -43,000 tonnes per year

With a life-cycle period of 120 years, savings in GHG emissions from modal shift of cargo from road and ferry to rail outweigh the GHG emissions from construction and operation of the tunnel. In the base traffic scenario, the balance turns positive after 10 years of operation, in the 50% scenario after 54 years.

6.2. Methodology and remarks on environmental analysis

There have been multiple activities concerning environmental conditions and impacts along the Fehmarn Belt route over the years. From 2009 till 2011 various field studies (in the whole region of the Fehmarn Belt Fixed Link) were carried out. The EIA forms part of the application for approval of the project. An EIA study according to EU regulations is underway and close to finalisation. The Danish Ministry of Transport issued the Environmental Impact Statement (EIS) for public hearing in July 2013 and a draft EIS for the German public involvement was handed over to the competent authorities of Schleswig-Holstein in October 2013 for a plausibility and consistency check.

The EIA involves identification, description and assessment of the project's impact on the factors human beings (including human health), fauna and flora (including biodiversity),

[34] http://www.femern.com/home/region-3/the-european-dimension/eu-internal-market (14.11.2012).
[35] http://www.femern.com/home/region-3/the-european-dimension/eu-climate-change-objective (14.11.2012).
[36] COWI (2013), EIA Fehmarnbelt fixed link, Greenhouse Gas Emission Inventory, June 2013

soil, water, air, climate, landscape, cultural heritage and other material assets as well as the interaction between these environmental factors.

The project applicants must present information on the project's environmental impact which is essential to the decision making regarding the tunnel, the "Environmental Impact Statement" (EIS), to the competent authorities in Denmark and Germany. In the EIS all effects due to construction, presence of physical structures (use of land) and operation of the fixed link on the above environmental factors will be identified, described and assessed. The Danish Minister of Transport has assigned Femern A/S the responsibility to conduct the EIA and draw up the EIS for the Fehmarn Belt Fixed Link.[37]

The substance and extent of the proposed environmental investigations fulfil Danish and German legal requirements and standards. International norms and standards for environmental investigations like HELCOM (Helsinki Commission)[38] recommendations are also taken into consideration. The following environmental factors are analysed in detail with respect to those potential environmental impacts which are relevant for the EIA of the Fehmarn Belt Fixed Link:

- Human beings, incl. human health, flora, fauna and biological diversity
- Soil, water, air, climate and landscape
- Cultural heritage and other material assets
- Pertinent interactions among the afore-mentioned environmental factors. [39]

The German EIA consists of two steps which are subdivided into different sub-categories. As a first step a spatial sensitivity analysis has been carried out to identify "relatively low impact corridors" for possible routes within a study area extending to the east and west of Puttgarden. The entire potential on- and offshore project area of the fixed link has been examined. On land, the area extends both west and east of the ferry ports of Puttgarden and Rødbyhavn. The spatial sensitivity analysis (Raumempfindlichkeitsanalyse) will analyse the importance and sensitivity of the environmental factors in relation to the project largely based on information already available.

As a second step the technical planners developed the various alignment alternatives for the bridge and tunnel solutions. Alternatives include alignments with landing sites west of Puttgarden and Rødbyhavn (west-west), landing sites east of Puttgarden and Rødbyhavn (east-east) as well as alignments diagonally from east to west etc. These route alternatives are then assessed and optimised with respect to environmental standards, but also with regard to aspects of traffic, navigational safety, as well as other factors. A comparison of the alignment alternatives with respect to environmental impacts on the environmental factors and components will form the basis for a prioritisation of the alternatives, and lead to a selection of the alignment alternative with the least environmental impact for both the tunnel and the bridge solution.

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[37] Femern A/S and Landesbetrieb Strassenbau und Verkehr Schleswig-Holstein. (2010): EIA Scoping report, Proposal for environmental investigation programme for the fixed link across Fehmarn Belt (coast-coast), p. 2.

[38] HELCOM: One of the most important duties of the Helsinki Commission is to make recommendations on measures to address certain pollution sources or areas of concern. These Recommendations are to be implemented by the Contracting Parties through their national legislation. Since the beginning of the 1980s HELCOM has adopted some 200 HELCOM Recommendations for the protection of the Baltic Sea. Online: http://www.helcom.fi/Recommendations/en_GB/front/ (19.11.2012).

[39] Ibidem.

All the relevant environmental investigations in line with European regulations are included in the Environmental Impact Assessment which were finalised in 2013 as part of the Danish VVM/German UVP procedures (Femern A/S: Transboundary Environmental Impact Assessment; Documentation for the Danish Espoo Procedure (Espoo report), June 2013 ; http://vvmdocumentation.femern.com/).

6.3. Characteristics of the transport demand scenario and its economic drivers

The traffic forecast studies were carried out by a mixed Danish and German consortium of transport consultants (selected by a public tender procedure) using state of the art traffic modelling methodologies.

The estimated revenue from the coast-to-coast link has been calculated on the basis of the traffic forecasts prepared by the FTC (Fehmarn Belt Traffic Consortium). The traffic forecast was prepared on the basis of an opening of the fixed link across the Fehmarn Belt in 2015. The traffic forecast was later updated to the current opening year 2021. During the first 25 years of operation the underlying assumptions result in an annual growth of 1.7% in road traffic. This analysis assumed a zero growth in traffic after 25 years of operation.[40]

Since 2001, a drastic growth in car traffic on the ferry crossing of Rødby-Puttgarden has been seen. During the period from 2001 to 2007, the average traffic growth on the ferry crossing was 5.4% per year. The actual traffic in 2007 was almost 6,250 vehicles per day. This equals the forecasted traffic volume in 2013. In 2007, car traffic between Rødby and Puttgarden was thus approximately 6 years ahead of the traffic forecast.[41] In contrast, traffic declined in the period from 2008 to 2012 by some 20%.[42]

The ferry operator Scandlines argues that the traffic growth during that period (2001-2007) was solely due to their successful attractive discount ticketing in combination with a landside border shop concept.[43]

In the following Table C6-2 the traffic forecast for the road traffic across the Fehmarn Belt Fixed Link in 2018 (with and without ramp-up) is shown.

[40] Femern A/S for the Danish Ministry of Transport (2008): Financial Analysis. Fixed Link across Fehmarn Belt, p. 10.

[41] ibidem, p. 12.

[42] Cf. Tesch, Gernot (2013) : Zukunftsperspektiven für den Fährverkehr über den Fehmernbelt, in : Internationales Verkehrswesen, year 64, n°. 4, December 2013, p.41

[43] Ibidem.

Table C6-2: Traffic forecast for road traffic across the Fehmarn Belt Fixed Link in 2018

Number of vehicles per day	Traffic forecast	Traffic forecast including ramp-up
Passenger cars	8 200	6 600
Lorries	1 300	1 000
Buses	100	100
Total	9 600	7 700

The numbers are rounded off to nearest hundred.
Source: Femern A/S for The Danish Ministry of Transport (2008): Financial Analysis. Fixed Link across Fehmarn Belt, pp. 10-11.

The main governing assumptions are explained within the Financial Analysis report of 2008.

6.4. Investment cost and structure of financing

The Fehmarn Belt Fixed Link has been declared a priority project as part of the 2007-2013 planning of the expansion of the trans-European transport network of the European Union (TEN-T). It makes an important contribution to completing the central North-South axis between Scandinavia and central Europe along the shortest route. As a result, the project has received substantial funding from the European Commission as part of the programme for a trans-European transport network.

The planning of the Fehmarn Belt Fixed Link project covers the following three stages:

Table C6-3: Planning stages of Fehmarn Belt Fixed Link

Activity number	Activity name	Indicative start date	Indicative end date
1	Approval phase (Study)	01/06/2008	01/04/2015
2	Development phase (Study)	01/10/2008	31/05/2015
3	Construction phase (Works)	01/07/2011	31/12/2015

In 2008, the Commission committed funds amounting to EUR 339 million for the time period 2007–2013 for total eligible costs of EUR 1 273.8 million (C(2008)7998 final, dated 11/12/2008).

As part of the mid-term review in 2010, all of the projects with grants from the EU were evaluated by independent consultants to the Commission. Based on this review and given a slower planning phase, total eligible costs during the 2007-2013 programming cycle were now estimated at EUR 756.4 million with the result that EU subsidies were reduced by around EUR 72 million from EUR 339 million to EUR 267 million. In a Second Amending Decision of 23 January 2012 the budget for 2007-2013 was further revised to EUR 193 million. In 2013, the Commission approved additional funding. Total EU funding for preparatory works now amounts to EUR 204.1 million, to be disbursed by 2015.

EU subsidies will again be applied for the time period 2014–2020 during which most parts of the fixed link project will be built. According to Femern A/S, the present financial assessment of the project is based on a minimum TEN-T grant of 10% of the construction costs.

The final engineering of project funding has not yet been firmly decided by the Danish government. It is anticipated that subject to confirmation, Femern A/S will be the implementing agency of the fixed link project. In this case Femern will also be in charge of project funding.

Construction funds will be raised in private capital markets. The Danish State will guarantee loans and bonds. The Danish National Bank will be on stand-by to complement private funding if insufficient.

In the longer term, revenues from the usage of the fixed link are expected to pay back all debts.

The way the project has been analysed by the Danish government does not refer to the return of investment (RoI), but to the total payback time which also takes account of the risks of the project. According to the latest financial assessment, the payback period is 33 years for the coast-to-coast fixed link.

6.5. Cost developments over the life-cycle of the project

Till 2010 it was expected that a cable-stayed bridge was the most suitable solution for a fixed link, based on the feasibility study of eight alternative cases (cable-stayed bridge, suspension bridge, bored tunnel, immersed tunnel, with different capacity level for road and rail traffic). New studies showed that an immersed tunnel would be a better alternative. In 2011, an immersed tunnel with 4 road lanes and 2 rail tracks was recommended to the Danish parliament as the preferred solution, with a cable-stayed bridge as a second-best preferred solution. A final decision has not yet been made.

Since the feasibility study in 1999, of the various project solutions, costs of selected solutions have been updated. In the course of time, the ranking has changed.

The costs estimate, which was a part of the 2011 recommendation of the preferred solution to the Danish Parliament, the immersed tunnel with four road lanes and double (electrified) rail tracks (4+2), is 5.5 EUR billion (in constant 2008 prices) which is equivalent to EUR 7.23 billion (in current prices – the price level of each individual year).

Based on the initial feasibility studies the cost estimate for the immersed 4+2 tunnel solution was estimated at EUR 3.8 billion (constant 1996 prices) in 1999, equivalent to EUR 5.1 billion (constant 2008 prices). The increase of EUR 400 million is according to Femern A/S due to the following reasons:

- A number of changes have been introduced in the conceptual design of the Immersed tunnel solution (IMT), which forms the basis for the plan approval of the Danish and German authorities. The solution presented in the Feasibility Study has been developed and optimized on the basis of current legal requirements, including the Tunnel Safety Directive, the TSI (Railway) and environmental legislation such as the EIA-directive, Natura-2000 directives. An example of change in the project: the motorway now has full emergency lanes in both directions. The net impact of these changes on the cost estimate is, however, minor.

- The major change in the cost estimate to the Feasibility Study is related to the planning phase, especially the project approval by the authorities in the two countries. In the Feasibility Study 3 years were allowed for planning, now it can be concluded that the planning phase will be at least 6 years. The increase in time and cost is related to investigations of alternative solutions, where now in all 4 technical solutions (conceptual designs) have been developed, environmental impacts assessed etc. This is mainly due to the legally binding plan approval procedures incl. requirements due to the implementation of German Nature Protection law, environmental impact assessment laws and the way the Land Schleswig-Holstein has implemented German administrative and environmental laws.
- Annual operations and maintenance costs are estimated to be around EUR 73.7 million (2008 prices), compared to EUR 68.2 million in the original cost estimate (1996 prices).

As regards the assessment of revenues, the rather unstable economic situation in most of Europe certainly affects the reliability of revenue estimates. This risk is, however, borne by Denmark under the State guarantee model by which the State guarantees all equity and loans of the implementing body.

6.6. Development since the last study

Upon application for additional funding, the Commission decided to increase the co-funding for works under the current decision to implement the project from 23.9% to the maximum of 30% (from EUR 193 to 205 million) for the years 2013-2015.

The (trans-border) environmental impact assessment was completed in 2013; the report is on the project website (Femern A/S: Transboundary Environmental Impact Assessment; Documentation for the Danish Espoo Procedure (Espoo-report), June 2013; http://vvmdocumentation.femern.com/). The German Espoo-consultation procedure will run parallel to the approval procedure conducted by LBV-Kiel, Schleswig-Holstein.

As regards our recommendation in the first study one year ago that an update of the traffic forecast and the CBA are needed to reflect the impact of the financial and economic crises, Femern A/S responds that no CBA study update was requested by the Ministry of transport as the Danish Parliament has already approved the decision to implement the project. However, the Danish Parliament requires an updated traffic forecast together with an update of investment costs once the project promoter presents the construction package to Parliament (in December 2014).

6.7. Related issues

6.7.1. Project critics and opponents

Critics and opponents of the Fehmarn Belt fixed link keep voicing their arguments against the project. The main arguments relate to unsound and outdated traffic forecasts as well as weaknesses and unrealistic assumptions in the cost-benefit analysis. They are partly echoded by individual MEPs. The European Greens, for example, argue:

- In the CBA it is assumed that there would be no ferry operations after the opening of the fixed link; this assumption is not realistic.
- The Hamburg rail knot is saturated; therefore the channelling of freight trains through this bottleneck does not make sense. A bypass more to the East would be more suitable.
- A link via Rostock would even be more suitable but the Danish government is opposed to this recommendation. Denmark is even removing rail tracks in that corridor.

The ferry operator SCANDLINES goes further by arguing that they are able to develop "zero emission ferries", ready for operation by 2020[44].

The first point of the European Greens relates to the traffic forecast of 2002, which forecasts a (not detailed) demand for ferry services operating parallel to the fixed link albeit the conclusion that the commercial viability of continued ferry services is doubtful. The CBA report states; "the ferry supply is fixed at the same level as the summer of 2002 except for the route Rødby-Puttgarden, which would be closed when the fixed link opens". The same assumption was made in the case of the Channel fixed link back in the 1980s. Nevertheless, by investing heavily in modern large ferries, the ferry operators were able to resist Eurotunnel competition and maintain a major share of the cross-Channel passenger and freight transport market. It remains to be seen how the forthcoming updated traffic forceast deals with this issue. Earlier traffic forecasts for the Fehmarnbelt fixed link dealt with the question in a rather simpliefied way. The assumption that the present ferry operator would cease operations as soon as the tunnel opens for traffic may not hold water.

The saturation of the Hamburg rail knot is also an argument that should not be overlooked in the revision of the traffic forecast. Different options to increase the capacity of the rail knot or to bypass it are being discussed. A first decision has been taken by DB and Hamburg City in July 2014 to relocate the station of Hamburg Altona to Diebsteich. The new station Hamburg Altona should become operational by 2023. We are not in a position to conclude if this is already a sufficient solution for handling of increased rail freight traffic due to the implementation of the Fehmarn Belt Fixed Link.

Femern A/S states that after the Danish Parliament, in March 2009, passed the legal act adopting the treaty between Denmark and Germany and committing Denmark to implementing the coast–to-coast fixed link there seems to be no clause for a revision of the basic parliamentary decision to go ahead with the project. However, before the presentation of the construction act in the Danish Parliament, Femern A/S will provide a full technical and environmental description, updated traffic forecasts; project cost calculation based on prices from the market as well as other relevant information.

6.7.2. Hinterland rail connection projects

Germany has committed itself to building a double track electrified railway line between Lübeck and Puttgarden (apart from the bridge across the Fehmarn Sund). DB Netz is the implementation agency of this project which, according to preliminary estimates, will require an investment in the order of EUR 817 million (€ (2003 price level). The technical planning is still at a very early stage. At present, the "Raumordnungsverfahren" (regional impact assessment procedure) is underway and expected to be concluded in spring 2014.

[44] Tesch (2013)

The follow-up will be the choice of the alignment and of other technical parameters. Only then, a more reliable cost estimate will be possible. For the time being there is no schedule for the plan approval procedure.

Within the framework of the revision of German transport infrastructure requirements, the federal Ministry of transport had commissioned a special CBA for the Lübeck - Putgarden project following the standard CBA procedure of the Bundesverkehrswegeplanung (Federal transport infrastructure planning). Based on the assumption that the fixed link as well as the Danish hinterland connection are implemented, the CBA result would be highly positive. The German project would yield a benefit cost ratio of 6.7 on the basis of the above-mentioned investment cost of EUR 817 million[45]. It should be noted that in the calculation, savings of truck operating costs represent 92% of net benefits.

The upgrade of the Danish hinterland rail connection is scheduled for the period 2014-2020 with a budget of almost EUR 1.8 billion, to be financed by Denmark, with co-funding from the TEN-T/CEF programme.

6.7.3. Prospects for project implementation

The planned time schedule for the preparation of the Fehmarn Belt Fixed Link project as shown in Table C6-3is still valid; the process may be slightly delayed by 2 months.

The German plan approval procedure, which is not included in the above schedule, is assumed to be on track.

6.8. Conclusions to be drawn

The Fehmarn Belt fixed link project was launched following the completion and operation of the Oresund fixed link in the year 2000. Retained as a TEN-T priority project in 2007, the combined rail & road project with access rail and road routes has been retained as part of the TEN-T core network for financing during the 2014 to 2020 cycle.

Originally envisaged as a joint Danish-German venture, the Danish parliament committed its government to financing and building the coast-to-coast fixed link with access routes in Denmark, while the German contribution is limited to the provision of the access infrastructure in Germany, in particular the upgrade of the rail link between Lübeck and Puttgarden.

On the Danish side, the project promoter, Femern SA, can build on the experience of planning and implementing the Oresund project as well as the Great Belt project. During the planning phase, Femern SA has demonstrated the capability of developing this megaproject without delays usually encountered in projects of similar size, notably the Brenner or the Lyon-Torino tunnel projects. The Danish government agency has commissioned all legally required studies which are available to the general public for download from the Femern website. Public consultations were held at various stages. The Danish public seems to accept the project without opposition as it is meant to be financed without taxpayers' money, i.e. with capital market funding, albeit with the Danish government guaranteeing the loans. The project is expected to reimburse the loans from traffic revenues. A significant contribution of EU funding is expected.

45 see BVU/INTRAPLAN (2010): Überprüfung des Bedarfsplanes für die Bundesschienenwege, final report, November 2010, pp. 9-357 – 9-369.

The Fehmarn Belt Fixed Link project now enters its final phase of preparation. After the presentation of revised traffic forecasts and construction estimates to the Danish Parliament, the construction project is expected to be approved and construction to begin in 2015. First tenders for construction contracts have been issued. The implementation of the coast-to-coast project and the upgrading of the feeder lines on the Danish and German sides are expected to cost some EUR 10 billion.

Our assessment can be summarised as follows:

- The Fehmarn Belt project is mainly driven by political forces on the Danish side. The German government has withdrawn from the coast-to-coast fixed link project. Notwithstanding, opposition groups in Germany argue for the cancellation of the project. Critical arguments come mainly from the German public where even a strong opposition has been building up.
- The project is developed by a competent Danish government agency, Femern AS, building on the experience of two other large-scale fixed-link projects. The postponement of the opening date of the new infrastructure by three years (2021 instead of 2018) is rather modest compared to the delays encountered in many other EU supported projects.
- An inquiry of commercial interest to develop the project as a private venture or as a public-private partnership was carried out in 2003; although banks, construction companies and PPP promoters expressed keen interest, the result was inconclusive as the Danish and German governments failed at the time to commit themselves to a clear risk-sharing scheme.
- It must be kept in mind that the Fehmarn Belt fixed link would divert significant parts of freight traffic from the Great Belt to Fehmarn Belt. Part of the Great Belt investment would thus be sunk costs.
- The economics of the project are unclear. Both traffic forecast and cost-benefit analysis were last carried out more than 10 years ago. An update of the traffic forecast is presently being prepared but there are no plans for an update of the CBA, the crucial measure to assess the socio-economic soundness of an infrastructure investment project.
- An independent audit of the forthcoming traffic forecast revision would be desirable; the audit ought to pay particular attention to the options of the ferry operator(s) to respond to the opening of the fixed link.
- The Hamburg rail knot is a neuralgic point of the German rail freight sector. Special attention ought to be given to the prospects of its capacity once the Fehmarn Belt crossing has become operational. How serious is Germany's commitment to an upgrading of the Hamburg rail knot and the rail link between Lübeck and Puttgarden, as Germany demonstrates in the case of the Upper Rhine rail infrastructure upgrade prior to the opening of the Gotthard alpine crossing that commitments are not met in due time?
- The EU contribution to the financing of the project should be based on a sound assessment of cross-border and wider economic benefits.

Appendix 1: Chronology

1991: At the signing of the treaty on a fixed link of the Öresund between Denmark and Sweden in 1991, Denmark agreed to a fixed link across the Fehmarn Belt for road and rail transport between Germany and Denmark. The aim is to improve the transport of persons and goods in an environmentally responsible and sustainable manner by shortening the route via the Great Belt and replacing the existing Fehmarn Belt rail ferry services.

1999: completion of technical, environmental and economic studies (see list of sources). The project consists of the coast-to-coast fixed link and the rail and road access lines on both sides including electrification. Various alternative technical solutions were investigated including cable-stayed or suspended bridge types and immersed or bored tunnel types at various levels of capacity (2 – 4 road lanes; 1-2 rail tracks).

2000: Danish-German memorandum to build the Fehmarn Belt fixed link

2001/2002: Enquiry of commercial interest into the implementation of a PPP project: the result of the enquiry was inconclusive since both governments did not want to commit themselves to a specific risk sharing concept.

2005: The Fehmarn Belt fixed link is listed as the main element of the TEN-T Priority Project n° 20. With the Öresund fixed link between Sweden and Denmark, opened in July 2000, the Fehmarn Belt fixed link would complete the direct land corridor between Scandinavia and Central Europe.

2007: The Danish and German Ministers for Transport signed a declaration of intent on establishing a fixed link across the Fehmarn Belt.

2008/2009: State treaty on establishing a fixed link across the Fehmarn Belt, ratified by the Danish parliament on 26 March 2009 to coincide with the enactment of the Danish Planning Act by the German parliament on 18 June 2009.

2010: In May 2010 the State of Schleswig-Holstein launched a regional planning process (ROV) for the rail hinterland connections. Furthermore the effects on human health, soil, water, air, climate, landscape, animals, plants and ecosystems, which in their turn have an impact on tourism and-municipal developments resulting from route closures or common developments were investigated.

2011: The Danish Minister for Transport declared the immersed tunnel solution as the preferred crossing. A preferred alternative variant is the bridge solution. Rødbyhavn was fixed as the only production site for the tunnel on grounds of the EU Directive 85/337/EEC ("the EIA Directive"). As a consequence environmental impact assessments (EIA) had to be conducted for this part.

The Budget Committee of the Danish Parliament approved increasing the budget for the planning exercise. This allowed Femern A/S to prepare the building of civil engineering construction work and start planning a security system for vessel-traffic during construction.

In August 2011, Femern A/S published a consolidated management accounting. Thereafter the cost for the immersed tunnel was estimated at EUR 5.5 billion and the Danish hinterland connections at approximately EUR 1.1 billion (2008 prices). The amortization period is estimated at 39 years.

2012: Consolidated technical report in which the main characteristics of possible variants immersed tunnel crossing, cable-stayed bridge, suspension bridge and bored tunnel are discussed.

2013: After the completion of the EIA, plan approval procedures have been initiated in Denmark, by Femern A/S, and in Germany, by the State of Schleswig-Holstein.
Tender procedures have started with prequalification of candidates; short-listed candidates are preparing tenders for submission in 2014.

Appendix 2: References

Year	Type	Title
2013	Environmental	Femern A/S (2013): Environmental Impact Assessment, June 2013
2013	Environmental	COWI (2013): EIA Fehmarnbelt fixed link - Greenhouse Gas Emission Inventory, June 2013
2012	Schedule	Femern A/S (2012a): Time schedule for the Fehmarnbelt coast-to-coast project, April 2012
2012	General	Femern A/S (2012b): Annual report 2011, April 2012
2011	General	Femern A/S (2011a): Annual report 2010, March 2011
2011	Costs	Femern A/S (2011g): Consolidated construction estimate for the Fehmarnbelt Fixed Link, August 2011
2011	Technical	Femern A/S (2011h): Consolidated Technical Report, Draft, December 2011
2011	Technical	Femern A/S (2011c): Facts & Figures – The immersed tunnel, May 2011
2011	Technical	Femern A/S (2011d): Facts & Figures – The cable-stayed bridge, May 2011
2011	Environmental	Femern A/S (2011e): Fact & Figures – Environmental Investigations, May 2011
2011	Administrative	Femern A/S (2011f): Fact & Figures – The approval process, May 2011
2010	General	Femern A/S (2010c): Planning status – Fehmarnbelt coast-to-coast, November 2010
2010	Environmental	Femern A/S, Landesbetrieb Strassenbau und Verkehr Schleswig Holstein (2010): Proposal for environmental investigation programme for the fixed link across Fehmarnbelt (coast-coast), EIA Scoping Report, June 2010
2010	General	Femern A/S (2010a): Annual Report 2009, April 2010
2010	Technical, environmental	Femern A/S (2010b): The preferred technical solution for the EIA process – the recommendation of Femern A/S + 8 appendices, November 2010
2009	Planning Act	Act on Project Planning for a Fixed Link over the Fehmarn Belt, with Associated Land Facilities in Denmark, 15 April 2009
2008	Treaty	Treaty of 3 September 2008 between the Kingdom of Denmark and the Federal Republic of Germany on a fixed link across the Fehmarnbelt
2008	Financial	Femern A/S (2008): Fixed Link across Fehmarnbelt Financial analysis, September 2008
2007	Memorandum of Understanding	Memorandum of Understanding regarding a treaty on a fixed link across the Fehmarnbelt between the Federal Republic of Germany and the Kingdom of Denmark, Berlin 29 June 2007
2006	Environmental	German Federal Ministry of Transport/Danish Ministry of Transport (2006b): A Fixed Link Across the Fehmarnbelt and the Environment, Environmental Consultation Response Report, October 2006

2006	Environmental	German Federal Ministry of Transport/Danish Ministry of Transport (2006a): A Fixed Link across the Fehmarnbelt and the Environment, Environmental Consultation Report, January 2006
2006	Regional	Copenhagen Economics/Prognos (2006): Regional Effects of a Fixed Fehmarn Belt Link, February 2006
2005	Environmental	National Environmental Research Institute (2005): Construction of a fixed link across Fehmarnbelt: preliminary risk assessment on birds, June 2005
2005	Environmental	COWI/DMU (2005): Fixed Link across the Fehmarn Belt – Effect on Emissions to Air, March 2005
2004	Financial	Ministry of Transport Denmark (2004b): Fixed Link across Fehmarnbelt, Financial Analysis, June 2004
2004	Technical	Copenhagen Economics/Prognos (2004b): Economy-wide benefits – Technical report, Dynamic and Strategic Effects of a Fehmarn Belt Fixed Link, June 2004
2004	Economic, regional	Copenhagen Economics/Prognos (2004a): Economy Wide Benefits – Main Report, Dynamic and Strategic Effects of a Fehmarn Belt Fixed Link, June 2004
2004	Economic	Ministry of Transport Denmark (2004a): Economic Assessment of a Fixed Link across the Fehmarn Belt, June 2004)
2003	Financial, traffic	Danish Ministry of Transport, German Ministry of Transport (2003): Fixed Link across Fehmarnbelt: Financial Analysis, Traffic Forecast and Analysis of Railway Payment, Summary Report, March 2003
2003	Financial	Femer Baelt (2003): Fehmarn Belt Fixed Link, Financial Analysis, Main Results, February 2003
2003	Financial	TetraPlan (2003): Fehmarn Belt Fixed Link, Analysis of Rail Infrastructure Payment, March 2003
2003	Traffic	Fehmarnbelt Traffic Consortium (2003): Fehmarn Belt Forecast 2002, April 2003
2002	Financial	Fehmarnbelt Development Joint Venture (2002) : Fixed Link across Fehmarnbelt, Financing and Organisation, Enquiry of commercial interest, June 2002
2001	General	Fehmarnbelt Development Joint Venture (2001): Fehmarnbelt, An infrastructure investment, Information Memorandum, July 2001
1999	Economic, financial	Planco/COWI (1999): Economic and Financial Evaluation of a Fixed Link Across the Fehmarn Belt, Final Report, June 1999
1999	Traffic	Fehmarnbelt Traffic Consortium (1999): Fehmarnbelt Traffic Demand Study, Final Report, January 1999
1999	Regional	KOCKS/ISL/CARL BRO (1999): Investigation of socio-economic and regional consequences of a fixed link across the Fehmarn Belt, Final Report, June 1999
1999	Technical, environmental	Lahmeyer/COWI (1999): Fehmarn Belt Feasibility Study, Coast-to-Coast Investigation, Investigation of technical solutions, January 1999

Source: Femern A/S (http://www.femern.com/service-menu/publications) and others.

ANNEX 7. TWO TUNNELS ON SE40 EXPRESSWAY SEVILLA-HUELVA

Table C7-1: Project summary two tunnels of SE40 Expressway Sevilla-Huelva

Aspect	Description	Aspect	Description
Project Title	Construction works of two road sections of a ring road around Seville (two tunnels)	TEN-T code	2009-ES-08092-E
Countries / area	Spain	Start date	June 2009 (official)
Mode(s)	Road with tunnel section	End date	December 2010 (official)
Managing authority	Sociedad Estatal de Infraestructuras de Transporte (SEITT); Ministerio de Fomento	Duration	1 year 7 mth.
		Delay (mth)	Significant
Investment cost (m€)	239.69 (total project cost 525)	Length (km)	2.76 (north) 4.14 (south)
EC funding TEN-T (m€)	23.969	EC share	10% (~5% of total cost)
Funding agent 1	Ministry of Public Works and Transport (Ministerio de Fomento)	Value (m€)	215.72
Funding agent 2	European Commission TEN-T European Economic Recovery Prog.	Value (m€)	23.97
Cost-bene-fit-analysis	National Guideline by the “Servicio de Planteamiento de Dir. Gral. de Carreteras” and conducted by the AYESA firm	CBA ratio	6.36 (6.04 to 6.54)
		Public y/n	« yes »
Transport scenario	Forecast until 2023. Source unclear. Updated forecast until 2030 from 2008.	Dated from	Undated (2008)
Externality covered	Analyses divided in: Physical, Biological, Socio-economic, Cultural and Patrimony, and Landscape	Ext. cost (m€)	Not quantified in monetary units (except for environm.)
EIA	Yes (for the whole SE 40 project)	Public y/n	« yes »
CIA	Not included	Public y/n	n.a.
Financial analysi	Made by the AYESA firm together with the CBA (see above)	Payback	7 years
		FIRR	26.31%
Ex-post evaluation	Proposed guidelines for ex-post environmental assessment: “Programa de vigilancia y seguimiento ambiental”	Cost overrun (m€)	Not available

Source: m€ = million Euro, own analysis.

Source: TEN-T Executive Agency

The project SE-40 Expressway Seville-Huelva is part of the longer road section Cordoba-Seville-Huelva that in turn forms part of the European priority project 8. Actually, SE-40 constitutes a ring road around the City of Seville. The funded project, analysed by this case study, concerns the construction of a tunnel crossing under the River Guadalquivir which is a section of this ring road SE-40 in the southwest of Seville.

The tunnel crossing is split into two parts, of which the northern part has a length of 2.76 km and the southern part of 4.14 km. In narrow terms this section would not have been part of priority project 8, which passes Seville in the northwest, while the project is located in the southwest of Seville. However, the TEN-T funding provided for the construction of the two tunnels comes from the European Economic Recovery Plan (EERP), i.e. the economic stimulus package that was defined in 2009 to mitigate the economic crisis of the years 2008/09. In that sense the project fulfilled the funding criteria as the Ministry of Public Works and Transport (MinFOM) published the call for proposals for the northern tunnel (MinFOM 2008a) as well as for the southern tunnel (MinFOM 2008b) as early as 2008. Thus, it was deemed to be sufficiently mature to spend the economic stimulus money during 2009 and 2010. However, the mid-term review of the EERP reports a completion date of 2014 and states that “The eligibility period has elapsed without the project having made significant progress or meeting its objectives.” (Giorgi 2011, p.53). On the other hand, the SEITT (Sociedad Estatal de Infraestructuras del Transporte Terrestre) reported in 2012 on their website that the project is still being executed (SEITT 2012).

7.1. Methodology and remarks on CBA and project selection

For the purpose of our analyses we obtained from the Spanish authorities the economic analysis of an upgrade of the northern part of the SE-40 ring road, which is actually part of the priority project 8 as it connects the motorway from the southwest coming from Huelva with the motorway towards Cordoba in the northwest passing Seville via the SE-40 ring road (Ayesa undated). The cost analysis differentiated the construction cost of three main route options with a total of 12 sub-options. For the transport demand analysis also different options for further sections of the SE-40 are considered, i.e. 4 main route options for the western section and 2 main route options for the south-western sections (i.e. the section including the two tunnels). 10 combinations of main route options for the three sections have been tested as others are similar to one of these 10 combinations or were not feasible.

The CBA has been conducted applying a national guideline for a benefit analysis recommended by the national road planning bureau (Recomendaciones para la evaluacion economica coste-beneficio de estudios y proyectos de carreteras, published by Servicio de Planeamiento de la Direccion General de Carreteras). The transport demand scenario has been forecasted for the years 2003, 2008, 2013 and 2023. Potential benefits are estimated for the following categories:

- Transport cost of car users including vehicle cost, fuel cost (between 29.6 and 30.2 pts/l), cost of lubricants (between 512 and 570 pts/l) and cost of tyres.
- Time savings applying a value of time between 1,965 and 3,475 pts/h in values of 1998.
- Cost of accidents applying a cost values of PTS 34 million per death and of PTS 4.5 million per injured person in values of 1998 (i.e. about EUR 204 000 per death and EUR 27 000 per injured person).

For the total upgraded/new sections of the SE-40 ring road (north, west and southwest part i.e. including the two tunnels) the benefit cost ratio is estimated at 6.36, the (financial) internal rate of return at 26.31% and the payback period at seven years. The 12 sub-options for the northern part of the SE-40 were estimated individually as well. Their benefit-cost ratios were between 3.67 and 10.40, and their FIRRs between 15.74% and 34.07%. The discount rate applied was 3.5% (Ayesa undated).

There has been an updated economic analysis that seems to build on Ayesa (undated) and includes specific estimations for the two tunnel sections as well. The methodological approach is the same as described above. The benefit-cost ratio for the tunnel sections was estimated to be between 6.04 and 6.54 (N.N. undated).

7.2. Methodology and remarks on environmental analysis

The environmental impact analysis (EIA) seems to be profound on the base of the state-of-the art of the late 1990ies. It was carried out on the base of Spanish legislation from 1986 to 1988 (N.N. 1999). It analysed 12 different options of route choice and compensation measures for adverse environmental impacts. Out of these 12 options 8 options were qualified as not feasible due to environmental concerns. Out of the remaining 4 options a ranking is provided and the option with the most limited environmental impact is proposed (was option 5).

For all 12 options also measures to mitigate and compensate environmental impacts have been assessed. The compensation measures would cost in the range between PTS 270 and PTS 380 million. The proposed option 5 caused mitigation cost of about PTS 307 million, roughly in the middle of this range.

Analysed environmental impacts included:

- Impacts on atmosphere (pollutants), hydrology, geology and climatic conditions (not emissions of greenhouse gases).
- Impacts on flora and fauna,
- Impacts on health and territorial planning,
- Cultural heritage,
- Nature and landscape, and
- Erosion and impacts of geological risks.

Climate impact assessment was not part of the EIA, even not only in terms of potential changes of emissions of greenhouse gases.

7.3. Characteristics of the transport demand scenario and its economic drivers

Two different transport demand scenarios have been used for the studies on the SE-40. One scenario that seems to stem from around 2000 and provides transport demand projections until 2023 with intermediate years 2003, 2008 and 2013 is used in the economic analyses by Ayesa (undated) and N.N. (undated). The same transport projections were used for the Environmental Impact Analysis, that seem to stem from the same period (N.N. 1999).

An update of the transport demand scenario was prepared in 2008 (Ayesa 2008) to estimate the cost of the equipment and installations to be implemented in the two tunnels. The forecast was then provided until 2030. It is not known if an update of the economic appraisal exists as well, using these transport projections. It should be also pointed out that this revised transport forecast does not include the impacts of the financial crisis of 2008/09. We also did not identify any indication that this update made reference to the Spanish strategic infrastructure plan of 2005, called PEIT (MinFOM 2005).

7.4. Investment cost and structure of financing

The investment cost estimates have changed slightly over the recent past years. The history can be detected from three sources provided by the Spanish authorities on the internet. For the northern tunnel of the southwest part of the SE-40 this development reads:

- Call for proposals 2008 (MinFOM 2008a): EUR 233 million (excl. VAT).
- TED confirmation of contract 2009 (TED 2009a): EUR 203 million (excl. VAT).
- Website of projects of SEITT (Sociedad Estatal de Infraestructuras del Transporte Terrestre, 2012): EUR 245 million (incl. VAT).

For the southern tunnel of the southwest part of the SE-40 the cost development reads:

- Call for proposals 2008 (MinFOM 2008b): EUR 245 million (excl. VAT).
- TED confirmation of contract 2009 (TED 2009b): EUR 232 million (excl. VAT).
- Website of projects of SEITT (Sociedad Estatal de Infraestructuras del Transporte Terrestre 2012): EUR 280 million (incl. VAT).

In both cases, it seems that the initial cost estimate was higher than the offers obtained from the successful bidders. This could be the result of the economic crisis of 2008/09, of the tough competition on the Spanish market or of both.

According to the SEITT data, the two tunnel sections together will cost EUR 525 million including VAT. This is significantly above the cost listed by the TEN-T EA of EUR 239 million. However, the TEN-T EA fiche explains that these costs would cover only the first part of the works. Thus the 10% TEN-T funding of EUR 24 million would amount only to roughly 5% of the project cost.

7.5. Developments since the last study

Contacts were maintained with the SEITT authorities. Unfortunately, according to their files, the status of the project is the same as in our previous report. Due to financial constraints, the civil works have been stopped and there is no further information on when they will start again.

Since 2011 (with the previous Spanish Government) many solutions have been discussed by the current and former Ministries (Limón, 2011; El País, 2012), like bridges, reducing the number of lanes of the tunnels, reducing the number of tunnels, and so on, or even terminating the contract with the construction companies to start all over again (Fernández Magariño, 2013). However, none of these alternatives have been approved and therefore, there seem to be no studies that could corroborate the feasibility of these alternatives. Recently an article in a Spanish newspaper was published regarding cost overruns in construction, especially noticed in public projects (Cordero, 2014). The article mentions that in 2008 the EU demanded that Spain abandons the policy of modifying contracts to increase their original price, many times without justification or penalties would be issued. Thereafter, cost overruns cannot exceed 10% of the tender proposal. One of the interviewees of this article also emphasises that Spanish legislation ranks the economic proposal higher than the technical proposal, which evidently runs the risk of being too naive. In this respect, this infrastructure had an overrun of around 35%, therefore the procedure had to be reinitiated (El País, 2012). In fact, the budget triplicates the original one calculated a decade ago (Limón, 2013).

According to the SEITT (2013) the tunnels are still under execution and not yet finished Table C7-2 presents the details according to this webpage (The webpage is last updated on September 30th, 2013).

Table C7-2: Project status according to the SEITT

Civil Works	Actual Budget (Tax included)	Company Awarded	Current State
Autovia SE-40. Sector suroeste. Tramo: Dos Hermanas (A-4)-Coria del Río (A-8058). Subtramo: Enlace A-4 (Dos Hermanas)-Túneles sur del Guadalquivir-Embocadura oeste (South tunnels, west entrance)	280,169,678.26 €	Aldesa Construcciones, S.A., Copisa Constructora Pirenaica, S.A., Bruesa Construcción, S.A.	En ejecución (in execution)
Autovía SE-40. Sector Suroeste. Tramo: Dos Hermanas (A-4)-Coria del Río (A-8058). Subtramo: Embocadura Este-Túneles Norte del Guadalquivir-Coria del río (A-8058) (South tunnels, east entrance)	245,552,177.34 €	OHL, Construcciones Sánchez Domínguez-Sando, S.A., AZVI, S.A.	En ejecución (in execution)

Source: SEITT online.

Although it seems that the projects are under execution, as a matter of fact they have been stopped and there are neither reprogramming information, nor official project amendments (Limón, 2013). Moreover, the project related to the tunnels' installation works has been resigned by the enterprise (SEITT, 2013) (project number 20081041-C). The Major of Seville, Juan Ignacio Zoido, has declared in a recent symposium that the National Government should prioritize this infrastructure (Agencias: Sevilla, 2013).

We also approached the "Ministerio de Hacienda y Administraciones Públicas" (Public Administration and Funding Ministry) through their webpage (Ministerio de Hacienda y Administraciones Públicas, online) and through direct contacts, but we were remitted again to the SEITT. We have not received information from the "Ministerio de Fomento" (Ministry of Civil Works) either. The information on their webpage regarding the project has not provided further details (Ministerio de Fomento, online)

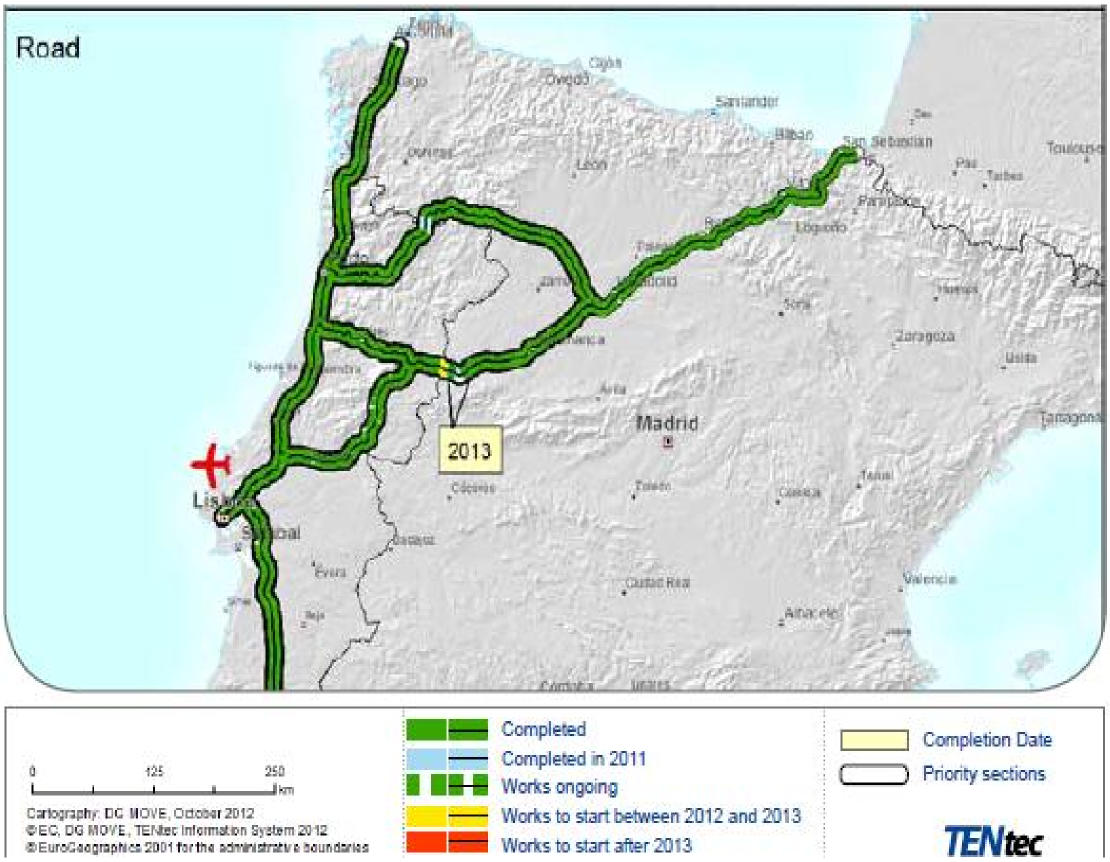
The Civic Association "Asociación de Defensa del Territorio del Aljarafe – ADTA" state that there would have been better and more sustainable alternatives, which could improve mobility in the area with a reduced amount of economic resources, and most importantly, lessening the environmental impacts (Limón, 2013). With regards to environmental impacts, they claim that this bypass impacts ecological regeneration projects, such as the Pudio river regeneration project, which is also funded by the EU (Limón, 2012).

Interesting to note would be that recently the Spanish law concerning the ex-post evaluation of environmental impacts of a transport infrastructure has been discussed for modification and the agreed changes were published in the Official Deputy Bulletin (BOCG, 2013), known as "Strategic Environmental Assessment". Therefore the tunnels will be subject to this new law or a modification of them should comply with these requirements.

Finally, it is noteworthy that according to the progress report related to the Priority Projects (2010, p.154), the PP8 regarding motorways would at that time be operational. Stated in the report this reads: "On the Spanish side, the motorways linking Lisbon- La Coruña and Lisbon-Seville are now operational".

Similar commentaries are written in the subsequent reports (TEN-T Trans-European Transport Network, 2012, p.83; TEN-T projects, online).

Table C7-3: Project status according to the TENtec



Source: Implementation of the Priority Projects, 2012.

7.6. Conclusions to be drawn

Obviously the project is on hold, and it remains unclear whether it will be continued to be completed. Public concern through the media pushes the debate of different alternatives although none of them has yet been officially studied or accepted.

Major economy drawbacks along with a complex engineering infrastructure should be analyzed in detail. Instead of remaining with an unfinished infrastructure, and some contracts awarded, it seems better to clarify the problems and develop solutions instead of prolonging the pending status.

Concerning EC funding it seems that the agreed Action could have been completed by starting a few meters of excavation. The question remains open if no date has been agreed when the full infrastructure should be completed and become operational.

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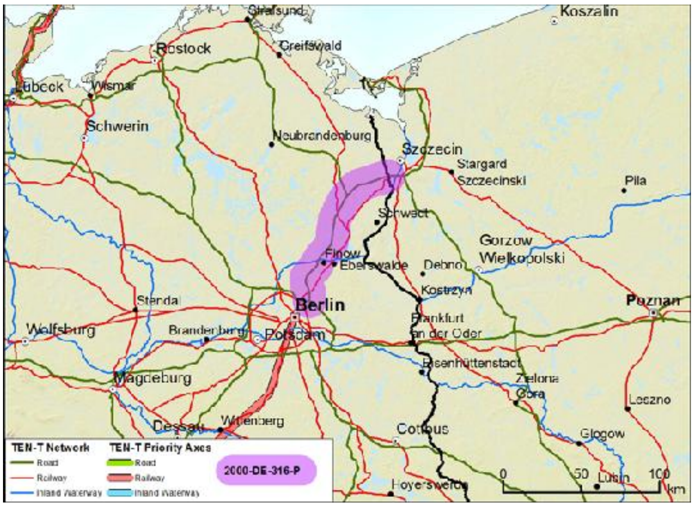
ANNEX 8. A11 MOTORWAY FROM BERLIN TO POLISH BORDER

Table C8-1: Project summary of A11 motorway from Berlin to the Polish border

Aspect	Description	Aspect	Description
Project Title	Construction works on the A11 motorway Berlin-Polish border	TEN-T code	2000-DE-316-P
Countries / area	Germany (DE)	Start date	2000 (1996)
Mode(s)	Road	End date	2010 (2014)
Managing authority	Ministry of Transport Brandenburg Ministry of Transport Mecklenburg-Vorpommern	Duration	11 (19)
		Delay (mth)	(48)
Included in TEN-T	Part of TEN-T road network in 1996 (TEN-T Guidelines EC Decision 1692/96/EC)	TEN-T element	Comprehensive
Investment cost (m€)	131.5	Length (km)	110
EC funding TEN-T (m€)	10	EC share	7.6%
EC funding Cohes. (m€)	0	EC share	0
Funding agent 1	German Federal Ministry of Transport	Value (m€)	121.5
Funding agent 2	European Commission	Value (m€)	10
Cost-benefit-analysis	Missing for the basic decision to renew A11 motorway	CBA ratio	
		Public y/n	
Transport scenario	Federal Infrastructure Plan 1992/2003 BMVBS Verflechtungsprognose 2025	Dated from	1992 / 2003 (2007)
Externality covered	Water, soil, climatic conditions, flora and fauna, nature and landscape	Ext. cost (m€)	Not quantified
EIA	Plan approval procedure of several sections of A11 (Landschaftspflegerischer Begleitplan Grundhafter Ausbau BAB 11)	Public y/n	(y)
CIA	Could not be identified – not in EIA	Public y/n	
Financial analysis	Missing	Expected RoI	
Ex-post evaluation	Missing	Cost over-run (m€)	

Source: own analysis.



The A11 motorway dates back to the 1930's connecting Berlin with Szczecin in Poland. Today the part from Berlin to the Polish border constitutes the motorway A11 in Germany. The A11 forms part of the European Highway E28 that should connect Germany via Poland to the Baltic States. Though the concept of this east-west axis existed since the 1930´s the whole motorway was never completed, yet. Until 1990 very little efforts were made to maintain or extend the A11 motorway.

After the German reunification in 1990 the German government defined the so-called "Verkehrsprojekte Deutsche Einheit" (VDE) (transport projects to implement German reunification), of which a large part was to renew poorly maintained existing transport infrastructure, and, where necessary, increase capacity to accommodate the expected transport growth between Western and Eastern Germany, and beyond towards the Eastern neighbouring countries. The latter became an even higher priority after the decision that Eastern neighbouring countries would accede to the EU. Since 1996 the A11 is continuously renewed section-by-section, but even until 2007 there have been sections, which still were constructed by the concrete slabs from the 1930's. Completion of the renewal building new pavements, adding emergency lanes, re-constructing all bridges and adding new bridges including green bridges allowing animal crossings is expected to last until 2014.

On the Polish side of the border after 1945, first of all, the destroyed bridge across the river Oder had to be rebuilt. Afterwards there were plans to complete the motorway until Kaliningrad, but until the fall of the iron curtain in 1990 nothing happened. At present, the Polish Part of the motorway is named A6 and since 2011 there are construction works ongoing. As part of the European Highway E28, it is now again planned to extend the motorway in a similar manner, as it was initially planned before the Second World War.

8.1. Methodology and remarks on CBA and project selection

The A11 is connected with the so-called "Verkehrsprojekte Deutsche Einheit" (VDE), though in narrow terms it is not part of any VDE. However, the reporting about the progress of road construction of the VDE most often includes part of the A11 within the reporting on the motorway A20 as a connection Lübeck to Stettin (Szczecin) (Bundesregierung/BMVBS 2002, 2006). The "Verkehrsprojekte Deutsche Einheit" (VDE), which comprised 17 projects to re-establish the transport connections between West- and East-Germany (9 rail projects, 7 road projects and one inland waterway project), were decided within a period of 6 months between October 3rd 1990 and April 9th 1991. The projects were a political decision to react on the fast and unexpected German reunification process. Therefore a CBA was not applied. During these 6 months the initial cost estimate for the 7 road projects was about EUR 12 billion. Until the nearly completion of the projects in 2010 the cost increased by about 40% to EUR 16.6 billion, in particular due to construction of tunnels additionally required in hilly areas (DEGES 2011). However, though for the basic decision to build the VDE projects no CBA was carried out, it can be concluded that for the decision on exact routes at least a plan-approval procedure was conducted, though this does not necessarily imply that a CBA was performed.

The part of A 11 receiving funding from TEN-T was built between 2000 and 2010 at a total cost of EUR 131.5 million supported by a TEN-T budget of EUR 10 million. We could not obtain any CBA on that project, which was essentially a renewal project of a deteriorated infrastructure and not a construction of a new infrastructure.

8.2. Methodology and remarks on environmental analysis

The plan approval procedure for A11 was split into five sections, of which we obtained the EIA, and a remaining part of about 20 km length of which we did not obtain an EIA. For each section a separate EIA is carried out, following the German guidelines (German Transport Authorities, undated). The considered impacts include impacts on water, soil, climatic conditions, flora and fauna, nature and landscape. Two patterns can be observed for the assessment of the different sections: on the one hand the impacts were assessed to be less dramatic as construction of the A11 in the 1930's already led to impacts on and a separation of the living space on both sides of it. On the other hand the areas crossed by the A11 are sparsely populated and several sites of ecologic importance have been identified and needed to be considered during the plan-approval procedures.

Emissions of greenhouse gases were not considered in the EIAs, neither were life-cycle impacts on CO_2 emissions of infrastructure or vehicles.

All impacts were assessed qualitatively, only. Monetisation of externalities and potential inclusion into CBA was not part of the tasks of the EIAs.

8.3. Characteristic of the transport demand scenario and its economic drivers

The initial decision on the VDE in 1990 was underpinned by expert opinions, which included also judgements on transport forecasts. Only when in 1992 the revision of the German Federal Transport Infrastructure Plan was published a transport forecast considering the German reunification of 1990 was developed. This transport forecast was updated for the revision of the Federal Transport Infrastructure Plan in 2003, followed by another revision in 2007 (BMVBS 2007). We are not aware if and how these forecast affected the planning and construction of A11.

Looking at the speed of implementation of other VDE compared to A11 it seems that the transport forecast for the A11 is very moderate. While the motorways connecting East and West Germany have been completed years ago, the A11 also more than 20 years after reunification is still under renewal in some sections. This highlights the importance for the European decision-makers to closely look at cross-border projects, to which A11 belongs, as for these the national interest often is lower than for other national projects.

8.4. Investment cost and structure of financing

The reported investment costs were EUR 131.5 million of which EUR 121.5 million were funded by the German Federal Ministry of Transport and Housing and another EUR 10 million by the European Commission (2011). However, the total costs should be yet unknown as renewal of final sections of A11 is still ongoing, and according to latest information might even continue until 2016.

8.5. Cost developments over the life-cycle of the project

There is no source existing on the time profile of cost of A11. On average the VDE road projects faced a cost increase of 40%. In the case of A11 the long duration of planning and construction probably will contribute to cost increases, though not even one source could be identified that estimated costs for the whole project (110 km).

8.6. Development since the last study

After 29 months of construction time, the interchange "Kreuz Barnim" was completed at the end of 2013. Since then it has replaced the former interchange "Dreieck Schwanebeck". The new interchange connects the southern end of A11 to the federal highway A10 and to the federal road B2. The construction costs increased from EUR 45 million up to EUR 57.5 million (about +28%), of which EUR 20 million (i.e. a share of 35%) were funded by the European Regional Development Fund (ERDF), the remainder was financed by German federal means (BZ 2012, BM 2013).

On the A11 itself, the following construction works were carried out during 2013: elementary upgrade from interchange "Kreuz Uckermark" to the border Brandenburg/Mecklenburg-Vorpommern, construction of the wildlife crossing "Melzower Forst". Furthermore, the planning of an elementary upgrade from junction "Lanke" to junction "Britz" is prepared, which will be implemented in 2016. The above measures were all entirely funded by the German government.

8.7. References

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ANNEX 9. LYON-TURIN BASE TUNNEL

Table C9-1: Project summary Lyon-Turin base tunnel (part of link Lyon-Turin)

Aspect	Description	Aspect	Description
Project Title	Lyon-Turin base tunnel (cross-border section)	TEN-T code	PP6, 2005-EU-603a-S, 2007-EU-06010-P amended 2009, 2013
Countries / area	France, Italy, Alpine area	Start date	1990: plans 2003: works
Mode(s)	Rail, high-speed and freight	End date	2020-2025
Managing authority	Lyon Turin Ferroviaire (LTF) (Alpetunnel from 1994 to 2001)	Duration	17 years
		Delay	5-15 years
Included in TEN-T	Essen projects in 1994 (then in 2004: PP6)	TEN-T element	Core network, Medit. corridor
Investment cost (m€)(2)	8 600 (23 000 to 26 000)	Length (km) (2)	57 km (257 km)
EC funding TEN-T (m€)	2007 – 2013(2015): 395 (planned 2014-2020: 3 400)	EC share	44.4% (40%)
Funding 1	Italian national government (2014-2020)	Value (m€)	2,900
Funding 2	French national government (2014-2020)	Value (m€)	2,400
Cost-bene-fit-analysis	Until 2011 several CBA, but not public. 2011/12: CBA by Lyon-Turin Observatory related to project of 270 km length	NPV (m€)(1)	FR: 14,291 IT: 11,972
		Public y/n	Y
Transport scenario	CBA by Lyon-Turin Observatory (transport figures provided by LTF model)	Dated from	(2011)
Externality covered	Air pollution, greenhouse gas, noise, accidents, congestion	Ext. cost (m€) (1)	FR: 13,149 IT: 11,891
EIA	Many detailed environmental analyses – unclear if full EIA exists	Public y/n	(N)
CIA	CO_2 savings as part of CBA, including construction phase	Public y/n	Y
Financial analysis	CBA by Lyon-Turin Observatory (figures provided by LTF)	IRR FR (1)	5.09
		IRR IT (1)	4.72
Ex-post evaluation	n.a.	Cost overrun (m€)	n.a.

(1) Valuation with French or Italian valuation parameters.
(2) Values in brackets refer to the complete link between the nodes of Lyon and Turin.
Source: own analysis, various sources, main was the current CBA [Observatory 2012], m€ = million euro.

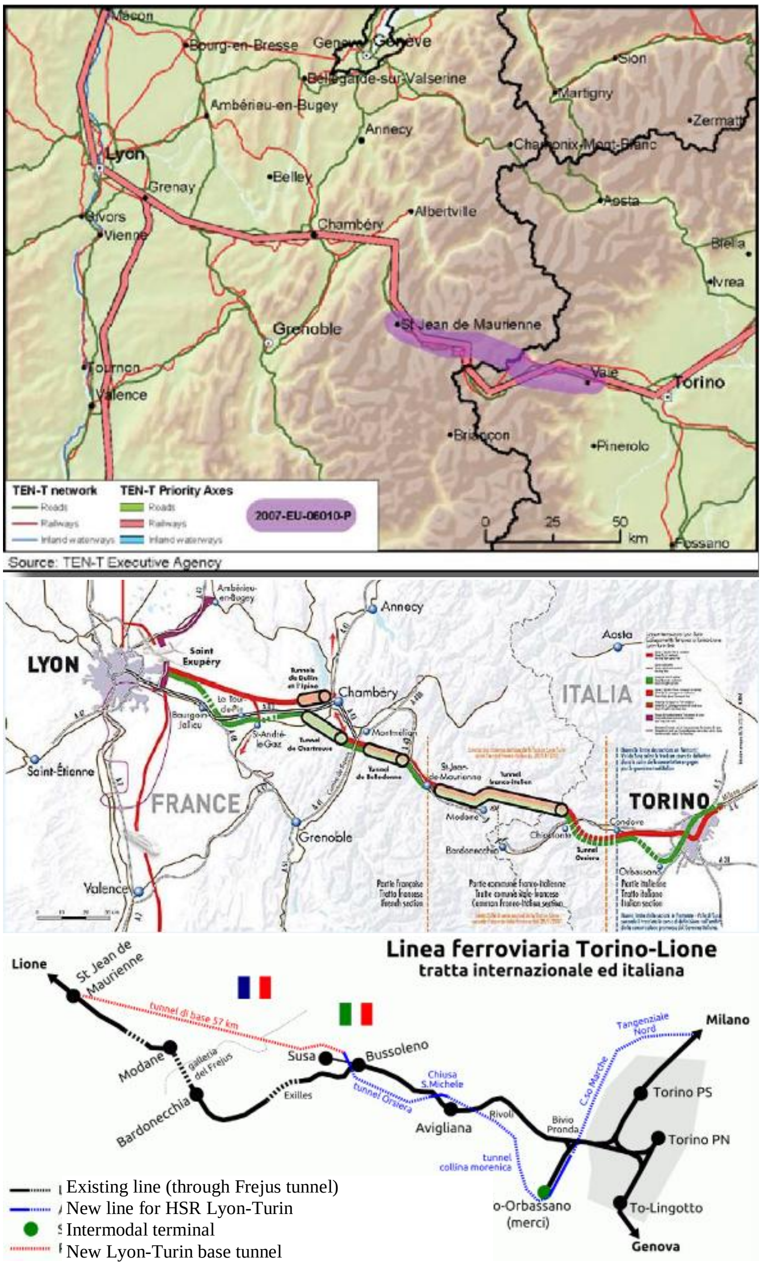

Figure C9-1: Maps on Lyon-Turin rail project

The Lyon-Turin base tunnel is part of the 257 km long railway connection between the cities of Lyon in France and Turin in Italy. The Lyon-Turin section was one of the 14 Essen projects agreed at an EU council summit in Essen in 1994. In 2004 it became part of priority project 6 (PP6), the railway axis Lyon-Budapest-Ukrainian border [EC Decision 884/2004/EC]. With the revised TEN-T guidelines in 2013 the Lyon-Turin section became part of the Mediterranean corridor [EC DEC 1315/2013].

Since the initial propositions to build a high-speed rail connection between Lyon and Turin that seem to have emerged around 1988-1990 the project has been re-designed many times. Today the cross-border section includes the 57 km long base tunnel to be bored between St. Jean de Maurienne in France and Susa in Italy as well as a second tunnel, the so-called 14 km long Orsiera tunnel (which replaced the 12 km long Bussoleno tunnel) to be bored in Italy as well. On the Italian side further construction works are planned towards and around Turin to connect the new line with the line Turin-Milan-Venice. In total 72 km of track would have to be built in Italy.

On the French side the access routes are split into the 75 km long new high-speed rail connection between Lyon and Chambery and a new freight line from Lyon to Combe de Savoie and from there to the entrance of the base tunnel in St. Jean de Maurienne, amounting in total to 120 km of new line including three long tunnels (Chartreuse: 16 km, Belledonne: 20 km, Dullin: 16 km) as well as a number of shorter tunnels. As of the beginning of 2014 the implementation of access routes on both sides of the base tunnel, in France and in Italy, seems to have been postponed and will only occur when transport demand in future grows and sufficient national funding can be secured.

In addition to the tunnels for the tracks four evacuation and safety tunnels and two passing tracks are planned to be constructed for the double tube 57 km long base tunnel: St. Martin La Porte, La Praz, Modane and Venaus/Maddalena. These tunnels also have a length of up to 7 km for the longest one. The maximum distance to a safety tunnel should stay at 14 km. Every 333 m cross passages between the two tubes are planned to allow escaping into the second tube in case of an accident or other emergency. The four access and safety tunnels would also provide for ventilation of the base tunnel. The design speed is now fixed to 220 km/h [Odgaard 2007, Rudin/Peinke 2008, Brino et al. 2013]. It is estimated that to implement the whole section Lyon-Turin about 300 km of new tunnels will have to be bored, though the exact length is difficult to verify as different sources report different numbers and lengths of tunnels along the whole line.

The initiative to propose a high-speed line from Lyon to Turin seems to have come from the French side in 1989 who wanted to extend their developing TGV network and linking it with the Italian network was an option. In Turin the Technocity association presented the concept of a 50 km tunnel to a group of experts and politicians in 1990. One year later in both countries committees supporting the tunnel were founded and the first feasibility study was conducted in 1991. References to such early studies quote cost estimates of EUR 3.7 billion for a line that would carry 7.7 million passengers and would roughly double rail freight transport to reach more than 18 million tons. The same year the first local committee to oppose the TAV (TAV = Treno Alta Velocita, High-Speed Train), called Habitat, was formed in the Susa Valley in Italy. The movement later on named itself No TAV [Allasio 2006, Cascetta/Pagliara 2011].

After Lyon-Turin became one of the 14 Essen projects in 1994 the Alpetunnel company was set-up by the French and Italian railways. Alpetunnel was supposed to manage the project development through the feasibility phase and the planning phase. Between 1995 and 2001 Alpetunnel commissioned studies and exploratory bores that together with those exploratory bores until 2013 amounted to 50 km of bores. However, after opposition since 1995 was getting more profound and the appraisal studies commissioned by Alpetunnel seemed not to provide support for the project the company was shut down in 2000/2001.

In 2001 (January 29th) the French and Italian governments signed an agreement for the construction of a new rail link between Lyon and Turin. A new French-Italian company was founded, Lyon Turin Ferroviaire (LTF), to promote and develop the project. The company is controlled jointly by Reseau Ferré de France (RFF) and Rete Ferroviara Italiana (RFI). LTF is responsible for the assessment, planning and implementation of the cross-border section of Lyon-Turin including the base tunnel. RFF is responsible for the same tasks of the two French sections connecting the base tunnel to Lyon and RFI for the Italian section up to Turin. Until today LTF has remained responsible for promoting and developing the project of the cross-border section and thus the base tunnel below the Mt. d’Ambin. At that time the plan was to make the Lyon-Turin link operational in 2015.

In 2003 the French Ministry of Equipment and Transport approved the pre-project studies and works on the 2.4 km long access and evacuation tunnel of Saint Martin La Porte in France could commence, which lasted until 2010. The 4 km long access tunnel of Modane was completed in 2007, and the 2.5 km long access tunnel of La Praz in 2009 such that on the French side of the base tunnel all three access tunnels were drilled down to the level of the base tunnel until mid 2010. The diameter of the access tunnels allows trucks to reach the level of the base tunnel. Boring works on the 7.5 km long exploratory tunnel of Maddalena on the Italian side - which will become the fourth access and evacuation tunnel to the base tunnel – did not begin until the end of 2012. The reason was the opposition of local stakeholders from the Susa Valley and its neighbouring regions as well as experts that formed the No TAV movement. Such opposition was provoked by the Italian political decision process which mainly involved the upper hierarchy of policy-making and neglected the local authorities and stakeholders. This will be discussed further below.

In 2004, after the European Union re-designed the TEN-T networks by defining 30 priority projects and confirming the European interest in the Lyon-Turin rail link by making it a part of PP6 from Lyon to the Ukrainian border, the French and Italian governments signed a Memorandum of Understanding to equally support the global investment in the Lyon-Turin link and expecting EU co-funding of 20% of the construction cost. Other sources report on an agreement dated from May 2004 according to which Italy would fund 63% of the cross-border section and France 37%.

In 2005 the situation escalated when the Italian government wanted to start exploratory works in the Susa Valley leading to what was called ''the battle of Seghino'' (on October 31st) and the ''defense of Venaus'' (December 6th, which is documented at http://www.arcoiris.tv/scheda/it/5097/) where the No TAV movement intended to block work on geo-technical core boring for preliminary studies in the locality of Mompantero and on the construction of the exploratory tunnel [Marincioni/Appiotti 2009]. Four days later, the Italian Government set-up the ''Lyon-Turin Environmental Observatory,'' (hereinafter the ''Observatory''), which was to act as an independent entity to facilitate the dialog among the various high-speed rail stakeholders. At the end of 2006 the Observatory started a dialog with local and regional authorities, representatives of the municipalities and invited experts to develop a joint approach that would be acceptable to all stakeholders. In 2008 it came up with a new preliminary project definition shifting the alignment of the tracks in the Susa Valley from the left side of the valley to the right side. The results of the dialog were then published by seven Quadernos by the observatory. The preliminary design was made subject to further studies and in particular laid the ground for the yet still missing public cost-benefit analysis (CBA). This was later on published as the 8th Quaderno by the Observatory at the beginning of 2012.

At the end of 2007 the French Prime Minister declared the public utility of the cross-border section of the Lyon-Turin project. The EU commenced its 2007 to 2013 budget period and decided to co-fund the Lyon-Turin base tunnel with EUR 671 million during that period, of which France indicatively should obtain EUR 234 million and Italy EUR 437 million. Together the French and Italian governments planned to spend EUR 1.4 billion until 2013. The EU supported both studies (at a co-funding rate of 50%) and construction works (at lower co-funding rates, eventually now 27%). Both studies and works were linked with planned milestones. For instance, the studies on developing the Maddalena gallery were assigned EUR 119 million connected with the milestone no. 10, and work was scheduled to start on January 31st 2010, actually it started at the end of 2012. The first two substantial phases of construction work of the base tunnel were supposed to start in 2012 with a planned budget of EUR 212 million (phase 1 only) and in 2013 with EUR 1 143 million (phase 1 and 2 together). According to the milestones the works of phase 1 should have started on April 30th 2012 [EC 2008]. The funding rules of the EU require that the activities are completed at the latest two years after the funding period ends, which would be December, 31st 2015. Projects not achieving their milestones by then risk losing their EU co-funding or at least part of it (N+2 rule). This could also mean that already paid EC funds would need to be paid back at least proportionally to the yet uncompleted activities. As it became apparent that the implementation of the base tunnel was delayed the funding decision was revised to a total investment of EUR 890 million for the period 2007 to 2013 with an EU co-funding of EUR 395 million (about 44%) [EC 2013].

At the beginning of 2012 (January 30th) the French and Italian governments signed a new treaty on the construction of the new Lyon-Turin rail link, which amends the Treaty of Turin from 2001 (see above). A main issue was to agree on the national share of funding of phase one, which basically includes the base tunnel and a shortened version of the Orsiera tunnel (2 km length). France would contribute 42.1% and Italy 57.9% after deducing the EU contribution from the total investment cost. The full text of the agreement remained confidential until it was published by the opposing No TAV movement. The TEN-T coordinator of PP6 briefly summarized the content of the treaty in his annual statement in 2013 pointing out that a new governance structure will be established in which the European Commission will play a more relevant and decisive role [Brinkhorst 2013].

In 2012 the first official and public cost-benefit analysis (CBA) was published by the Observatory [Observatory 2012] and presented by the Italian government on April 26th 2012. The CBA refers to the full project of 270 km length and provides a socio-economic assessment for three scenarios differentiating the future economic development: permanent shock, lost decade and rebound, with lost decade being the median scenario. While in the permanent shock scenario the net present value of the whole Lyon-Turin link is negative, the other two scenarios would generate a benefit. The underlying time horizon assumes a start of construction in 2013, start of operations in 2023 and consideration of cost and benefits until 2072.

In France a debate about the strategic planning of a sustainable transport system had also taken place. Building on the French National Infrastructure Plan (SNIT) the Commission Mobilité elaborated the infrastructure needs for developing a sustainable transport system in France. They classified infrastructures into those to be built by 2030, those to be built between 2030 and 2050, and those relevant only for the more long-term after 2050. Initially the Lyon-Turin link was classified into the latter category. Finally, it was decided to exclude the planned link from the evaluation, which meant not to classify it at all by the Commission Mobilité. The argument was that by legal international agreements – those between France and Italy mentioned above and those with the EC - the decision to build the project had been taken already [Commission Mobilité 2013].

The TEN-T coordinator of PP6 emphasized in 2012 that the Lyon-Turin project was not beyond the “point of no return”, a statement which was repeated in 2013 modified in a sense that it could become so after the political green light would have been given. This could have happened at a meeting of French and Italian leaders on November 20th 2013 [Brinkhorst 2012, 2013]. Though at this meeting the French and Italian Presidents confirmed their support of the project, today still reasonable doubts may exist if the project will actually be built.

Over the whole process at least eleven options to align the route on the Italian part of the Lyon-Turin link have been proposed by different stakeholders including the promoters (Alpetunnel and LTF), industry and regional authorities [Virano 2012]. The planning situation today can be described as a phased approach in which the whole Lyon-Turin link of 257 km length might be implemented stepwise. Each further step would be implemented only, if the condition was met that after each phase of implementation transport demand would grow and reasonable demand projections would reveal that increased rail capacity would be needed on the link. In the first implementation phase the 57 km long base tunnel and a 2 km long Orsiera tunnel are planned to be built.

The flawed stakeholder process in Italy

The political situation concerning the new Lyon-Turin rail link differs substantially in France and Italy. In France the regional and local authorities were involved early in the project development and support the project, while on the national level the project was criticised to be too costly [Cour de Compte 2012] such that more relevant and more beneficial transport projects would not receive funding anymore as a large share of French infrastructure investment budget would need to be assigned to the Lyon-Turin link. In Italy it was the opposite situation: the national governments over the years all supported the project, while in particular the local stakeholders of the Susa Valley and Italian citizens had been opposed to the project since the beginning in the 1990ies, when they formed the technical committee called Habitat.

In fact, the case of stakeholder involvement on the Italian side of the Lyon-Turin link – actually the lack of local stakeholder involvement over 15 years of developing the project - became an issue analysed in depth by sociologists, who even argue that the project kicked-off a new citizens' movement in Italy, when the so-called No TAV movement connected with other movements e.g. those against the G8 summits in Italy as well as the Occupy protests occurring as a consequence of the financial crisis[46] [e.g. Carls/Iamele 2011, Greyl et al. 2013].

Nevertheless, the No TAV movement and the Habitat Committee together acted on all levers available for citizens to get involved in decisions when they are not officially getting involved. This included:

- Peaceful resistance via demonstrations, marches, sit-ins and blockades.
- Addressing their opinions and arguments to all political levels including the EU.
- Contributing to the scientific debate with scientific papers and media articles.
- Acquiring land to strengthen their legal situation.

The detailed history of the conflict is also documented by a book series that consists of four volumes, where just the volume describing the decisive year 2005 until the setting-up of the observatory takes about 380 pages [Gino 2010].

Over 15 years the resistance of local opponents in the Susa Valley increased. Remarkable single events were bombings and sabotage activities during the second half of the 1990ies after which two of the accused persons seem to have committed suicide in 1998, while they were in jail. The most important mass protests took place at the end of 2005 and were called ''the battle of Seghino'' and the ''defense of Venaus'' by Marincioni/ Appiotti [2009] due to the massive deployment of police and the high number of demonstrators that were reported to be about 70,000. Considering that the Susa Valley in the lower part has a population of about close to 70,000 persons and in the upper part of about 13,000 persons it means that up to 80% of the local population could have participated. The demonstrators intended to prevent the construction workers from starting to bore exploratory holes from the Venaus site, and despite the police temporarily managing to clear the sites, the demonstrators returned the next day and started the blockades again. Thus a few days after the "defense of Venaus", which happened on December 6th, the 3rd Berlusconi Government decided on December 10th, 2005, to establish the ''Lyon-Turin Environmental

[46] For an example see for instance: http://italycalling.wordpress.com/2011/11/17/occupy-everywhere-occupy-everything-november-17/#. For more information on No TAV see: http://www.notav.info.

Observatory'' (the Observatory), as an independent entity with the declared goal of facilitating a dialog and exchange of arguments amongst the high-speed rail stakeholders, including in particular the local municipalities.

At the beginning of 2006 the Winter Olympics took place in Turin, where the locations of the downhill sports events were to be reached via the Susa Valley. Thus the government asked for an Olympic truce for that period, which was accepted by the No TAV movement revealing also their seriousness about the issues they raised concerning the rail project. The coincidence of the Olympics and the establishment of the Observatory calmed down the protests and started a new phase of open-minded debate.

The Committee on Petitions to the European Parliament reacted to the petitions from Habitat and others by sending a fact-finding mission to Turin and the Susa Valley in November 2005. The mission met both proponents and opponents to the project and was also an eye witness to the police activities against the No TAV blockade in Venaus on November 29th, just shortly before the events at Venaus of December 6th. They summarize the seven main arguments of the opponents in 2005 as [European Parliament 2006]:

- Uncertainty over the cost-benefit analysis.
- Refusal to upgrade the existing line.
- Hydrogeological risk to groundwater in the area.
- High noise emissions levels in the Alpine valleys.
- Environmental risk due to asbestos and uranium in the debris.
- Dubious technical arrangements to transport the debris out of the tunnel.
- Inadequate compensation offered for the loss of value of surrounding property.

However, the Committee also notes that the big issue of debate is if the project should be built at all and not if it should be built in a better or different way [European Parliament 2006].

Between 2006 and 2009 the Observatory managed to establish a process that also by most of the opponents – however not by all as the No TAV movement remained absent - was seen as sufficiently open and independent to participate and contribute their arguments to the discussion process, which by the mandate of the Observatory was focussing on four debated issues: (1) the actual capacity of the existing line, (2) the Alpine traffic including the forecast, (3) the railway hub of Turin, and (4) alternative routes of the Lyon-Turin link. Also due to the innovative and creative role that the President of the Observatory Mario Virano played the activities of the Observatory led to an agreement of a new alignment of the new Lyon-Turin railway through the Susa Valley. However, with local elections bringing new parties into municipal governments including the No TAV movement and a territorial restructuring of municipalities some opposing municipalities decided not to participate further in the Observatory meetings, such that after 2010 opposition increased again and during 2011/2012 clashes between the police and the opposition to the new railway occurred and became stronger reaching again numbers of several ten thousand protesters [Maggiolini 2012].

One of the important reasons for Italian opposition seems to be the application of the rule to accelerate the implementation of infrastructures and manufacturing plants of national strategic interest (called legge obiettivo, Italian law 443 of 2001) by the government. As a consequence the standard environmental assessment procedures (e.g. for exploratory tunnels) and public participation were avoided.

Apart from addressing the Committee of Petitions of the EP (see above) the opposition to NLTL (New Lyon-Turing Link) of the Susa Valley also addressed other policy-makers. In 2007 they made an appeal to the European Parliament not to decide in favour of funding the base tunnel from TEN-T funds for the period 2007 to 2013 [Sangone 2007]. In 2009 they addressed the TEN-T coordinator Laurens Brinkhorst to clearly express that no formal agreement on the NLTL between the local communities and the Italian government had ever been reached and to invite him to a joint conference [No TAV valleys 2009]. In 2011 they explained to European Commissioner Siim Kallas that the works at La Maddalena Gallery had not been started by June 30th 2011, a deadline set earlier by the EC and pointed out the additional cost of the police activities at the construction site, which were not accounted for in the cost estimates [No TAV valleys 2011]. In 2012 more than 350 scientists supporting the No TAV positions sent a letter to the Italian President Mario Monti to explain their positions on the flaws of the transport forecast, the lack of benefits of the project and that the project would have a negative energy balance [Ulgiati et al. 2012].

As already the Habitat Committee, formed during the early 1990ies, had a scientific background the opposition to the NLTL right from the beginning communicated their arguments also in the scientific community. Apart from the literature on the sociological and participatory aspects of the public debate quoted above [e.g. Marincioni/Appiotti [2009, Carls/Iamele 2011, Maggiolini 2012], a literature developed on the topic of the cost-benefit analysis discussing aspects like the assessment of transport benefits and questioning the transport forecast, the assessment of externalities questioning the energy and CO_2 savings of rail transport on a life-cycle base and concluding that the project would just be a huge waste of tax payer's money [Debernardi et al. 2011, Giunti et al. 2012, Grimaldi/Beria 2013, Maffii/Parolin 2013, Clerico et al. 2014].

9.1. Methodology and remarks on CBA and project selection

The project of a new link between Lyon and Turin to be constructed at a lower altitude (e.g. using a base tunnel) emerged at the end of the 1980ies. In 1994 it was adopted by the EU Council as one of the 14 Essen projects. At that time there were seven criteria defined for the selection of projects by the so-called Christophersen Group though it was not specified in detail how these were met by each of the selected projects. A reduced set of criteria was applied by the so-called van Miert Group when the NLTL became part of the priority project 6 (PP6), though both processes resembled more a political process than an analytical process building on the selection criteria. However, for the revision of the TEN-T guidelines to be applied for the funding period 2014 until 2020 the EC has developed an analytic approach to define the Trans-European Transport Network (TEN-T), which was developed by a group of independent consultants [TML et al. 2010], debated and amended by the European Parliament [Koumoutsakos/Ertug 2012] and adopted by the Parliament and the Council as the new Union guidelines for the TEN-T [REG 1315/2013, European Parliament/Council 2013]. The NLTL fits into the newly defined selection process as it connects two node cities of the core network, i.e. Lyon and Turin, which definitely fulfill the criteria defined for becoming selected as a core node, as well as two rail-road terminals of the core network. Accordingly, the Lyon-Turin link became a core element of the Mediterranean Corridor as well as connecting Italy with the North-Sea-Mediterranean Corridor. Thus the selection process of the link becoming part of the core network was straightforward and in line with the new TEN-T guidelines.

Looking at the options to select alternative routes, two existing ones remain: to the south the link Marseille to Genua via Ventimiglia and to the North the Lötschberg base tunnel, though the orientation of both differs from Lyon-Turin, where the former is clearly West-East and the latter North-South oriented. Further, there would be the option to improve the existing rail line through the Mt. Cenis tunnel. Additionally, there would have been two new options: first, to strengthen the motorway of the sea from the West of the Mediterranean both to the Western and the Eastern coast of Italy, and second to choose another Alpine valley for the Alpine crossing between Lyon and Turin. To the best of our knowledge a CBA based comparison of these six alternative options has never been carried out. It should also be remarked that a further development on the Lötschberg base tunnel, e.g. to improve access rail routes from Geneva, is not in the hands of the European Union and their Member States.

Looking at the CBA of the NLTL, there seem to have been a number of socio-economic assessments in earlier years that have not been published e.g. in 1991, 2000 and 2006 (e.g. in 2000 Alpetunnel asked a Consortium to carry out a Feasibility study applying Cost Benefit Analysis and Option Value Theory), and which we were not able to obtain. Thus, one of the first publicly available CBAs on the NLTL was published by Prud'homme [2007]. He used a simplified approach considering investments, consumer and producer surplus, government revenues and externalities building on rough hypotheses about these elements of the CBA. The calculations applied resemble to some extent a "back of the envelope" estimation. One of the major disbenefits estimated are the loss of fuel tax revenues due to savings of fuel due to the modal-shift from road to rail. From today´s point of view, after having experienced the oil price peaks of 2008, the continued high oil prices and the energy crisis with Russia and the Ukraine energy security has become one of the most important issues of governments and the EU. Any saved fossil fuel would be a contribution to improve energy security that could be handled as a positive externality. Also the track charges from the railways are not accounted for, which could have been done in the same way to benefit the government or the infrastructure operators (as it was done with the losses of the road charges at the Frejus tunnel). Applying a discount rate of 4% seems rather high, e.g. compared with recommended discount rates in other countries like Germany where the German long-term infrastructure planning procedure suggests a rate of 3%, and in the sustainability literature there are debates if discount rates for long term damages should be applied at all (i.e. the conclusion would be to use a discount rate of close to 0%). Finally, Prud'homme estimated a negative net-present value of about EUR -19 billion of the investment, which means that the investment would be a loss to society. However, this assessment should be treated cautiously due simplifications as per the abovementioned issues.

In 2012 the Observatory published the CBA referring to the full implementation of the NLTL [Observatory 2012]. Out of three scenarios two of them the lost decade and rebound, would generate a positive net-present value (NPV) of about EUR 14.3 billion using French parameter values and EUR 12 billion using Italian parameter values, respectively for the lost decade scenario and EUR 27.1 and 24.8 billion of the rebound scenario. The permanent shock scenario revealed a negative NPV of EUR -1.2 and -3.3 billion. The start of construction was assumed for 2013, start of operations for 2023 and cost and benefits were considered until 2072. Involved experts criticised the lack of analysing alternative options (e.g. assessing the improvement of the historic line) as well as that the CBA did not comply with European recommendations provided by the EC DG REGIO guide for Cost-Benefit Analysis and the HEATCO project [Maffii 2012]. As an example, it was demonstrated that assumed reductions of accident rates in the CBA were over-optimistic leading to threefold the benefits through reductions of fatalities and injuries then would have been estimated with proper values. To us also the value used to monetize the annual savings of CO_2 seems extremely high (if there is not an error in expressing the units of measurement). The French approach is quoted with a cost value of 0.008 euro/g CO_2 saved, and the Italian value at 0.006 euro/g CO_2 saved. Translating that into the more commonly applied unit of euro per ton of CO_2 saved, this would amount to 8,000 and 6,000 euro/t CO_2 saved. Common values have been suggested in the range between 10 and about 200 euro/t CO_2 saved, the latter e.g. proposed by IWW et al. [1998]. However, more recent estimates provide cost values at the lower end.

It should also be pointed out that for the assessment of such large scale projects the traditional approach of a link-based analysis of transport changes might be insufficient and instead the assessment of wider economic benefits would be appropriate [see e.g. Exel et al. 2002, Schade et al. 2013]. However, a standardized methodology does not yet exist, with which wider economic benefits should be measured. An example of how such benefits could be measured applying an integrated assessment model, called ASTRA, was presented by using the Lyon-Turin corridor as a case study [Schade 2006]. Using the investment figures of 2004 of EUR 13 billion and the time savings e.g. for passengers of 2.15 h between Lyon and Turin modal choice and export flows are affected by the new infrastructure. The ASTRA model enables to estimate the macro-economic impacts of policies in terms of changes of GDP. Implementing the link Lyon-Turin using the cost and transport parameters of 2004 resulted in an accumulated increase of GDP of EU15 countries by EUR 61 billion over 15 years until 2020, which indicates a macro-economic benefit of the new infrastructure. However, the author acknowledges that apart from two different types of policies no alternative uses of the invested money have been tested.

It should be noted that an elaborated financial analysis for the operation phase could not be identified, an issue which is also highlighted by the opponents to the project.

9.2. Methodology and remarks on environmental analysis

The environmental analysis so far has consisted of many separate analyses to examine single aspects of the project e.g. exploratory bores to analyse the soil crossed by the base tunnel, analyses of the hydrogeology, etc. However, we were not able to assess if an Environmental Impact Assessment (EIA) exists for the whole of the project. There are indications that an EIA at least does not exist for some of the Italian parts of the project e.g. the exploratory tunnel of Maddalena [European Parliament 2009].

There is no doubt that the construction of the base tunnel is facing environmental risks. The most relevant ones are:

- Some of the drilled rocks will contain asbestos.
- Some of the drilled rocks will contain uranium.
- The tunnel might change the hydrogeological conditions.

It seems to us that the risks have been analysed though uncertainties remain about the actual impact on the hydrogeology.

Noise emissions constitute a part of the debate. In general, the expectation seems to be that the increased traffic of the new line will affect the local population with higher noise levels. In our opinion this view neglects substantial benefits of the new line. First, due to the length of the planned base tunnel of 57 km as opposed to the length of 13.6 km of the Mt. Cenis tunnel an additional 43 km of railway line will be in a tunnel eliminating the noise emissions on that part of the track. Further, the modal-shift from trucks on the motorway through the French and Italian valleys will reduce the noise from the motorway, a fact which often seems to be neglected in the debate.

The climate impact of the project was a matter of intense debate as well. Savings of greenhouse gas emissions in general is a strong argument in favour of rail transport as well as it is also an objective of the European strategy to shift transport from road to rail or from air to high-speed rail for passenger transport. Accordingly the savings of CO_2 were considered as an element of the CBA resulting into an annual saving of 3 Mt CO_2 during the operation phase of NLTL. Additionally the CBA considered the CO_2 emissions due to the construction of the base tunnel concluding that 23 years after the start of construction works the net balance of CO_2 emissions will result into savings of CO_2. As explained above, according to our understanding these savings have been valued by too high cost values in the CBA. On the other hand, the opponents to the base tunnel try to prove that rail freight transport is more CO_2 intense than road transport [Clerico et al. 2014, quoting Federici et al. 2008]. Of course, we agree that the correct approach to undertake such a comparison of modes is to apply a life-cycle approach. However, looking at other literature the conclusion is that HSR and/or rail freight are significantly more energy-efficient and CO_2-efficient than road transport, also from a life-cycle perspective [e.g. Åkerman 2011, Chang/Kendall 2011, Hill et al. 2012, ÖKO 2013]. It seems that some assumptions in Federici et al [2008] are either not justified (e.g. the share of truck weight on total weight of trucks of 22%, which should rather be 35 to 40%) or the focus on a rather inefficient case study of rail transport, as the liberalization on the Italian rail market is lacking thus due to missing competition the offered services are inefficient revealing low occupancy rates and load factors, respectively. This in fact is an issue to be taken into account for Lyon-Turin as well: the investment into the base tunnel would only bear potentials to become beneficial, when efficient and cost-effective rail freight transport can be operated on the link. The pre-requisite is that on both ends of the base tunnel, i.e. in France and Italy, the rail markets have actually been opened and competition is taking place such that a variety of efficient and cost-effective services will be offered, in particular for rail freight.

In fact, despite the long debate on the Lyon-Turin link one strategic environmental issue seems to be missing: the long-term goals to reduce GHG emissions by at least -80% by 2050 compared with 1990 for industrial countries, to which Italy and France belong, will require electrified freight transport and not fossil fuelled trucks. In countries where the debate how to achieve these targets also for transport technological options like hybrid electric freight trucks operating under a catenary or being fuelled by synthetic fuels produced by renewable electricity (e.g. wind gas) have been or are analysed. However, the easier and technically more convincing solution still remains electrified freight rail and a modal-shift from truck to rail. In that sense, a debate considering fossil-fuelled trucks as a future sustainable solution would be rather backward looking and grounded in today's silos of thinking.

9.3. Characteristics of the transport demand scenario and its economic drivers

The transport forecast is the most questioned and questionable element of the assessment of the NLTL, in particular as previous forecasts always overestimated freight demand. Forecasts of the 1990ies expected a growth of freight transport volume on the link between Lyon and Turin of about 70% between 1994 and 2015, even in less favourable conditions concerning the development of industrial production. Freight travel time would be reduced from 5.10 h to 3.15 h. For the whole freight demand across Mt. Blanc, Mt. Frejus and Mt. Cenis a growth from 32.1 Mt/year in 1994 to 47.7 Mt/year in 2015 in a pessimistic scenario and 74.7 Mt/year in an optimistic scenario was expected [LET/Transalpe 1997].

The corresponding figures for passenger transport read as follows: today the TGV trip from Milan to Paris takes close to 7.5 hours of which about 4 hours account for the section between Turin and Lyon (TGV 9240, data provided by DB travel portal) of which about 2 h and 15 minutes could be saved by the NLTL alone, achieving finally a travel time of 4 hours between Milan and Paris. Air transport services between Turin and Paris amount to three flights (one direction) and between Milan and Paris to 12 flights (one direction, all flights).

The TEN-STAC study in 2004 analysed the 25 priority projects of the TEN-T including the PP6 and separating the section Lyon-Milan in their analyses. In the study a substantial number of scenarios were analysed and the presentation of results concentrated on the impacts of a PP alone and the impacts of all PPs altogether for a time horizon until 2020. For that year a maximum rail freight demand of 23.3 Mt/year was expected if only the PP6 was built and of 16.6 Mt/year if all other PPs including the Gotthard and the Brenner base tunnels were built. On average rail freight traffic would be 11.1 Mt/year and 6.8 Mt/year, respectively [NEA et al. 2004].

Over the past 15 years two disruptive events affected freight traffic on NLTL and complicated elaborate projections of the future demand. The first was the disastrous fire in the Mt. Blanc tunnel in early 1999, which led to a closure of this road tunnel for about three years. During that period a substantial share of freight demand that usually would have passed Mt. Blanc shifted to the Frejus and Mt. Cenis tunnels (road and rail) increasing the demand on this section by more than 50% (in 2000 it amounted to 35.2 Mt/year according to CAFT). The second event was the partial closure of the Mt. Cenis railway tunnel due to renovation and enlargement such that for a period of close to 10 years until 2012 for several hours per day one direction of the tunnel was closed which negatively affected the capacity and reliability of the rail link [Observatory 2007, Virano 2012].

Closely linked with the debate of the transport forecast is the debate about the capacity of the historic railway line through the Mt. Cenis tunnel. An often-quoted transport forecast developed by the LTF, the promoter of NLTL, estimates for freight transport demand in 2030 a volume of 16.4 Mt without the project and of 39.4 Mt per year with the NLTL [Allasio 2006, Observatory 2007]. In 2004 the demand was 6.5 Mt per year, however, here the temporary capacity limitations explained above should be taken into account as without them it could reasonably be expected that demand would have been higher. Concerning the capacity of the existing line through the Mt. Cenis tunnel studies from 2000 and from 2004 report a potential capacity of 20 Mt per year (185 freight trains and 66 passenger trains per day) and of 27 Mt per year (150 freight trains and 70 passenger trains per day) [Allasio 2006, Observatory 2007]. According to these forecasts the capacity of the existing line seems to be sufficient to cope with future demand, at least for the next two decades.

However, the environmental problems mentioned in the previous section would not be solved, rather they can be expected to be aggravated (i.e. noise from growing rail and truck traffic, long-term mitigation of climate change).

Other reports highlight that the capacity limitations for freight transport would first be observed on the rail node of the Turin metropolitan area with a capacity of up to 10 Mt of freight (about 60 freight trains per day) and neither on the existing line through the lower Susa Valley with a capacity of up to 28 Mt per year (about 160 freight trains per day) nor through the upper valley with a capacity of up to 32 Mt per year (about 180 freight trains per day), and corresponding numbers of passenger trains (174/94/46 passenger trains per day) [FARE 2008].

The traffic forecast underlying the CBA published in 2012 is provided by LTF and applies the same methodology as the earlier one debated by Quaderno 2 [Observatory 2007]. However, decelerated growth is expected also with the NLTL being built such that the demand of 40 Mt per year of freight on NLTL would only be reached in 2035 (i.e. 5 years later than estimated in earlier forecasts). Three different economic growth scenarios have been analysed in the CBA [Observatory 2012].

It should be noted that transport policy-making has significantly changed since the 1990ies. Modal-shift and climate mitigation policies have become high-level strategies expressed by the last two transport White Papers of the EU (from 2001 and 2011). Accordingly rail projects are favored compared with road projects, which in the case of NLTL would mean to abandon all projects extending the competing road capacity: The idea of new road capacities on the competing routes, even in the short and medium term, is not compatible with this project. A coherent approach as regards infrastructure charging is in addition necessary [Statement of the High Level Group on TEN-T concerning Lyon-Turin, HLG 2003, p. 34]. It seems that this strong and still valid recommendation from 2003 has not sufficiently been taken into account, in particular with regard to the motorway through the Susa Valley and along the Mediterranean Coast passing Ventimiglia when developing the Lyon-Turin project further.

The AlpFRail project also concludes that it will be most important for shifting demand to rail for the Lyon-Turin link that the operational measures to improve intermodal rail operations are implemented in parallel to the track infrastructure improvements. Only then up to 100 additional freight trains per day would be feasible to carry on the link until 2020. There seems to be reasonable potential to shift freight from road to rail as the share of road freight being transported for distances longer than 500 km on the link is above 70% [AlpFRail 2007].

Switzerland is implementing the most ambitious modal-shift policy of all Alpine countries resulting in a rather environmentally friendly modal-split of freight transport compared with the Alpine traffic in Austria, France and Italy. Accordingly modal-share of rail freight in the inner Alpine arc is 63.4% in Switzerland, 26.8% in Austria and 15.1% in France (without traffic through Ventimiglia) [UVEK 2013]. Considering the whole French Alpine freight traffic (i.e. including traffic through Ventimiglia) the rail modal share amounts only to 8.4% in 2011 compared to 63.9% in Switzerland [EGIS et al 2013]. To successfully implement the modal-shift policy in Switzerland, the Swiss government is regularly analysing and forecasting transport in the neighbouring countries and it is recommended to consider these studies as well when assessing the Lyon-Turing link. Concerning the traffic forecast the Swiss studies conclude that Italian exports suitable for rail freight will moderately continue to grow, in particular this concerns food and plastics [UVEK 2013]. Also the Swiss reports highlight that comparing the major Alpine crossings for road freight the Ventimiglia route by far is the cheapest route. Comparing representative freight connections of about 300 to 500 km length the average cost per km through the Ventimiglia route amounts to 0.36 €/km, while through the Gotthard tunnel it amounts to 0.57 €/km and through the Frejus tunnel to 1.68 €/km [UVEK 2013].

We conclude that the transport forecast, in particular for freight, seems to be on the optimistic side and that implementing the base tunnel alone will not be sufficient to attract such demand to rail. However, the examples of other countries, in particular Switzerland, reveal that three to six times higher rail modal shares than observed on the French-Italian connections would be achievable. These high rail modal shares are an outcome of the transport policy framework, including, apart from the rail infrastructure, also policies affecting the cost and capacity of the competing modes. Obviously demand on an improved Lyon-Turin rail connection will be higher, if the motorway capacity through the Frejus tunnel is not increased in parallel and if the cost of road transport through Ventimiglia is not the cheapest of all Alpine crossings. Therefore, implementing the new Lyon-Turin base tunnel and the whole connection between the nodes of Lyon and Turin implies to get the whole policy framework right between Ventimiglia and the Mt. Blanc, setting incentives for a modal-shift towards rail away from trucks for long distances. This policy effort is still pending, and without such an effort the investment into Lyon-Turin should be questioned.

9.4. Investment cost and structure of financing

Already the first proposals to implement the NLTL provided estimates of investment cost. If these were estimated by a detailed planning and engineering approach or by rough estimates building on average cost figures remains unclear to us. Over the past 20 years the investment cost has continuously increased, though a comparison seems risky as also the size of the project has increased by adding further elements (e.g. new tunnels, new stations, etc.) to the project. First estimates during the 1990ies calculated a cost of EUR 3.7 billion [Allasio 2006]. Until 2004 the investment cost estimate increased to EUR 13 billion [Schade 2006]. The cost-benefit analysis built on a cost estimate of EUR 23.6 billion in values of 2010 [Observatory 2012], while the French Court of Auditors report a cost of EUR 26.1 billion in 2012 [Cour de Compte 2012]. Taking into account the cost increase over 20 years, from 1991 until 2010, the average annual growth of cost in nominal terms was about 10%, which is significantly higher than inflation during that period (in France inflation stayed between 0.5% and 2.5% annually and in Italy between 1% and 5.5%). This reveals that the cost estimate of the project has continuously increased and that any decision taken earlier than 2010 was built on preliminary plans and estimates of investment costs.

However, it seems that due to the effort of project (re-)definition during 2007 to 2010 the CBA published in 2012 is now building on more solid planning. Though it should be reckoned that due to the phased implementation approach, which given the uncertainties of demand development seems a reasonable approach, the actual cost of parts of the line to be built further into the future will continue to increase. It should be ensured that future increases would be only driven either by taking into account inflation or by adding new elements to the project but not by insufficient planning of the project underestimating the cost of today's plans.

The first implementation phase will include the base tunnel plus a part of the Orsiera tunnel, which together would come to a cost of EUR 10.5 billion of which the base tunnel amounts to EUR 8.2 billion. Works on the base tunnel will be co-funded at a share of 40% by the European Commission (EUR 3.28 billion). The remaining budget will be shared 57.9% to 42.1% between Italy and France. Private funding is not foreseen. The cost of the base tunnel per km of tube amounting to EUR 86 million would thus be in the same range as for the other Alpine base tunnels (Brenner, Gotthard, Lötschberg) [Virano 2012].

Concerning investment cost there is a debate whether Italian (high-speed) rail projects are more costly than in other countries and if yes, why this is the case. Rus and colleagues show that HSR investment per km of projects under construction in Italy in 2009 can be two to three times more costly than in other countries [Rus 2009]. Such an observation suggests that adequate procedures to monitor cost and progress of construction will be of significant importance for the implementation of the Lyon-Turin link.

9.5. Conclusions to be drawn

Without doubt the link between Lyon and Turin constitutes a relevant part of the European TEN-T core network. Though it has been part of the TEN-T since 1994, the methodology to conceive the TEN-T developed in 2010 proved that the link should be part of the TEN-T core network as it connects two major urban nodes and two rail nodes of the core network.

However, the lack of public participation in Italy and the lack of transparency of analyses during the first 15 years of project development since 1990 have been important obstacles to achieve progress in project implementation. It seems that transparency and improved participation since 2006 have led to a modified and improved project design and a phased approach to implement the infrastructure in phases. After each phase it will be observed if transport demand increases and if the additional capacity provided by implementing the next phase will be required, and only then the next section of the link will be implemented. This seems to be a reasonable approach given the uncertainties of the transport forecast, which are also linked with uncertainties about the transport policy framework (e.g. cost on alternative routes).

Over the first 20 years of developing the Lyon-Turin link a publicly available CBA was lacking, such that doubts about the benefits of the project have permanently been raised. In 2012 the first official and public CBA was published by the Observatory revealing a positive net-present value under two out of the three analysed scenarios. However, some of the valuation parameters are questioned as well as that the transport demand models underlying the scenarios were developed by the project promoter and were difficult to verify. Thus a scientific debate questioning the transport demand scenarios and as a consequence also the results of the CBA has continued. On the other hand, the CBA applies the traditional network based approach, which is neglecting the potential that wider economic benefits exist that could make a project profitable for society.

Remarks concerning the socio-economic assessment include:

- We could not identify a financial analysis for the operation phase. If it does not exist yet, it would be recommended to develop and publish such an analysis.
- To preclude the continuous criticism related to the transport demand scenario it would be recommended to let develop transport demand projections by independent Institutions/consultants involving experts from Switzerland. The latter is important as due to their modal-shift policy towards rail the country disposes of an excellent knowledge base on the relevant issues.

To stimulate demand on the new rail link it will be important to implement the right incentives. These include:

- To design the policy framework both in favour of the link and to reduce adverse environmental impacts of Alpine transport crossing between Mt. Blanc and Ventimiglia. Transport demand on the Lyon-Turin rail link will be strongly dependent on the developments of these competing links and modes. In particular, extensions of the motorway through the Frejus tunnel seem contradictory to the project as well as the cheap transport cost through Ventimiglia, which resulted in a continuous road freight demand growth on this route. This policy framework should be considered in the transport demand analyses suggested above.
- To implement the rail liberalisation measures foreseen by the EC rules such that competition can develop at both ends of the base tunnel and new attractive services for rail passengers and freight will emerge in France and Italy.

Better coordination between the French and the Italian side will definitely be necessary, which holds in particular for infrastructure managers and operators of the new link. The former gave an excellent example of the substantial negative impact of non-cooperation. Over six years the historical line was renovated and its capacity improved by e.g. new signalling technology and enlarging the tunnel profile to enable larger container wagons and larger wagons of the rolling motorway to pass it. At the end of December 2010 the works were completed. However, RFI and RFF had chosen different approaches to enlarging their national parts of the tunnel, which were not compatible such that RFI, who had the responsibility to approve the whole renovated tunnel, could not give their approval. It took another one and a half years and the efforts of the Lyon-Turin corridor platform to solve the issue including some additional works [Brinkhorst 2012]. Having this in mind the stronger involvement of supra-national stakeholders as the EC and the TEN-T coordinators seems an important element to improve processes at cross-border sections.

Looking at other cases where such large infrastructures have been built or are being built some lessons concerning public participation can be learned. Though obvious but still relevant to highlight is that involvement of local stakeholders from the beginning of project development will be an asset, improve the project and will make it more feasible and less costly to bring it through. In the case of large scale projects, we would also recommend to think about organizing a public vote to decide whether the project should be implemented. The development of the Swiss base tunnels of Lötschberg and Gotthard decided by the vote in favour of the NEAT provides an example to follow. Of course, such a vote would be recommended before the start of the works. However, there have been examples of public votes that calmed down situations, with very strong opposition close to being similar of the one in the Susa Valley. Such a vote was organized following a several month long public mediation process in the case of the so-called S21-project planning a high-speed rail between Stuttgart and Ulm and a new underground through station in the city of Stuttgart (see the case study on S21 in this report). The support of the project by the majority of Baden-Württemberg's citizens at the public vote calmed down the protests and part of the opposition disappeared, accepting the rules of democracy. Of course, the public vote must be prepared in a fair manner, but in our opinion this seems to be a fruitful and democratic approach to deal with the protests and engage with the local population along the Lyon-Turin link. This pre-supposes that the point of no return has not yet been achieved.

Despite the fact that numerous environmental analyses have been carried out, we were neither able to identify an Environmental Impact Assessment (EIA) according to the EU

Directive 2011/92/EU (was before 85/337/EEC) nor a Strategic Environmental Assessment (SEA) according to EC Directive 2001/42/EC, which, given the size of the full project, seems to be applicable as well.

As transport noise in the Alpine valleys may constitute a serious problem and as we could not identify a comprehensive analysis of noise of the relevant alternatives, we would recommend to carry out a noise study comparing at least the options of having future traffic in 2030 (1) on road truck transport, (2) the improved historic rail system, or (3) in the base tunnel and the other elements of NLTL (e.g. Orsiera tunnel). The results on surrounding noise levels to be expected should be presented in noise maps and publicly discussed.

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ANNEX 10. GOTTHARD BASE TUNNEL

Table C10-1: Project summary Gotthard Base Tunnel

Aspect	Description	Aspect	Description
Project Title	NEAT: "Neue Eisenbahn-Alpen-Transversale" (Section Gotthard Base Tunnel)	TEN-T code	-
Countries / area	Switzerland	Start date	1996. Construction started in 1999
Mode(s)	Rail with tunnel sections	End date	Dec. 2016 (expected)
Managing authority	AlpTransit Gotthard Ltd. Will hand over the tunnel to the Swiss Federal Railway (SBB)	Duration	20 years
		Delay (mth)	
Included in TEN-T	The project "Rail Freight Corridor 1" is part of the Rhine-Alpine Corridor (named since 01/01/2014). It was formerly named "Corridor Rotterdam-Genoa"	TEN-T element	
Investment cost	CHF 9 800 million from the year 1998	Length (km)	57 km
EC funding TEN-T (m€)	none	EC share	none
Funding 1	-	Value (m€)	-
Cost-bene-fit-analysis	2010 (latest). At least two previous studies are available: one from 1997 (WIRE 1997), and from 1988 (Infras). There were updates in 1994 and 2002.	CBA ratio	~ 1
		Public y/n	(y)
Transport scenario	No NEAT, Lötschberg and/or Gotthard tunnels. 4 m height increase in tunnels.	Dated from	2010 (latest)
Externality covered	Weather, emissions, noise exposure, and accidents	Ext. cost (mCHF)	141 (NEAT project)
EIA	NIBA: Nachhaltigkeitsindikatoren Bahn (sustainability indicators for trains)	Public y/n	
CIA		Public y/n	
Financial analysis		Payback	
		FIRR / SDR	
Ex-post evaluation	Continuous monitoring and evaluation (NEAT Standberichte	Cost overrun (mCHF)	3 451 (55%)

Source: own analysis.

The NEAT "Neue Eisenbahn-Alpen-Transversale" in German, or in French the NLFA ("La Nouvelle ligne ferroviaire à travers les Alpes") is composed of different railway tunnels (mainly Lötschberg and Gotthard) whose final objective is to increase the total transport capacity across the Alps in particular for freight, with special attention to the link between Germany and Italy.

Figure C10-1: Corridor Rhine Alpine

Source: Corridor Rhine Alpine (online).

This project is part of the Rhine-Alpine Corridor (named since 01/01/2014) which was formerly named "Corridor Rotterdam-Genoa". It also belongs to the project "Rail Freight Corridor 1".

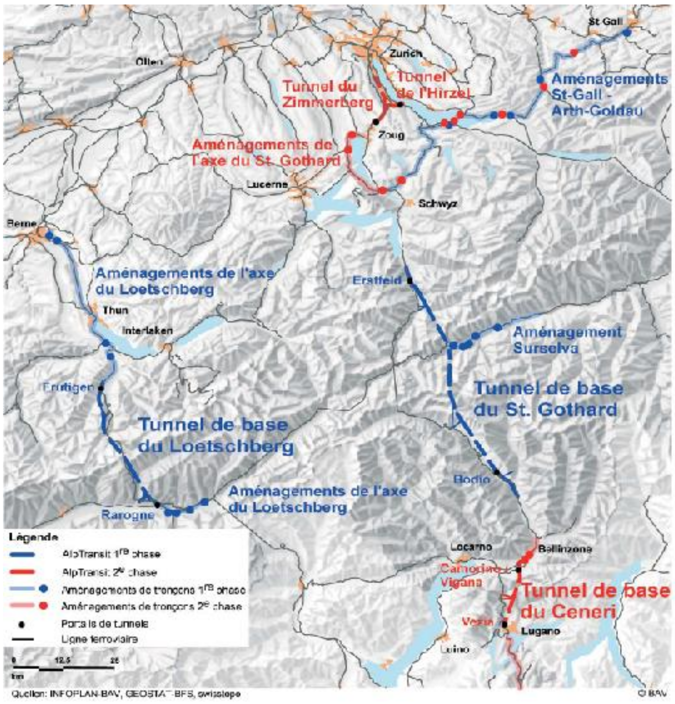
Its final goal is to shift freight from road to rail to reduce environmental impacts. Nonetheless, it would also benefit passenger trains due to the fact that it would diminish train travel time. It is expected that a train from Zurich to Milan will take about 3 hours, and from Zurich to Lugano around one hour and 50 minutes (with both the Gotthard and Ceneri base tunnels being operational). The St. Gotthard base tunnel is the world's largest rail tunnel (Office fédéral des transports OFT, online; Wikipedia, online). According to the NETLIPSE evaluation (Hertogh et al., 2008), the St. Gotthard base Tunnel has implemented the best practices for risk management proven by the highest score in their risk management analysis.

The official webpage of the Swiss Federal Office of Transport (OFT, online) states that in 1992 Swiss citizens approved the first draft project of the new rail link through the Alps, NRLA (La nouvelle ligne ferroviaire à travers les Alpes, NLFA in French) and in November 29th, 1998, the citizens also approved the revised project. This project is also part of the agreement regarding land transport between Switzerland and the EU.

The project was carried out in two different stages as presented in Figure C10-2. They were related to the Loetschberg-Simplon axe planning, and one to the Base tunnel of St. Gotthard (with the Ceneri base tunnel south of it). The Loetschberg Simplon axe with the Loetschberg base tunnel started to operate on December 9th, 2007.

The St. Gotthard base tunnel is 57 km long and construction works started at the end of 1999. Both construction fronts were finally connected in March 2011 (first tube in October 2010).

Figure C10-2: NEAT Project



Source: AlpTransit (2014).

According to the NETLIPSE book (Hertogh et al., 2008 p.50), planning took 7 years, construction is taking around 18 years and therefore the total delivery will be about 25 years. Nowadays civil works are concentrated on the equipment of the rail systems. The third part is related to the Ceneri base Tunnel which should be connected in 2015 and operational in 2019. According to the progress report of December 31st, 2006 it was expected that the Gotthard Base tunnel could be in operation in 2017, whereas previous reports had published earlier dates of completion (Hertogh et al., 2008 p.51). There were some delays –for instance resulting from the complaints of the Uri canton which were underestimated and turned out to be translated into delays and extra costs. Problems related to the tunnelling process also deferred works.

It is noteworthy that the planning process of the project, which is recognized as an important part of the project, assures its success. It is based on the “Sectoral Plan AlpTransit”, first published in 1995. Federal, cantonal and local authorities discussed and integrated their spatial planning activities. It is a binding document for all levels of policy-making and has to be taken into account for future planning. Any overlap with new programs should be pointed out and discussed with the Division for Infrastructure of the Federal Office for Transport (FOT) and all parties concerned should work together on a solution. Furthermore, it can be updated, adapted and reviewed as necessary (Hertogh et al., 2008). This key step might be seen as a very simple one, but indeed it is one of the clues for success in infrastructure development and not easy to achieve for most projects as discussed elsewhere (Mejia-Dorantes & Lucas, 2013). Moreover, the Division for Infrastructure of FOT have specifically assigned communication responsibilities since the beginning of the project (Hertogh et al., 2008 p. 91). Therefore the progress of civil works was discussed by a specific unit (the division for Infrastructure of the FOT) and topics related to finance had to be discussed by another unit responsible for this topic. Nevertheless, the project’s success was based on the cooperation between all the people involved.

A special parliamentary delegation also carried out political supervision. It is the “Delegation for the Supervision of the NEAT”, known as NAD, the highest supervisory authority for the planning and construction of the “New Railway Lines under the Alps” in order to assure the continuity of the project over new governments or different authorities (Hertogh et al., 2008).

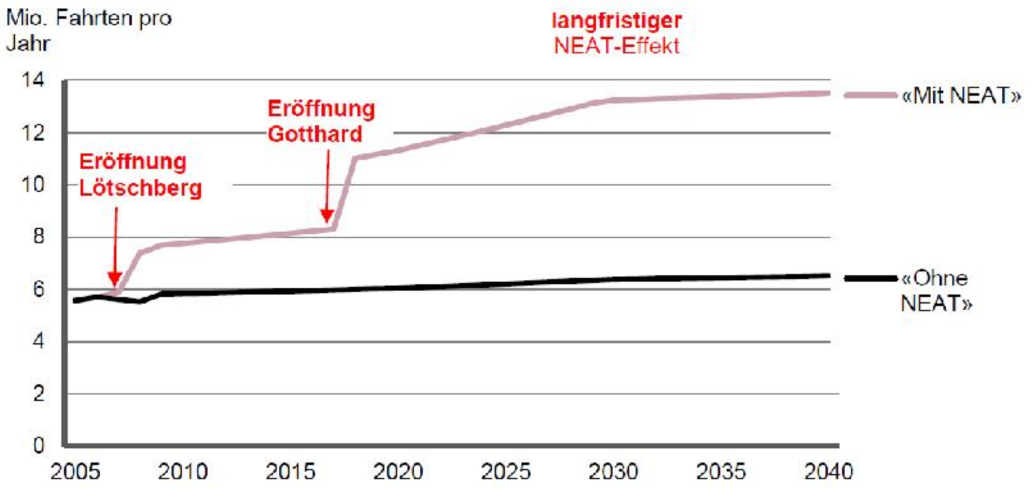
10.1. Methodology and remarks on CBA and project selection

The Parliament has committed itself to inform the public periodically about the economic status of the project, therefore many studies have been prepared both public and not public. See for example the Economic Analyses from 2010 and 1997 (Wirtschaftlichkeitsstudie NEAT), (Ecoplan, 1997; Ecoplan and Infras, 2011; Infras, 2012); or the periodic status reports on the New Railway Link through the Alps from different years (Neue Eisenbahn-Alpentransversale Standbericht 2007/I, 2008/I, 2008/II) available online in OFT (online b).

The economic analyses make use of the NIBA-methodology (Bruns, Erismann, 2006), with a time period of 60 years and an interest rate of 2%. The net benefits of the total NEAT infrastructure was calculated in the magnitude of 526 million CHF/year from 2008-2070, leaving a net gap between socio-economic benefits and cost that can be monetized of CHF 31 million per year (Ecoplan and Infras, 2011). The authors acknowledge that further benefits exist, that could not be monetized.

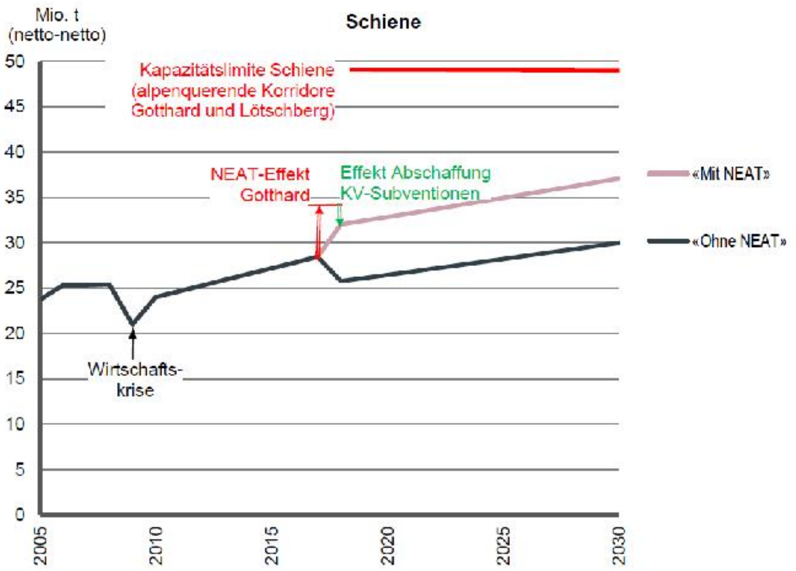
Ecoplan/Infras (2011) evaluate the total costs of the railway system without the NEAT, with the Lötschberg opening and with the Gotthard opening over the long term for transport of people and goods, as shown in Figure C10-3 and Figure C10-4.

Figure C10-3: Forecast of increase in millions of trips per year



Source: Ecoplan & Infras (2011, p. 7).

Figure C10-4: Forecast millions of tons transported per year



Source: Ecoplan & Infras (2011, p. 8).

The economic analysis took into account the following aspects:

- Environmental
  - Emissions of air pollutants
  - Noise exposure
  - Weather
- Economic:
  - Infrastructure: operation, maintenance, energy, reinvestment
  - Transport of people: rail operation, revenues from tickets, and from time savings
  - Transport of goods: productivity savings from rail.
- Society
  - Accidents

The most recent analysis of cost and benefits of the NEAT reveals that a substantial part of benefits accrues outside Switzerland i.e. to the European Union. The Swiss analysis concludes that the EU experiences benefits through NEAT that are three times higher than the cost. This is an interesting estimate of European added value of a mega project (Ecoplan/Infras 2011).

10.2. Methodology and remarks on environmental analysis

At federal level the NIBA (Nachhaltigkeitsindikatoren für Bahninfrastrukturprojekte in German) evaluation method was applied and then compared with the macroeconomic analysis. As it was stated before, the environmental analysis takes into account emissions of air pollutants, noise exposure, and weather.

Nowadays the project is explained as the “largest environmental protection project in Switzerland” in order to generate a positive perception from citizens, although before it was advertised differently (Hertogh et al., 2008 p. 80).

10.3. Characteristic of the transport demand scenario and its economic drivers

Many studies have been carried out. According to the latest economic assessment (Ecoplan & Infras, 2011), at least two previous studies are available: one from 1997 (WIRE 1997), and another from 1988 (Infras). There were also updates in 1994 and 2002.

The first NEAT profitability study was carried out by Infras in 1988. Six years later, Coopers & Lybrand updated the accounts of the previous business model study. In 1997 Ecoplan presented a new business model with new transport analysis and costs, which was updated later, in 2002. All these studies concluded that the project was not profitable.

The study from 2010 by Ecoplan & Infras (2011) describes different scenarios: from having no NEAT to building different tunnels like building Brenner and Mont Cenis-base tunnel until 2030 or considering a strategic coordination of projects. Thh authors also point out that demand on the Gotthard rail axes can be reduced substantially by increasing the capacity of competing road infrastructure e.g. by adding a second bore to the Gotthard road tunnel.

10.4. Investment cost and structure of financing

At the end of 2013, the OFT, “Office Fédéral des Transports”, estimated that the total costs would reach CHF 18.5 billion (CHF = Swiss francs), which is equal to EUR 15.3 billion (AlpTransit, 2014) (prices from 1998), of which approximately CHF 12.4 billion (EUR 10.6 billion) are funds for the St. Gotthard axe (which also includes Ceneri). The Saint Gotthard base tunnel represents approximately CHF 10 billion (EUR 8.2 billion) (Office Fédéral des Transports OFT. Confédération Suisse, 2011).

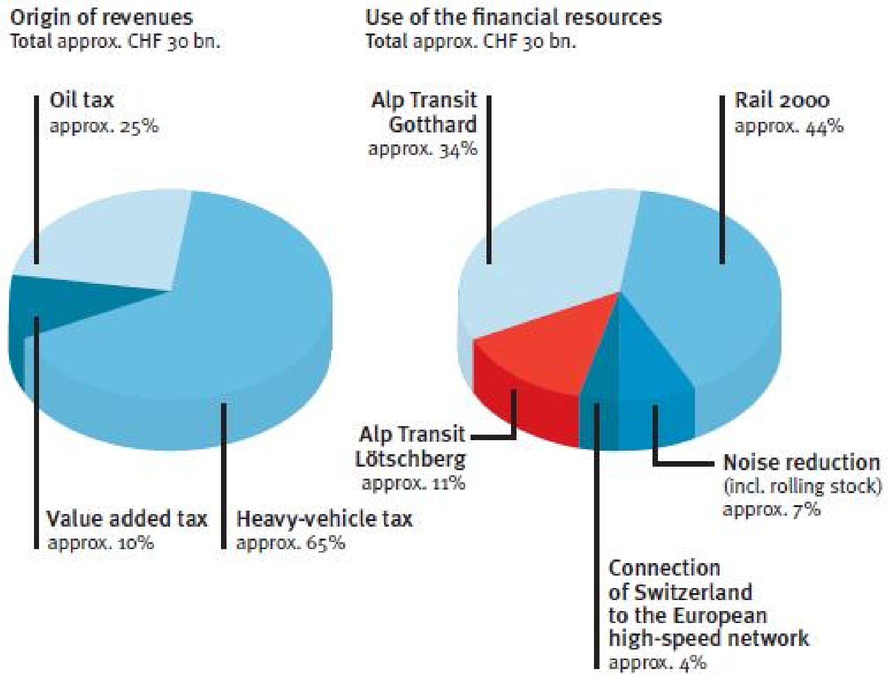
Both the Gotthard Base and Lötschberg Base tunnels were subjected to longer discussions regarding project viability (Hertogh et al., 2008). From 1992 to 1995 two ministers discussed the projects, and a solution to financing came up through a special fund, called the FinöV-Fund, for the construction and financing of designated projects. See Figure C10-5 for more information on the financial resources and their application.

The NLFA is being financed by a special fund, the so-called the FinöV-Fund, which is nurtured by three different resources: The heavy goods vehicle charge (LSVA), fuel taxes, and a per mill of the value-added tax (AlpTransit, 2014) (Hertogh et al., 2008 p.84).

According to Ecoplan & Infras (2011 p.9) they understand that the transport of people will be benefitted by the NEAT project, giving positive revenues of about 87 million CHF/year. On the other hand, in the case of transport of goods, they assume a complete liberalization and competition of rail logistics. Even if these factors question the results, they consider that the transport of goods would give balanced results. Finally, taking into account the profits from the infrastructure of transport of people and goods along with the generated costs, the result would lead to a profit of 96 million CH per year, even if approximately 20 years later this amount would decrease to 87 million CH/year due to replacement costs.

They state that the NEAT is in fact a measure which is very profitable for the neighbouring territories, with benefits equal to three times the cost. Notwithstanding this situation, Switzerland contributes to tackling the transport problem and contributes to improving transportation across the Alps in a sustainable way.

Figure C10-5: Origin of financial resources and their application



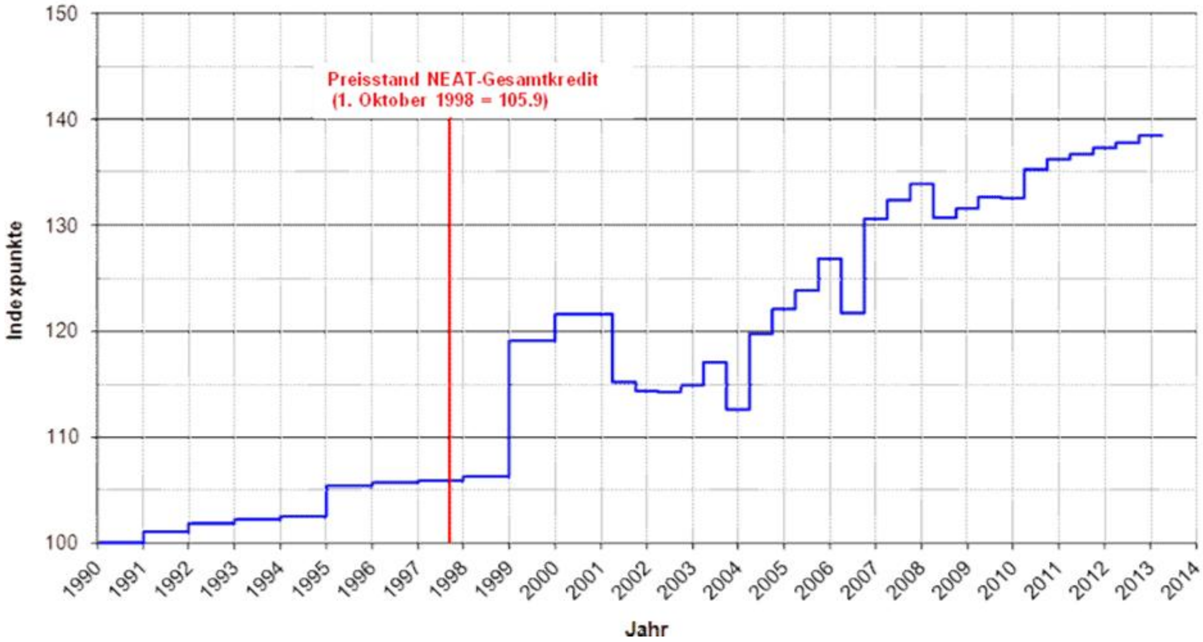
Source: Hertogh et al. (2008, p. 84).

A recent study carried out by INFRAS (2012) assesses the impact on the volume of traffic of the NRLA and a 4-metres corridor on the Gotthard axis. The Gotthard and Ceneri base tunnels have decreased the distance of the route through Switzerland by 30 km (decreasing the Basel-Chiasso/Luino route by 10%), which means savings in travel time of 60 minutes (17%), decreased operating costs of the railway of around 30%, and 35% decreased personnel costs, with reduced energy costs of around 10%. In total, via Gotthard and taking into account an unaccompanied combined transport (UCT) (containerized transport of goods), costs are said to be reduced by 9%, and with an improved quality, it would reduce costs by between 10% and 20%. Furthermore, the study estimates that the opening of the Gotthard base tunnel will increase the number of transalpine UCT by 59% from current levels and by 98% by 2030. Whereas with the hypothetical situation without the NRLA, in 2030 transport volumes would increase by 12% and 40% with the 4 m corridor (the expansion of a 4 m profile height of the Gotthard axis is a measure to control the expected outcomes, like transporting trailer traffic and allowing the transport of tall heavy goods vehicles on the Rolling Highway). Heavy trucks traffic will still increase even with the NRLA and the 4 m corridor.

10.5. Cost developments over the life-cycle of the project

For transparency purposes, the NEAT projects introduced an index, which relates price increases to cost types relevant to tunnel construction projects. They also included 15% of the budget for contingencies (Hertogh et al., 2008 pp. 87-88). Figure C10-6 shows the development of this index.

Figure C10-6: NEAT price increase index per year



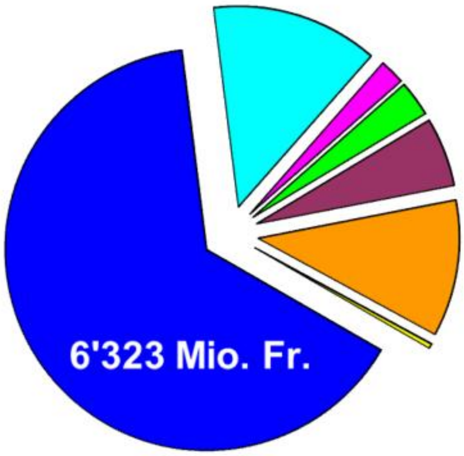
Source: NEAT Offices (last update 2013).

Moreover, the NLFA global credit was officially accepted by the Federal decree of September 16th, 2008 of CHF 19.1 billion (EUR 15.6 billion) which includes the investments in different tunnels: St-Gotthard base, Ceneri and Loetschberg, the development of the Surselva, developments over the rest of the resources from the Loetschberg and the St.Gotthard, plus urgent developments in Arth-Goldau and the surveillance of the project (AlpTransit, 2014).

The cost of the Gotthard base tunnel increased by about +55% as compared with the initial cost estimate of CHF 6 323 million. Figure C10-7 shows the different reasons for cost increases. Environmental mitigation and project additions together with political delays account for about 15% of the cost increase. Geological issues which rather could be classified as risk of tunnel boring projects account for another 16%. The remaining two third of cost increases (security, engineering, construction issues) could rather be classified as planning deficiencies, though a more detailed analysis is necessary to conclude on the actual reason for a cost increase summarized into these categories.

Figure C10-7: Budget modifications (Gotthard without Ceneri)

Project modifications: 3,451 Million CHF



Final costs forecast: CHF 9 774 Million

- Original cost basis (CHF 6 323 million)
- Security and engineering development (CHF 1 312 million)
- Improvements for population and the environment (CHF 199 million)
- Delays due to political reasons (CHF 281 million)
- Geology (CHF 544 million)
- Construction issues (CHF 1 076 million)
- Project Additions (CHF 38 million)

*Prices are with respect to 1998. Updated information as of December 31st 2013

Source: Office Fédéral des transports (online b).

10.6. Conclusions to be drawn

- The NEAT was subject to a strong debate for many years, which improved its understanding and usefulness. One of the issues that arose after these debates was the funding mechanisms necessary to push the project ahead.
- A new financing method was developed to assure the financial feasibility of the project; therefore, the FinöV fund is an important funding innovation for the whole NEAT. It places more burdens on road transport through taxation for 20 years, which are sufficient for the construction of the project.
- The project scope of Gotthard was reduced in order to assure its feasibility. Nevertheless, the whole NEAT comes at a cost-benefit ratio of about 1, considering monetizable benefits only.
- Potential extensions of competing road infrastructures would reduce the benefits of the Gotthard base tunnel.
- The organization and supervision of the project is a remarkable point.
- However, project costs will increase by more than 50% compared with the original cost base.
- As mentioned by the NETLIPSE book (Hertogh et al., 2008 p.92) the 3-V model resulted in strong cooperation between different spatial levels of authority.
- A significant share of benefits of NEAT accrues as European added value to the EU.

10.7. References

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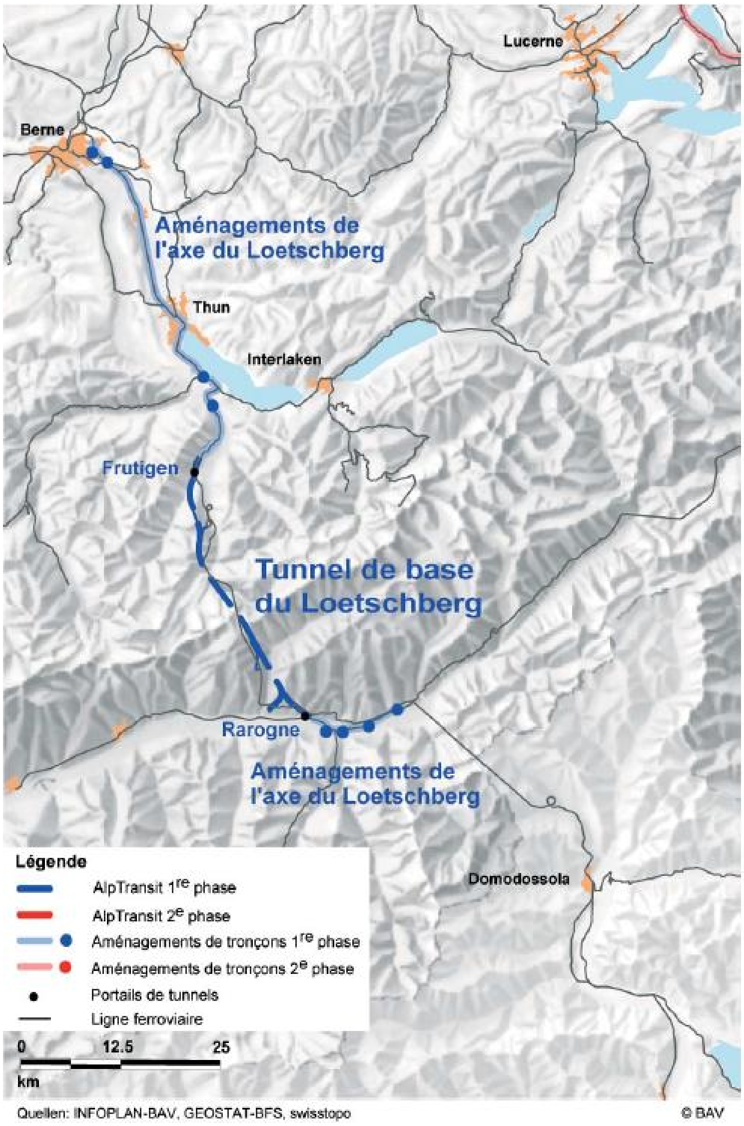
ANNEX 11. LÖTSCHBERG-SIMPLON TUNNEL

Table C11-1: Project summary Lötschberg Base Tunnel

Aspect	Description	Aspect	Description
Project Title	NEAT: "Neue Eisenbahn-Alpen-Transversale" (Section Lötschberg Tunnel)	TEN-T code	-
Countries / area	Switzerland	Start date	1994, 1999 base tunnel
Mode(s)	Rail with tunnel sections	End date	Dec. 2007
Managing authority	BLS AlpTransit SA	Duration	13 years
		Delay (mth)	11
Included in TEN-T	The project "Rail Freight Corridor 1" is part of the Rhine-Alpine Corridor (named since 01/01/2014). It was formerly named "Corridor Rotterdam-Genoa"	TEN-T element	-
Investment cost	CHF 5.31 billion (~EUR 4 200 million)	Length (km)	34.6 (Lötschberg)
EC funding TEN-T (m€)	None	EC share	None
Funding 1	Swiss Government, partly to be paid back	Value (m€)	-
Cost-bene-fit-analysis	2010 (latest). At least two previous studies are available: from 1997 (WIRE 1997), and from 1988 (Infras). There were also updates in 1994 and 2002.	CBA ratio	~1 (NEAT)
		Public y/n	y
Transport scenario	No NEAT, Lötschberg and/or Gotthard tunnels. 4 m height increase in tunnels.	Dated from	2010 (latest)
Externality covered	Weather, emissions, noise exposure, and accidents	Ext. cost (mCHF)	141 (NEAT)
EIA	NIBA: Nachhaltigkeitsindikatoren Bahn (sustainability indicators for rail)	Public y/n	-
CIA		Public y/n	-
Financial analysis		Payback / EIRR	
		FIRR / SDR	
Ex-post evaluation	Under preparation in 2008 (not available) (according to EVA-TREN project)	Cost overrun (m€)	27% (55%)

Source: own analysis.



Source: (AlpTransit, 2014) original source not found.

The NEAT "Neue Eisenbahn-Alpen-Transversale" in German, or in French the NLFA ("La Nouvelle ligne ferroviaire à travers les Alpes") is composed of different railway tunnels (mainly Lötschberg and Gotthard) whose final objective is to increase the total transport capacity across the Alps in particular for freight, with especial attention to the link between Germany and Italy.

This project is part of the Rhine-Alpine Corridor (named since 01/01/2014) which was formerly named "Corridor Rotterdam-Genoa". It also belongs to the project "Rail Freight Corridor 1".

Its final goal is to shift freight from roads to rail to reduce environmental impacts. Nonetheless, it would also benefit passenger trains due to the fact that it would diminish train travel times.

When we refer to the Lötschberg-Simplon tunnel, we actually refer to the rail tunnel that passes through the Alps which connects the town of Brigue in Valais (Switzerland) to the Iselle (Piamont) in Italy. It has a length of 19.823 km and it was inaugurated in 1906. Until 1982 it was the longest tunnel in the world.
On the other hand the Lötschberg base tunnel is a tunnel that connects Frutigen (Berne Canton) and Rarogne (Valais Canton) in Switzerland. It is part of the NLFA or NEAT. It is 34.6 km long with two galleries.

BLS (online) states that it was designed with twin single-track tubes to ensure optimum reliability, but for financial reasons, only one of the tubes was fully equipped, while the second one was left largely as a shell. Moreover, all systems are duplicated in the tunnel which means that operations can continue in the event of any technical problems. According to other sources, (EVATREN, 2008), the feasibility studies conducted stated that two tunnels would not be profitable even with a long concession period. Due to the political and social situation it would have not been possible to carry on with the project with only one tunnel.

According to the BLS (online) this tunnel is nowadays traversed by around 50 passenger trains and up to 60 freight trains per day which means that the tunnel's capacity averages over 80% and on some days even reaches 100%, which implies highly qualified traffic management.

The official webpage of the Swiss Federal Office of Transport (FOT, online) states that in 1992 Swiss citizens approved the first draft project of the new rail link through the Alps, the NRLA (La nouvelle ligne ferroviaire à travers les Alpes, in French) with 63.5% votes in favour. According to other sources there was a previous referendum on Rail 2000 in 1987, which had 57% votes in favour (BLS, online). In November 29th, 1998, the citizens also approved the revised project. This project is also part of the agreement regarding land transport between Switzerland and the EU.

The project was modified during project development. An important reason was to reduce the investment cost. Instead of building the Loetschberg base tunnel from the beginning with two fully equipped tubes a phased approach was chosen. This meant dividing the project into phases of implementation and only starting the next phase of implementation if after the previous phase of implementation transport demand is growing and it can be expected that demand will continue to grow such that a cost-benefit analysis of the next implementation phase would become positive. For the first phase it was decided to fully build and equip only one tube. Only about three quarters of the second tube were dug during the first phase and less than half of the second tube is fully equipped and operational for rail transport. Thus, when the Loetschberg-Simplon axe with the Loetschberg base tunnel started to operate on December 9th, 2007, more than half of the base tunnel was operated with a single track reducing the capacity of the base tunnel (BLS 2005, NLFA 2014).

It is noteworthy that the planning process of the project, which is recognized as an important part of the project, assures its success. It is based on the "Sectoral Plan AlpTransit", first published in 1995. Federal, cantonal and local authorities discussed and integrated their spatial planning activities. It is a binding document for all levels and has to be taken into account for future planning. Any overlap with new programs should be identified and discussed with the Division for Infrastructure of the Federal Office for Transport (FOT) and all parties concerned should work together on a solution. Furthermore, it can be updated, adapted and reviewed as necessary (Hertogh et al., 2008). Moreover, the FOT specifically has assigned communication responsibilities since the beginning of the project (Hertogh et al., 2008 p. 91). Therefore the progress of civil works was discussed by a specific unit (the division for Infrastructure of the FOT) and topics related to finance had to be discussed by another unit responsible for this topic. Nevertheless, the success of the project was based on the cooperation between all the people involved in the project.

A special parliamentary delegation also carried out political supervision. It is the "Delegation for the Supervision of the NEAT", known as NAD, the highest supervisory authority for the planning and construction of the "New Railway Lines under the Alps" in order to assure the continuity of the project over new governments or different authorities (Hertogh et al., 2008)

Many sources such as BLR (online) describe some of the funding strategies developed for this project. For example, the special fund, which largely contributes to financing the NEAT through the heavy goods vehicle charge along with revenues from mineral oil taxes.

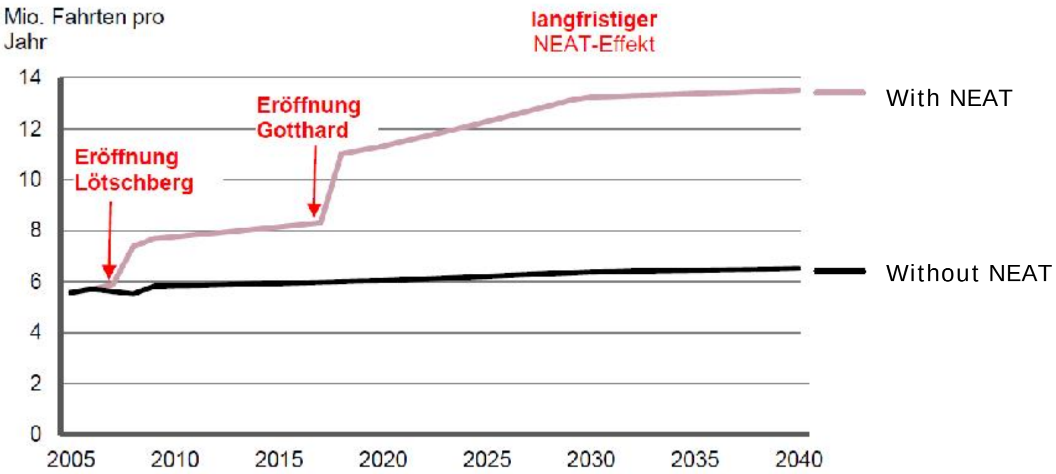
11.1. Methodology and remarks on CBA and project selection

The Swiss Parliament has committed itself to inform the public periodically about the economic status of the project. Therefore many studies have been commissioned, and many of them published. See for example the Economic Analyses from 2011 and 1997 (Ecoplan, 1997; Ecoplan & Infras, 2011); or the periodic status reports from the New Railway Link through the Alps from different years (Federal Office of Transports, online). Interestingly, the purely economic analyses of 1997, i.e. excluding external cost, concluded that all NEAT options would lead to negative economic results. Investment cost would never be recovered, apart from an investment scenario that would only implement the Lötschberg, but neither the Gotthard nor the full NEAT concept, and that would be accompanied by a high or very high growth of freight transport (Ecoplan 1997). The economic analysis was updated in 2002 concluding that under favourable conditions about 25% of the investment made for the NEAT could be paid back by users of the infrastructure (Ecoplan 2002).

Their recent analyses make use of the NIBA-methodology (Bruns, Erismann, 2006), with a time period of 60 years and an interest rate of 2%. The benefits of the total NEAT infrastructure were calculated in the magnitude of 526 million CHF/year from 2008-2070 (Ecoplan & Infras, 2011).

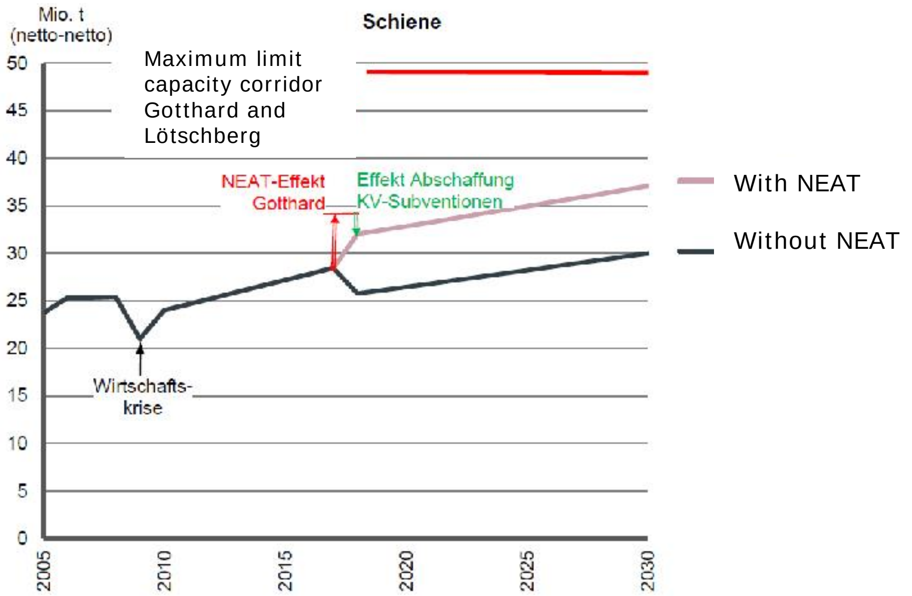
The authors evaluate the total costs of the railway system for different scenarios for transport of people and goods over the long term: without the NEAT, with the Lötschberg opening and with the Gotthard opening.

Figure C11-1: Transport demand for the NEAT in the long-term (in Millions of trips per year) Scenarios with the opening of Lötschberg and Gotthard / without NEAT



Source: Ecoplan, Infras (2011, p. 7).

Figure C11-2: Transport of goods demand for the NEAT in the long-term (in millions of tons transported per year) Scenarios with the opening of Lötschberg and Gotthard / without NEAT



Source: Ecoplan, Infras (2011, p. 8).

The socio-economic analysis took into account the following aspects:

- Environmental
  - Emissions of air pollutants
  - Noise exposure
  - Weather
- Economic:
  - Infrastructure: operation, maintenance, energy, reinvestment
  - Transport of people: rail operation, revenues from tickets, and from time savings
  - Transport of goods: productivity savings from rail.
- Society
  - Accidents

11.2. Methodology and remarks on environmental analysis

At federal level the NIBA (Nachhaltigkeitsindikatoren für Bahninfrastrukturprojekte) evaluation method was applied and then compared with the macroeconomic analysis.

Nowadays, the project is explained as the “largest environmental protection project in Switzerland” in order to generate a positive perception from the citizens, although before it was advertised differently (Hertogh et al., 2008 p. 80).

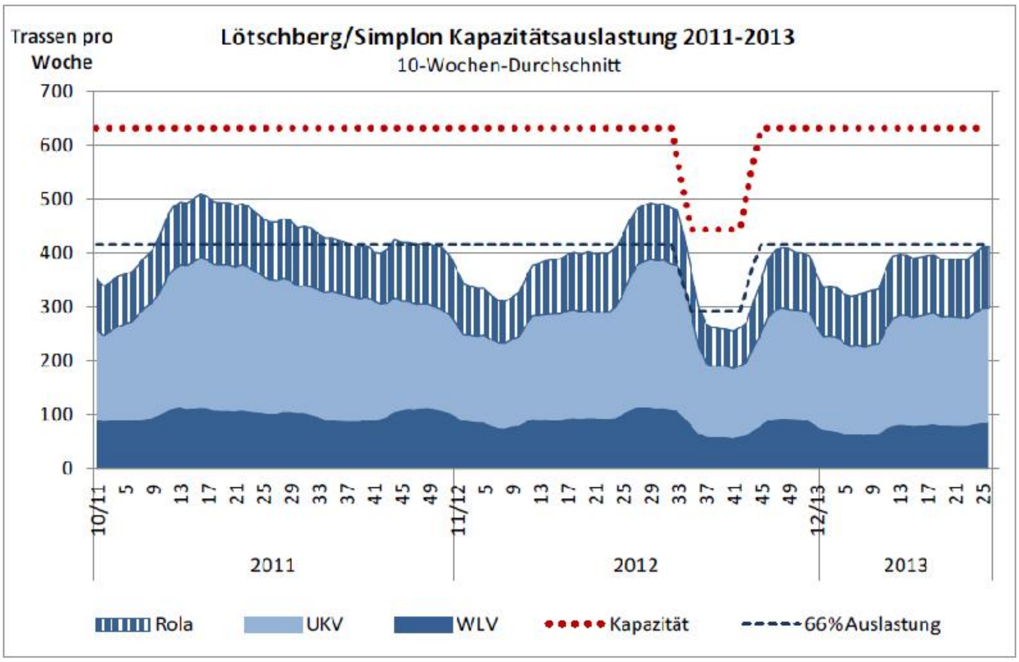
11.3. Characteristic of the transport demand scenario and its economic drivers

Many studies have been carried out, the most recent one in 2010. At least two previous studies are available: one from 1997 (WIRE 1997), and another from 1988 (Infras). There were also updates in 1994 and 2002.
The first NEAT profitability study was carried out by Infras in 1988. Six years later, Coopers&Lybrand updated the accounts of the previous business model study. In 1997 Ecoplan presented a new business model with new transport analysis and costs, which was updated later, in 2002. All these studies concluded that the whole NEAT project would not be profitable.

The study by Ecoplan & Infras (2011) in 2010 describes different transport scenarios: from having no NEAT to building different tunnels. Also it discusses the potential impact of parallel improvements of road infrastructure. The latter would reduce the benefits of the NEAT tunnels.

The maximum capacity of the Lötschberg-Simplon axe is 110 freight trains per day. Considering capacity limiting factors (e.g. maintenance) the weekly capacity would be above 600 freight trains. As Figure C11-3 reveals, on average about two thirds of the capacity is used, with at maximum above 500 freight trains per week. During a blockade of the Gotthard rail line up to 105 freight trains could actually be served on the Lötschberg-Simplon axe (EBP 2012).

Figure C11-3: Use of rail freight capacity at the Lötschberg-Simplon axe



Source: EBP 2012.

11.4. Investment cost and structure of financing

At the end of 2013, the OFT, "Office Fédéral des Transports", estimated that the total costs would reach CHF 18.5 billion (CHF = Swiss francs), which is equal to EUR 15.3 billion (AlpTransit, 2014) (prices from 1998), of which approximately CHF 12.4 billion (EUR 10.6 billion) are funds for the St. Gotthard axe (which also includes Ceneri). Numbers differ depending on sources. The NETLIPSE study (Hertogh et al., 2008) reports for the Lötschberg base tunnel a budget of EUR 2 676 million for the year 2006 and at a price base of 1998.

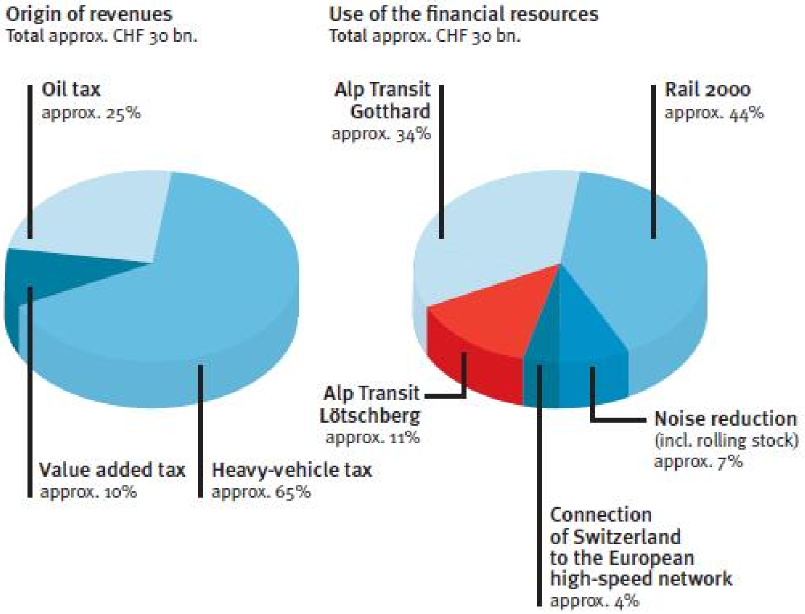
Both the Gotthard Base and Lötschberg Base tunnels were subjected to longer discussion regarding project viability (Hertogh et al., 2008). From 1992 to 1995 two ministers discussed the projects, and a solution to the financing came up through a special fund, called the FinöV-Fund, for the construction and financing of designated projects.

The NLFA is being financed by a special fund which is nurtured by three different resources: The heavy goods vehicle charge, fuel taxes, and a per mill of the value-added tax (AlpTransit, 2014; Hertogh et al., 2008 p.84).

According to Ecoplan & Infras (2011 p.9) it is understood that the transport of people will be benefited by the NEAT project, giving positive revenues of about 87 million CHF/year. On the other hand, in the case of the transport of goods, they assume a complete liberalization and competition of rail logistics. Even if these facts question the results, the authors consider that the transport of goods would give balanced results. Finally, taking into account the profits from the infrastructure of transport of people and goods along with the generated costs, the result would lead to a profit of 96 million CH per year, and approximately 20 years later this amount would decrease to 87 million CH/year due to replacement costs.

Ecoplan/Infras (2011) conclude that the NEAT is in fact a measure which is very profitable for the neighbouring territories, with benefits equal to three times the cost. Notwithstanding this situation, Switzerland contributes to tackling the transport problem and contributes to improving transportation across the Alps in a sustainable way.

Figure C11-4: Origin of revenues in the NEAT project (left) and use of financial resources (right)



Source: Hertogh et al. (2008, p. 84).

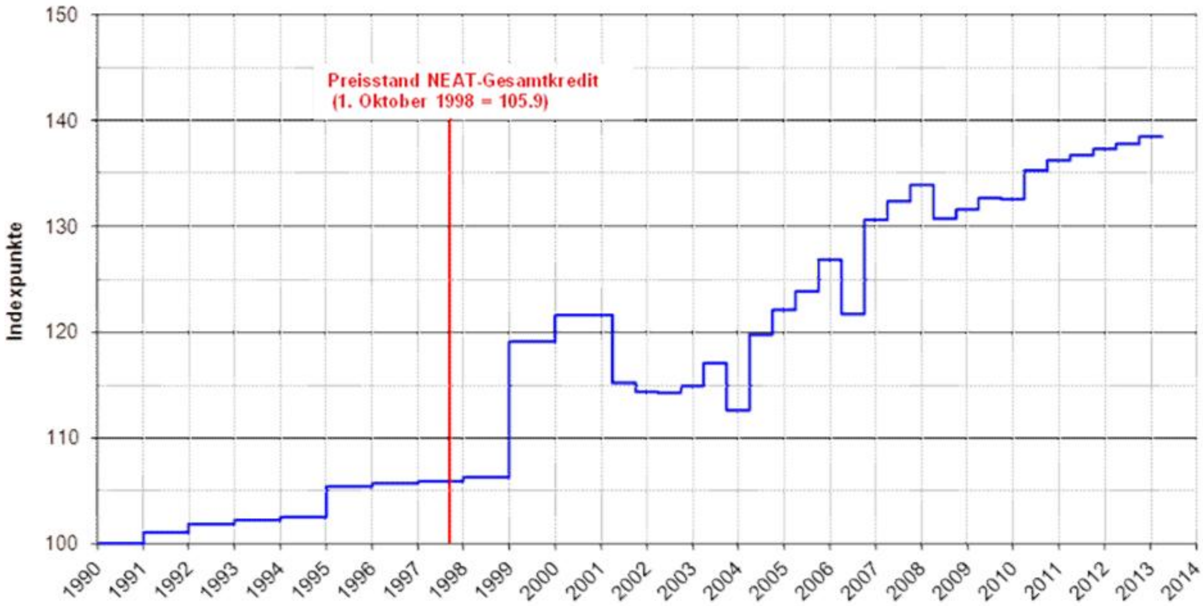
11.5. Cost developments over the life-cycle of the project

In 1997 investment costs of the Lötschberg base tunnel were estimated at about CHF 3 200 in values of 1993 (Ecoplan 1997). The final cost was calculated at CHF 4 250 million in values of 1998 and at CHF 5 310 million in current values of 2009 (BAV 2009). Considering that inflation in Switzerland was 4.1% between 1993 and 1998 the cost increase of the Lötschberg base tunnel was about 27%.

For transparency purposes, the NEAT projects introduced an index, which relates price increase to cost types relevant to tunnel construction projects. Its development is shown in Figure C11-5. They also included 15% of the budget for contingencies (Hertogh et al., 2008 pp. 87-88).

Moreover, the NLFA global credit was officially accepted by the Federal decree of September 16th, 2008 of CHF 19.1 billion (EUR 15.6 billion) which includes the investments in different tunnels: St-Gotthard base, Ceneri and Loetschberg, the development of the Surselva, developments over the rest of the resources from the Loetschberg and the St.Gotthard, plus urgent developments in Arth-Goldau and the surveillance of the project (AlpTransit, 2014).

Figure C11-5: NEAT's price increase rate per year (NEAT-Teuerungsindex in German)



Source: NEAT offices (last update 2013).

11.6. Conclusions to be drawn

- This project is understood as a necessary modernization step, shifting road traffic for passengers and transport of goods to rail.
- To this end, Swiss policy-makers consider three important mechanisms for a successful transfer traffic policy: the New Rail through the Alps, the mileage-related heavy vehicle charge and the opening of the markets through the rail reform.
- It was planned to have the NEAT as a group of complex infrastructures instead of three independent infrastructures. Therefore, its completion, problems, profitability and other outcomes are interrelated.
- In this case, it was necessary to continue the Lötschberg axe with the rest of the projects: Gotthard and Ceneri.
- It is worth highlighting the efforts which have been made to have proper coordination between different levels of authorities in order to assure the continuity of the project without political changes.
- The fact that this project was largely discussed and later voted on in a plebiscite, eases the confrontation and problems that often arise with mega projects.
- Even if the project has incurred substantial cost overruns (+27%), a periodic and transparent publication of the state of the art of the project improved its image in the long term.

11.7. References

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ANNEX 12. SEINE-SCHELDT CANAL PROJECT

Table C12-1: Project summary Seine-Scheldt waterway

Aspect	Description	Aspect	Description
Project Title	The Seine-Scheldt inland waterway network-cross-border section between Compiègne and Ghent	TEN-T code	2007-EU 30010-P
Countries / area	France, Belgium	Start date	January 2007 (Planning)
Mode(s)	Water	End date	January 2014
Managing authority	VNF for France	Duration	7 years
		Delay (mth)	
Included in TEN-T	Priority project 30 in 2004	TEN-T element	Core network, Corridor North Sea-Mediterranean
Investment cost (m€)	4 400 – 4 700 (French part) 1 600 (Belgium part)	Length (km)	160 km
EC funding TEN-T (m€)	420 for 2007-2013 is expected to be updated	EC share	max 40%
Funding 1	France state budget	Value (m€)	Not decided
Funding 2	EU TEN-T co-finance	Value (m€)	Not decided
Funding 3	PPP partnerships withdrawn	Value (m€)	0

French Sector			
Cost-bene-fit-analysis	VNF (2006a): Seine-Nord Europe. Socioeconomic assessment Revised 2013 after reconfiguration of the project	CBA ratio	n.r.
		Public y/n	Y
Transport scenario	VNF (2006a). In the context of CBA Revised 2013 after reconfiguration of the project	Dated from	Dec. 2006
Externality covered	VNF (2006a) ; extended by CE Delft et al. (2010)	Ext. cost (m€)	No aggregate figures reported CE study for intermodal comparison per km

EIA	VNF (2006a)	Public y/n	Y
CIA	Covered by VNF (2006b)	Public y/n	Y
Financial analysis	n.r.	Payback / EIRR	n.r.
		FIRR / SDR	
Ex-post evaluation	Project not started	Cost overrun (m€)	n.a.

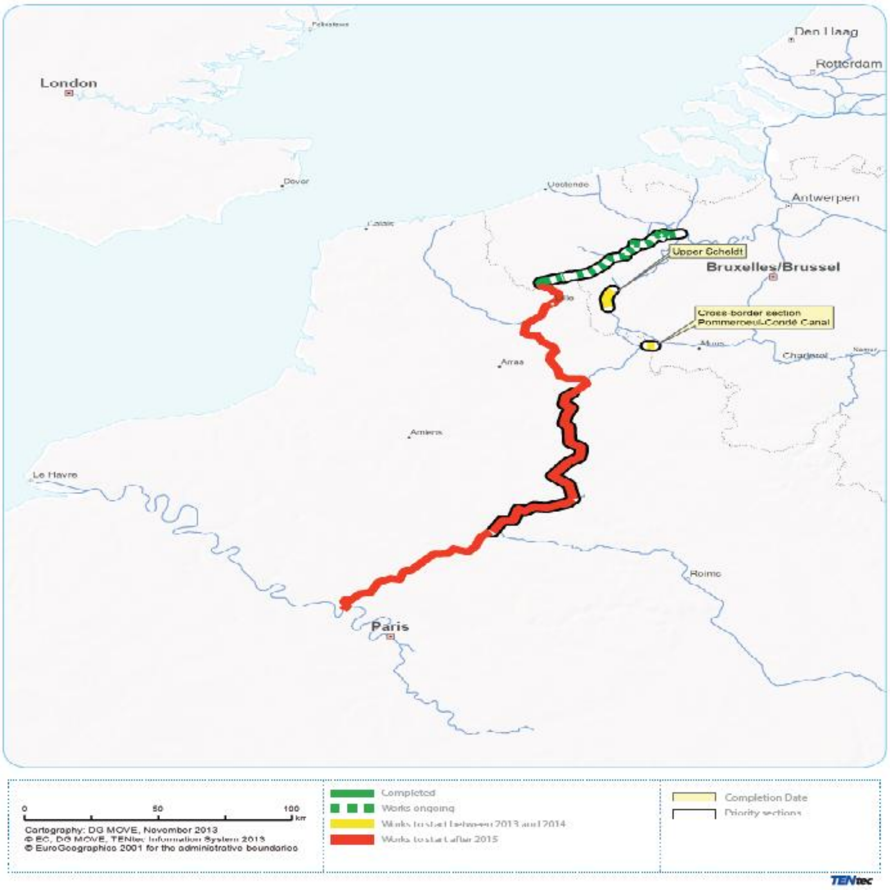
Belgian (Flemish) Sector			
Cost-benefit-analysis	Belconsulting (2005): Maatschappelijke kosten-batenanalyse. Technische & Economische Analyse.	CBA ratio	Alternative 1: 0.73 Alternative 2: 0.90 Alternative 3: 1.45 Alternative 4: 0.77
		Public y/n	Y
Transport scenario	VNF (2006a): vol H – Socio-economic assessment, December 2006, p. 51	Dated from	December 2006
Externalities covered	External effects: emissions, noise, congestion and social aspects (safety)	Ext. cost (m€)	
EIA	Belconsulting (2005): Actualisatie economische studie: milieuimpactanalyse. Within this study the following impact aspects have been analysed: Water; Soil; Sound; Air; Human life; Fauna & Flora.	Public y/n	Y
CIA	None	Public y/n	
Financial analysis	Not available	Expected RoI	
Ex-post evaluation	d.n.a.	Cost overrun (m€)	n.a.

Source: VNF and own analysis.
The summary relates to the data configuration 12/2013 (see section 12.6).
For the data configuration 12/2012 see first study.

"The Seine-Nord Scheldt project is part of Priority Project 30 Inland Waterway Seine-Scheldt and is designed to connect the Seine and Scheldt river basins, and, to a broader extent, the entire Rhine-Scheldt delta and the Rhine basin (Priority Project 18 - Waterway axis Rhine/Meuse-Main-Danube). It will not only help to alleviate serious road congestion which affects the north-south economic axis, but also to open up a new European freight corridor between Le Havre, Paris, Dunkerque, Antwerp, Liège and Rotterdam/Amsterdam.

Along this corridor, the project will allow the concentration of freight in push-tows carrying up to 4 400 tonnes. At the same time it will provide high-capacity access to the northern seaports -and a catchment market of more than 60 million people.

Figure C12-1: Location of the Seine-Scheldt waterway network



Source: TENtec.

The project investments will be aimed at eliminating the main bottlenecks, and will concern the following three sections:

- Seine-Ghent
- Condé-Pommeroeul to Sambre
- Upper Scheldt" [47]

[47] TEN-T EA (2012): The Seine-Scheldt inland waterway network - cross-border section between Compiègne and Ghent. http://tentea.ec.europa.eu/en/ten-t_projects/ten-t_projects_by_country/multi_country/2007-eu-30010-p.htm (30.11.2012).

The objectives of PP 30 will be achieved by upgrading, recalibrating and developing the broad-gauge waterways of the Seine and Scheldt basins:

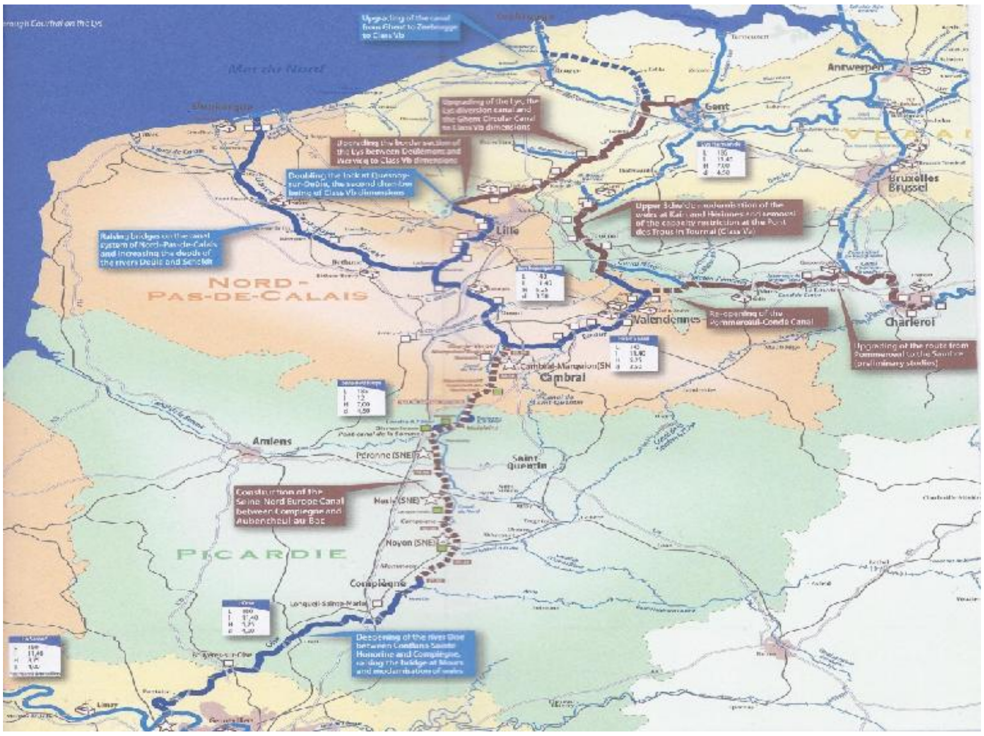
- In France: The Seine and the Tancarville Canal (Montereau-Gennevilliers-Rouen-Le Havre) with Port 2000 Lock; the downstream section of the Oise between Conflans-Sainte-Honorine and Janville; the Nord - Pas-de-Calais network which includes the Dunkerque - Scheldt Canal connecting Dunkerique to Valenciennes with three sections to Belgium via the Deûle and the Lys, via the Scheldt and via Condé-Pommeroeul Canal; the future broad gauge canal between the Oise and Nord - Pas-de-Calais, the Seine - Nord Canal with, in particular, the creation of four multimodal platforms located along the 106 km of the future Seine-Nord Europe Canal and the development of innovative transport solutions.
- In Belgium: The Lys, the diversion of the Lys, the Ghent - Bruges Canal, the Ghent circular Canal, and beyond the sea canal between Ghent and Terneuzen, the Ghent Canal to Bruges and Ostend; the upper-Scheldt between Mortage and Ghent, the Condé-Pommeroeul Canal, the corridor through Wallonia from Pommeroeul to the Sambre including the Nimy-Blaton Canal, the Centre Canal, the Charleroi - Brussels Canal and the Sambre.

The French, Flemish and Walloon governments, co-operating in this project, have created a European Economic Interest Grouping (EEIG) as the implementing body. Within the limited time frame we were able to establish contact with Voie Navigables de France (VNF), the French implementing body, and Waterwegen en Zeekanal NV, the Flemisch implementation body, but not the Walloon authority. Because of the largely independent implementation activities on the French and Belgian sides, we present the French and the Flemish sectors separately.

“The project is on-going. On the French side, the land appropriation and archaeological surveys required to construct the Canal "Seine-Nord Europe" (SNE) are well advanced. Some important networks have been deviated to facilitate the future works, not least the lowering of the A29 highway. The Competitive dialogue related to the construction and operation of the Canal SNE is underway. On the Lys River, both in France and Belgium, activities are progressing and some environmental issues are still due to be solved, in particular with the development consent expected in 2012 on the French side and on the Belgian side for Condé-Pommeroeul.”[48]

[48] ibidem.

Figure C12-2: Overview over the Seine-Scheldt inland waterway network



Source: EEIG Seine-Scheldt: The Seine-Scheldt Link – a new waterway vital to Europe's transport network, Bethune, November 2011.

The delays occurred on the French side have had an immediate effect on the Belgian developments just across the border due to necessary coordination. In particular on the sections concerning Lys and Pommeroeul-Condé, delays by the French partner have had repercussions on these Walloon projects. A thorough analysis of the actual situation was planned for the end of 2012 in order to assess the necessary measures to reduce delays that may affect the eligibility period for works already set for the end of 2015. The canal is planned to be fully operational in 2019.[49]

[49] European Commission (2012): Annual report of the Coordinator, Priority Projects 18 and 30, Karla Peijs, p. 9.

12.1. FRANCE

The projected Seine-Nord Europe Canal will form a new system for freight transport between France, Belgium, the Netherlands and Germany within the high-capacity waterway network which serves the major economic centres of Northern Europe. This geographical area is characterised by intense cross-border traffic movements and by one of the highest levels of road saturation of the European continent, on this north-south-route: 132 million tonnes of freight transited this north-south corridor in 2000. The new canal will provide an interconnection between the Seine river basin, in particular the Paris (Ile-de-France) region as well as the Le Havre and Rouen seaports, with the River Rhine and adjacent areas. The high-capacity Seine-Nord Europe Canal will be built between Compiègne and Aubencheul-au-Bac.

The Seine-Nord Europe Canal involves building, within the territory of the Picardy and Nord-Pas de Calais regions, a new canal 106 km long, with technical characteristics corresponding to "class Vb" of the European classification of waterways of international interest.[50]

Voies Navigable de France (VNF) is the implementing body in France. The agency runs a dedicated website for the project (http://www.seine-nord-europe.com/) with information and a selection of documents for download. For our analysis, the thus available documentation is, however, insufficient, in particular regarding the financial planning.

12.1.1. Methodology and remarks on CBA and project selection

The economic evaluation was prepared in 2006 for the Enquiry prior to the Declaration of Public Interest as part of the official French procedure for the planning of large-scale infrastructure projects. The economic studies were conducted by specialised French and Belgian consultancies. Earlier– in June 2004 –, after taking into account the findings of the economic studies of the previous phases of the project (1998-1999) and the national debate of 2003 on major infrastructure projects, VNF set up an economic studies monitoring committee made up of eight French, Belgian and Canadian transport economists to prepare the preliminary design studies. This arrangement was made to ensure that all the issues of the project would be taken into consideration within a framework broadened both geographically and through the nature of the project benefits, by comparison with the preliminary studies. The committee worked in collaboration with the economic consultants on the methodological choices and contributed its expertise to drafting the socio-economic assessment. The main tasks carried out by the committee were:

- the construction of macroeconomic scenarios, involving in particular validation of the basic economic reference assumptions (growth, transport policy);
- methodological choices on modelling adapted to the very particular characteristics of freight transport by inland waterway;
- methodological choices relating to calculating the advantages under the socio-economic assessment.

The CBA is carried out on two levels: France only, and Europe i.e. France, Belgium, Netherland, Germany. It is argued that about one-third of benefits materialise outside

[50] VNF (2006a), p. 7.

France. Furthermore, the CBA differentiates between the implementation of the project by public funding only or partly through public-private partnerships which changes the nature of the risks and the associated costs during the investment phase. The calculation mechanism is not transparent in the available document. Only the results are documented.

The base case assumes an EU contribution of 19% to the project; in addition, sensitivity tests are carried out for a lower/higher EU contribution, 10 and 30% respectively. We gather that the EU contribution is used to reduce project costs for investments. This procedure is questionable since EU financial contributions do reduce only financial costs of the participating countries, but not economic costs. A similar argument relates to the participation of the private sector.

A CBA run for funding without EU grants and without support by the private sector has not been carried out. Hence we can only estimate that in such a case the internal rate of return would be in the order of 4.2%, a still respectable rate for an inland waterway transport project.

A separate “logistics scenario” has been considered, which in fact is an alternative transport demand scenario with higher traffic assumptions. EIRRs increase in this case marginally to slightly. They also increase by approximately one percent-point when external costs are internalised

According to VNF, a complementary study was carried out and approved by the EEIG in 2010. This study aimed at defining more precisely the expected impacts of the project, focused on French territories. The whole impacts (growth, traffic, added value) have been updated. The relevant documents were, however, not made available to us for the first study.

The CBA is assumed to be carried out in conformity with French government regulations. Sensitivity tests with regard to variations in toll levels below and above the central toll rate of EUR 2.5 per tonne (EUR 1.75 and EUR 3.25 respectively) have been carried out. The impact on the EIRR is roughly +/- 0.3 points), hence relatively limited.

The scenario updated in 2010 is based on a pivotal toll value of EUR 2.9 /ton.

It appears that the project has not undergone a selection process in France. The proposal of the French and Belgian governments to present it for co-funding by the European Commission was quite clearly based on political considerations. The project was in fact presented to the EU at a very late stage of 2007-2013 programming and was added to the original list of 29 priority projects as n° 30.

12.1.2. Methodology and remarks on environmental analysis

The principal effects on the environment are those related to the actual construction works, with some residual effects to be considered during subsequent operation of the Seine-Nord Europe Canal. The development works aimed at improving the navigable characteristics of the existing waterways have only minimal impacts on the environment. The assessment comes to the following conclusions:

- The land requirement for the development works to the north and south of the Seine-Nord Europe Canal is limited. There is no significant impact on agriculture, on natural habitats or on heritage as a result of these works;

- according to the studies carried out for the Oise-Aisne agency (Entente Association), the recalibration of the river Oise upstream of Creil brings an overall improvement to the conditions of flood flows of the Oise without any impact on the water levels at the confluence between the Seine and the Oise;
- aquatic environments are not affected by implementation of the works, with the exception of some short-term impacts during the dredging works. By using vegetation for bank protection along the modified river sections the impacts of the river engineering works can be reduced. In the Compiègne-Creil section, a system of alternating one-way navigation will be used to reduce the extent of river bend easing and widening, without imposing any significant restrictions on navigation;
- the noise generated by the increase in waterborne traffic is substantially lower than the thresholds of noise considered as prejudicial for other infrastructure projects. The modal shift from road and rail to waterborne freight will lead to an overall reduction in noise;
- water consumption resulting from the operation of the existing waterway network will increase on account of the increase in traffic. If necessary, water recycling plants will be installed at the locks to reduce and control water consumption effectively;
- the increase in waterborne traffic has only a limited impact on bank erosion;
- the quality of air is improved in the corridor close to major roads and motorways, without causing any pollution in the area immediately bordering the waterway; construction of the link gives rise to a reduction in carbon emissions producing the greenhouse effect, thanks to the modal shift from road to water transport:
- Doubling of the locks of the Seine–Nord Europe Canal involves no additional water consumption. The increase in waterborne traffic resulting from this development improves the modal shift, with positive effects on the energy balance and carbon emissions.

As far as we can judge no environmental aspects are missing.

No specific climate impact assessment has been conducted regarding the Seine-Nord Europe project. All climate-related issues are being covered within the EIA.

12.1.3. Characteristics of the transport demand scenario and its economic drivers

In 2000, 258 million tonnes (Mt) of non-containerised freight and almost 631,000 containers (TEU) were transported between the regions of the concerned project area, of which 90 Mt and 320,000 TEU were concentrated in the north-south corridor, to be served by the Seine-Nord Europe project.

The presence of high-capacity waterways has a major impact on the market share of inland water transport. On sections where high performance is possible, such as on the Seine, water transport has a significant market share. On the other hand, the constraint of capacity on the north-south waterway route (Canal du Nord limited to 650 t) limits the water transport share to a little over 3%.[51]

[51] Seine-Nord Europe Canal/public enquiry dossier, 18.

By connecting the Seine basin to the European high-capacity waterway network, the Seine-Nord Europe Canal project will contribute to reducing isolation of this waterway system and to making possible an alternative solution to the growth of road traffic (74% market share in 2000) for the supply of both consumer goods and equipment.

Connection of the Seine basin to the north European network induces an increase in waterway traffic of between 3.2 and 3.7 million tonnes in 2020 (see table below).

Table C12-2: Traffic forecast on the section Vernon-Gaillons

Traffic on the section Vernon-Gaillon (in million tonnes)

Scenarios of behaviour of economic stakeholders	2020		2050	
	Macroeconomic scenarios			
	Trend	Central	Trend	Central
"Continuing current trends"	18.5 Mt	20.0 Mt	23.0 Mt	26.2 Mt
"Development of inland water transport"	structuring effect measurable as from 2020		25.8 Mt	29.4 Mt
Traffic without Seine-Nord Europe	15.3 Mt	16.3 Mt	17.5 Mt	20.3 Mt

Source: VNF.

Overall, the interconnection of the Seine basin induces an additional traffic of 25%, originating partly in the increase in the amount of traffic using the Seine-Nord Europe Canal (+1.6 Mt in 2020 under this central scenario) and partly in the fact that the Seine basin itself becomes more dynamic through the greater competitiveness of inland water transport in a more open and fluid market (+2.1 Mt in 2020 under this scenario).[52]

The data used to define the volumes of traffic by origin and destination are based on a combination of data from various sources in France (SITRAM, Seaports, Customs, VNF) and Europe (TEN-STAC). The modal share of the road transport, which has the dominant market share (87% versus 8% for rail and 5% for water transport), is explained by the saturation of the railway network described in the previous chapter (particularly on account of the priority given to passenger transport on the approaches to urban centres) and by the absence of an interconnection of the high-capacity waterway network.

The traffic forecasts were developed by VNF and external consultants. The detailed traffic studies were not available for review.

12.1.4. Investment cost and structure of financing

In the mid-term evaluation it was concluded that the project is significantly behind schedule due to political, financial and technical issues. Thus, it will not be completed by the end of 2015. Given this delay, it will not be possible to maintain EU support for the part of the activities to be carried out after 2015. This entails a reduction of the TEN-T contribution of approximately EUR 44.3 million. The completion of around 85% of the project by the end of 2015 is more realistic, provided that the following conditions are met:

[52] Seine-Nord Europe Canal/public enquiry dossier, 44.

- the competitive dialog of the PPP process is launched by the end of 2010
- the competitive dialog is completed and the contract awarded by the end of 2011
- the project continues to respect the revised implementation planning provided in the 2010 ASR.[53]

A thorough analysis of the actual situation was envisaged for autumn 2012 in order to assess the necessary measures to reduce delays that may affect the eligibility period for works already set for the end of 2015. No information was released by VNF on this subject. The canal is anticipated to be fully operational in 2019.[54]

Table C12-3: Breakdown of costs in the present phase 2007-2013 – million euro

Total project cost	4 258.7
EU contribution	420.2
National budgets	874.5
Regional/local budget	962.1
Action promoter (public or private)	1 986.3
Other sources	15.7

12.1.5. Cost developments over the life-cycle of the project

As the planning phase is still ongoing, investment cost estimates may change at any point in time. We do not have information on the most recent cost estimates. An audit of all large transport infrastructure projects in France has been ordered by the new French government. The results are expected shortly.

[53] TEN-T Trans-European Transport Network (. Mid-Term Review of the 2007-2013 TEN-T Multi-Annual Work Programme_ Project Portfolio (MAP Review), 179.

[54] Karla Peijs (2012): Annual Report of the Coordinator. Priority Project 18 and 30, 9.

12.2. BELGIUM: FLEMISH SECTOR

Figure C12-3: Belgium Part of the Project

The waterway Seine-Scheldt project includes the trajectory of the channelled Lys of Deûlémont to Deinze, the diversion canal of the Lys to the junction with the Canal Ghent-Ostend, the Ghent-Ostend to the confluence with the ring canal and the Noordervak of the ring canal to the lock of Evergem.[55]

Source: Belconsulting N.V. (2005): Vervolgstudie Seine-Schelde / Rivier herstel Leie.

12.2.1. Methodology and remarks on CBA and project selection

In 1999 a Cost Benefit Analysis "Economische studie verbinding Seine-Schelde, Technum ESEG, 1999" was conducted in order to provide a clear picture if an upgrade of the Seine-Scheldt could be realized. In 2005 Belconsulting conducted an update. Within the latter CBA four different project alternatives are compared, these will be outlined further in the analysis. One of the guidelines which has been used during the conduction of the CBA is the "Dutch Directives for the Waterways" - Nederlandse Richtlijnen Vaarwegen (Commissie Vaarwegbeheerders, 1999).

In the CBA for Seine-Scheldt the following effects are addressed:

- Direct effects: these are the direct costs (investment, maintenance) and revenues (financial + travel time) as a result of the implementation of the project.
- Indirect effects: changes in society that are not directly involved in the project, but arise due to the project (creation or geographical shift of employment or to attract foreign businesses).
- External effects: these are side effects of the project, such as environmental impacts (emissions, noise), effects on other infrastructure (congestion) and social aspects (safety).

Previous studies have shown that project alternative 3 is preferred to the other project alternatives. Project alternative 3 scores the highest for both monetized- and non-monetized effects, environmental and landscape impacts and social impacts. The Cost Benefit Analysis shows that project alternative 3 is the only alternative with a positive balance, and therefore with a positive yield ratio.

55 Belconsulting N.V. (2005): Vervolgstudie Seine-Schelde / Rivier herstel Leie, 13.

The project selection is based on the previously conducted survey, the spatial development and the results of the working profile. The development consists of 15 plans with the spatial development of this development plan and a descriptive section with a motivation of the proposed interventions in each of these plans. This spatial effect is preceded by a summary of the design principles which may be used.[56]

12.2.2. Methodology and remarks on environmental analysis

The available document is a summary of the conducted EIA; this summary does not mention the followed guidelines. Furthermore, no separate CIA was conducted. CO_2 emissions have been covered within the EIA. In addition to the environmental aspects the following aspects have been taken into account: ground and water; noise; air; human life; fauna and flora; monuments and landscapes. There is no indication that certain relevant environmental aspects have not been addressed.

12.2.3. Characteristics of the transport demand scenario and its economic drivers

In 1999 a prospective study of traffic forecast was conducted. In 2003 the Lys counted approximately 6.7 million tonnes of transported goods which amounts to nearly 22,000 cargo ships.

On this basis, a relationship between the development of the industrial production in Belgium and the growth of inland transport on the Lys has been made. This relationship is also being implemented into the autonomous growth of navigation on the river Lys, resulting in an annual growth of 1.4%. This increases the transport from 6.7 million tonnes in 2003 to 9.0 million tonnes in 2025.[57]

Due to the fact that we had only a summary report of the EIA, CBA and transport demand forecasts conducted by Belconsulting N.V., there was unfortunately no detailed description of the main governing assumptions. We have tried to obtain the original documents, which presumably contain this information, but the tight timetable did not allow us to receive them in time. The relevant original document is: “Actualisatie economische studie: trafiekprognose“. Concerning this part of the project there are, as far as our research shows us, no updates available on this Upper Schelde part. As we have seen in the analysis of the French part there are studies which conducted new transport scenarios for the concerned area.

12.2.4. Investment cost and structure of financing

To have a better understanding of the total cost estimations it is important to have a clear overview of the different alternatives the project proposes. Unfortunately we have insufficient information on the financial engineering. The project is based on the following four project alternatives:

- Alternative 1, depth 4.0 m class Vb ship "Full two-way"
- Alternative 2, depth 3.5 m class Vb ship "Draft-limiting class Vb"

[56] Belconsulting N.V. (2005): Geintergreerd Strategisch Plan. Opmaak van het ontwikkelingsplan, 118.
[57] Belconsulting N.V. (2005): Geintergreerd Strategisch Plan. Technische & Economische Analyse, 93.

- Alternative 3, depth 3.5 m class Vb "Keep current waterline, tight profile Class IV / unidirectional class Vb"
- Alternative 4, depth 3.0 m class Vb ship "Profile Seine Nord".[58]

The total cost of the project is largely determined by the cost of the processing of the ground mortar. Estimations were calculated for the minimum and maximum scenario for all alternatives. The following estimates (minimum, maximum and average) form the total cost of the Seine-Scheldt project.

Table C12-4: Total cost estimation for the Flemish project component (EUR)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Minimum total	353.308.449	288.715.936	176.669.122	321.760.403
Maximum total	446.285.609	353.222.832	213.031.107	401.959.419
Average total	399.797.029	320.969.384	194.850.114	361.859.911

The delays which occurred on the French side have had an immediate effect on the Belgian developments just across the border due to necessary co-ordination. In particular on the sections concerning Lys and Pommeroeul-Condé, delays by the French partner have had repercussions on these Walloon projects.

12.2.5. Cost developments over the life-cycle of the project

The investment costs were occasionally reviewed and adjusted. The first economic analysis study in 1999 calculated cost predictions, which were updated in 2005. However, there is no specific documentation available, although one can assume that at the time of the review, all new elements were taken into account.

12.2.6. Developments since the last study

In the Annual Activity Report of the European Coordinator for project 30 Inland Waterway Seine – Scheldt (Peijs 2013) it is pointed out: "As far as the sections in Flanders and in Wallonia are concerned, the works are progressing according to the schedule". Therefore this report on developments since the last study focuses on the French part of the project, the Canal Seine Nord Europe (CSNE) as well as on the comments of VNF that we received to our first study.

12.2.6.1. Summary of findings of the first study and comments by VNF

The following part refers to the development of the project in France.

The main critical findings of the first study, submitted to the EP on January 8, 2013, were:

- Missing upgrades of the 2006 CBA.
- Uncertainty about the reliability of financial figures and the treatment of risk.
- Missing availability of documents, e.g. for EIA and SEA.
- Limited documentation on the Belgian part (upgrading the Upper Scheldt and the river Lys).

[58] Belconsulting N.V. (2005): Geintergreerd Strategisch Plan. Technische & Economische Analyse, 93.

In a letter to the EP in March 2013 VNF commented very critically on the upper three bullet points. The main points put forward are:

- No clear distinction has been made between the European project Seine-Scheldt (from Conflans (FR) to Gent (BE)) and the canal Seine–Nord Europe, which is the main part of the European project and includes the stretch from Compiègne to Cambrai in France = canal Seine Nord Europe, CSNE). This critical response was provoked by a misleading investment cost figure in the first study by the consultants for the CSNE project (EUR 5.9 billion instead of EUR 4.3 billion) in the text on p. 72, while all cost figures were given correctly in the appendix tables.
- Strict rejection of the statements in the study by the consultants on the missing availability of documents and missing transparency.
- Comments on the general recommendations in the study by the consultants, in particular arguments against the consideration of wider economic impacts and in favour of using partial equilibrium approaches as applied in traditional CBA.

We will come back to these arguments after reporting on the changes which have happened since December 2012 concerning the project (section 2) and the assessment methodology in France (section 12.6.2).

12.2.6.2. Reconfiguration of the CSNE project in 2013

Commission Mobilité 21

The French Ministry of Transport has established a Commission "Mobilité 21" to develop a prioritisation hierarchy among the projects proposed by the Scheme of National Infrastructures for Transport (SNIT). This Commission submitted a final report on June 27, 2013. It clustered the projects into three categories:

- Category 1: high priority, to be accomplished before 2030
- Category 2: medium priority, to be accomplished between 2030 and 2050
- Category 3: very long-term, to be accomplished eventually after 2050.

The projects of SNIT have been assigned to these categories subject to four criteria of evaluation (contribution to major public objectives; ecological performance; social/territorial performance; socio-economic performance) and to two financial scenarios:

Scenario 1: Increase of the total investment budget for transport by EUR 8-10 billion until 2030, which is in line with the budget development of AFTIF (French National Agency for Transport Infrastructure Finance), which is EUR 2.26 billion/a between 2017 and 2030.

Scenario 2: Increase of the total investment budget for transport by EUR 28-30 billion until 2030 which would require an increase of the annual AFTIF budget by about EUR 400 million/a.

In the case of Scenario 1 only 9 projects would have a chance to be realised until 2030, no inland waterway (IWW) project among them. In the case of Scenario 2 a total of 20 projects could be realised until 2030, including the IWW project Bray-Nogent (Seine). The large IWW project Saone-Moselle and/or Rhone-Rhin has been allocated to the third category (very long-term).

The Commission Mobilité 21 has excluded the projects Lyon-Turin (high-speed rail) and Seine-NE from ranking. First of all international agreements have been signed which make it necessary to continue procuring the project. Secondly it was regarded that reconfiguring the projects makes it possible to cut down investment costs. Thirdly it appeared realistic to receive a much higher co-finance from the Commission than calculated in the 2006 CBA. Co-funding was expected to increase from less than 10% to more than 30%.

Mission of IGF and CGEDD (2013)[59]

IGF (Inspection Générale des Finances) and CGEDD (Conseil Général de l'Ecologie et du Développement Durable) have examined the CSNE project based on the 2006 studies and later documents and delivered their expertise in January 2013. It was found that the estimations of investment costs were too low while the estimation of revenues seemed too high. The total cost figures according to the latest documents of VNF would come to EUR 5.4 billion (compared to EUR 4.3 billion as estimated in 2009). Even if the EU co-finance would increase from EUR 0.33 to 1.58 billion - corresponding to 30% co-finance as assumed by VNF - a major risk would remain for the French federal financial agency (AFTIF: Agence de Financement des Infrastructures de Transport de France) which would have an impact on the realisation of other projects. Beyond the cost risks also the expected revenues from user charges seemed to be too optimistic which would cause an additional load on AFTIF because the private partners of the intended PPP regime were not able to increase their risk share, on the contrary, after the economic crisis their interest in taking long-term risks decreased drastically.

IGF/CGEDD stated that despite the less favourable changes after the economic crisis the socio-economic evaluation of the project had not undergone a revision. They mentioned in particular

- The strong reservation, which had already been expressed since 2006, against the socio-economic viability of the CSNE canal, not regarding the other sections of the Seine-Scheldt project.
- The weak reasoning for the ecological benefits of the project.
- The negative evolution of all economic and financial parameters of the project between 2008 and 2012 which would set the social value at risk.

As a response to the first point, VNF delivered some data from a recent forecast. According to these data (see sections 12.6.2.4 and -2.5) the new canal would cause a modal shift from road to IWW of 5.6 million t/a and from rail to IWW of 3.3 million t/a, i.e. a shift of 3.8% from road and of 13.3% from rail. IGF/CGEDD conclude that the coherence with the political actions in favour of the railways should be discussed.

IGF/CGEDD recommend taking into account the unfavourable development of economic and financial parameters. The costs should be adjusted to higher values because of increasing prices of construction work, the changed scheduling of works, the underestimation of several cost components and the costs of pre-financing. At the same time the revenues from user charges on the canal need to be re-estimated to lower values. Both adjustments would cause the need for higher subsidisation. The arising financial problems cannot be solved without a high degree of co-finance from the EU. IGF/CGEDD finally recommend preparing a new comprehensive report with an appropriate base year

[59] Also quoted in SETEC (2013), p. 6.

and re-examining the configuration of the transport infrastructure in the corridor to find out the best solution.

Rapport Pauvros

In April 2013 the Ministry of Transport charged Deputy Rémi Pauvros with a reconfiguration of the Seine – NE project to present it to the European Commission with the objective of benefitting from the EU financial support in the period 2014 to 2020.

a) Reconfiguration

The reconfiguration of the project includes

- Redesigning the alignment and using parts of the existing canal du nord
- New concept for sealing the ground
- Redesign of locks
- Re-design of multi-modal platforms
- Improved water regulation in the region of Nord Pas de Calais
- Optimisation of construction work.

The cost savings are estimated at EUR 550-650 million such that the overall costs of the Seine NE canal would be reduced to EUR 4.4-4.7 billion[60]. While the volume of cost savings is remarkable it is not clear whether this has impacts on the benefit side (e.g. reduced barge standard from Vb to Va on some sections, changed multi-modal platforms).

b) Wider political and economic context

Beyond the issue of reconfiguration the Rapport Pauvros addresses a number of aspects which are to underline the high importance of the project for French and European transport policy:

b1: General economic arguments in favour of the project
The CSNE project offers the chance to create an integrated inland waterway network which connects major seaports, hinterland ports and intermodal freight centres and is able to divert a considerable share of road transport to environmentally more friendly transport modes. It will lead to improved competitiveness of enterprises in the connected regions and will serve to accelerate regional economic development. It will allow for generating a higher proportion of renewable energy and in this way contribute to the politically intended transition towards sustainable energy production. Substantial employment effects are expected: About 10,000 full time jobs during the construction phase and up to 50,000 full time jobs in the year 2060 in regions with relatively high unemployment rates.

b2: Reconfiguration of the financing scheme
The CBA of 2006 assumed a financial contribution of the European Commission of 6.22% which made a sum total of EUR 333 million. A PPP was planned to be established with two private partners (Bouygues and Vinci) who were expected to take over a financial load of more than EUR 2 billion. As the cost estimation of EUR 4.3 billion for CSNE (status 2009) proved too low and an increase of more than EUR 1 billion was expected the private

[60] These figures don't correspond exactly to the figures delivered by VNF to IGF/CGEDD as given in section 12.6.2.2.

partners withdrew their commitment such that a new financial arrangement became necessary. The new financial scheme is based on the declaration of Tallinn on TEN-T[61] in which the Ministers of Transport of France, Wallonia, the Netherlands and the European Commission, represented by Commissioner Sim Kallas, have agreed to foster the CSNE project and to co-finance it by up to 40% of the eligible costs in the programming period 2014 to 2020. CEF-funding[62] would be the central financial instrument. The remaining financial load should be carried by the federal state and the regions touched by the project. Credits from EIB are also under discussion. The process of financial negotiations is presently going on, several regions have announced their willingness to contribute financially to the canal project, while others have agreed to co-finance the multi-modal terminals on their territory. While it is foreseen to recover the major part of costs of maintenance and operation by user charges, the magnitude of such charges and the resulting revenues are still open.

b3: Reconfiguration of the governance scheme

After abandoning the PPP it has become necessary to construct a new governance scheme based on the commitment of public partners. It is planned to establish a project company in which the federal state, the regions and the VNF as a public enterprise are represented on the board. The management of the Albert canal in Belgium between Antwerp and Liège is discussed as a possible prototype for the governance scheme to be established.[63]

b4: Suggestions for fostering intermodal collaboration

While the project aims in the first instance at strengthening the competitiveness of inland waterway shipping in France, a second aim consists of exploiting synergies and intermodal complementarities. Intermodal platforms as they are planned in agglomerations (Paris, Lille) and intersections of transport corridors (Longueil Sainte Marie, Marquion) should improve overall efficiency, the modal share of environmentally friendly transport modes and the commercial activities in the concerned regions.

Recommendations

The Rapport Pauvros finds that the overall impacts of the CSNE project are positive and improve the transport efficiency as well as the economic prospects of the regions. It underlines the effects on competitiveness and employment in regions of Northern France with high unemployment which had not enjoyed major improvements in the freight transport system in the past decades. It is reminiscent of the success story of the Albert Canal in Belgium and of its contribution to developing growth and employment under sustainable logistics conditions.

[61] Decided during the TEN-T Days held in Tallinn, October 2013.

[62] CEF: Connecting Europe Fund with a volume of EUR 26 billion 2014-2020 incl. EUR 11 billion transferred from the Cohesion Fund.

[63] The Albert canal is managed by the de Scheevaart company under public law, owned by the region of Flanders.

12.2.6.3. New studies accomplished in 2013

SETEC study on economic impacts of CSNE

The SETEC study on the economic impacts on the French side of the Seine-Scheldt waterway tries to answer four questions (SETEC 2013):

- Will CSNE enhance the development of the ports' performance in France?
- To which extent will CSNE contribute to the economic development, regional, national and European?
- Will the project contribute to a balanced spatial development?
- Which triggers will be necessary to develop the inland waterway transport in a way that it will lead to a substantial modal shift?

To answer these questions SETEC explores numerous reports, studies and documents, interviews major actors in the field, analyses the parallels with a similar infrastructure project, the canal Albert in Belgium, and develops a prospective vision based on expert judgement. The study describes the present situation and future development prospects in some detail for 9 freight transport segments (commodity groups) and analyses the impacts of CSNE.

SETEC does not expect a major market growth for bulk cargo segments. In particular the transport of cereals tends towards stabilisation of volumes. CSNE offers the chance to shift bulk cargo flows from road to IWW, as for instance on the corridor from Nord Pas de Calais to Rouen which is the largest EU port for cereals. The market for wholesale commodities will grow modestly and the canal provides more options for transporting palletised goods on the waterway. The report mentions that the container standard of 20/40 ft is not optimal for this type of transport, 45 ft containers would be better for meeting this demand. The market for container transport will continue to grow, but at a lower speed compared with the forecasts made in 2006. Although the CSNE will only allow for 2 stacks of containers the prospects for attracting a considerable market share are evaluated positively.

Figure C12-4: Impacts of CSNE on transport segments

	Compétitivité	Valeur ajoutée	Emplois	Relocalisation Territoire	Ouverture UE	Accessibilité bassins de conso	Accessibilité Export
Céréales	++				+		++
Granulats						++	
Grande distribution	+		++	++	++	++	
Métallurgie	+	+	+	+	+		+
Chimie	+	+	+	+	+		+
Produits recycl.	+	+	+	+		+	
Automobile	+	+	+	+		+	+
Mécanique Colis Lourds	+	+	+	+		+	

Source: SETEC, 2013.

The SETEC report also analyses the role of the ports of Le Havre, Rouen and Dunkerque and their development chances after realising CSNE. It furthermore describes the importance of the multi-modal platforms for modern logistic supply chains.

Summing up, the CSNE is expected to increase IWW transport in France by 0.5-3.8% until 2030 and by 2.1 - 5.8% until 2060. The modal shift for IWW is estimated at +4%, while road transport goes down by 2%. The port of Le Havre will increase its importance in particular for container shipping and is expected to attract +0.15 million TEUs until 2030 and 1.2 million TEUs until 2060. These changes are due in the first instance to increased competitiveness of IWW transport and to a smaller extent to increasing transport volume.

SETEC also addresses wider economic impacts such as the employment effects which have been mentioned in the Rapport Pauvros and the potential for improving the competitiveness of regions and their attractiveness for tourism. It ends with a case study on the economic dynamics which have been induced by the Canal Albert in Belgium, opened in 1939. This canal has a similar length (114 km versus 106 km of CSNE) and can be regarded as a success story for transport and economic development in the busy corridor between Antwerp, Brussels and Liège. The transport volume 2012 was about 22 million t. However, the different dimensions should be noted: The width of the Albert canal was originally 50 m, was then extended to 63 m and is presently in most sections 100 m (CSNE: 54m). The clearance is presently 7 m and allows for 3 layer container barges and there are plans to increase the clearance to carry 4 layer container barges. The barge standard is presently ECMT VIb, i.e. barge convoys carrying up to 10,000 t. There are plans to extend the standard to ECMT VII which would increase the loading capacity by a further 30%. Therefore the Canal Albert case study is very helpful for getting an impression of the transport and economic activities which follow such a mega investment in transport infrastructure. But one should be careful of deriving quantitative conclusions for canals of smaller dimensions.

SETEC (2013) study on socio-economic evaluation

The background study of SETEC for the Commissariat Général à la Stratégie et à la Prospective, September 2013, on the adjustment of transport modelling and the revision of the socio-economic evaluation is presently not available. VNF has announced it would send a summary of essential figures but this could not be realised.

12.2.6.4. Conclusions and response to the feedbacks

Conclusions

The properties of the project have changed substantially compared with the status of December 2012, which was the deadline for our first study (Schade et al. 2013):

- Critical comments were given in the report on Mobilité 21, and the project was excluded from an assignment to the priority categories due the existence of an international agreement.[64]
- Critical comments were given in the report by IGF and CGEDD. An update of the 2006 figures on forecasting and assessment was recommended.
- The Rapport Pauvros announced a substantial reconfiguration of the project which leads to cost reductions in an order of magnitude of EUR 550-650 million The

[64] Agreement signed at ministerial level between France, Wallonia, Flanders and the Netherlands in July 2007.

rapport does not mention changed transport forecasts and revised CBA figures. It underlines the economic importance of the project and wider economic benefits.

- SETEC consultants have prepared two studies, one on the economic importance of the project (the baseline of the associated Rapport Pauvros chapters) and one on the revision of forecasts and CBA. The latter could not be made available.
- While a number of new documents have been received which describe the changes of the project procurement the most important document is still missing: the revised forecast and CBA. Therefore it is still not possible to provide a comprehensive evaluation of all project documents. While the political promotion of the project was pushed successfully, partly supported by the Rapport Pauvros, a scientifically based report on the economic viability of the project – eventually based on the Rapport Quinet (2013) - is still missing.

Response to the feedbacks to our first study

(1) Preliminaries

The Comments by VNF consist of (1) clarifications and amendments of facts and figures on the Seine-Scheldt/Seine Nord Europe canal project and (2) some supplementary and partly critical scientific remarks with respect to the general findings and recommendations of the first study on „TEN-T Large Projects – Investments and Costs“ as of April 2013 (Schade et al. 2013). We prefer to respond separately to these two parts although they are not clearly separated in the VNF Comments as they follow the sequence of the first study.

In the Comments “VNF and the Scientific Committee in Charge of Supervising the Traffic and Transport Studies” are mentioned as the authors. The Comments include the information that VNF have established several consultant bodies, such as an “Economic Committee”, a “Scientific and Technical Committee”, and a “Review Team”. It is not clear which of these bodies has participated in preparing the Comments. The authors of the Comments are not given and it is also not clear which members of the responsible Committee have agreed to the Comments.

(2) Clarifications and amendments of facts and figures

(a) Cost figure
The responsible author for the case study Seine-Scheldt in the first study, O. Meyer-Rühle, communicated the reasons for misunderstandings in a letter of February 28, 2013. A wrong figure in the investment costs of the CSNE, i.e. the French part of the project, could not be corrected in the main part of the study because the correct information arrived after the deadline.

Conclusion: The investment costs for CSNE have to be corrected to EUR 4.3 billion (estimation 2009).

(b) Missing documents and transparency
When the first study was accomplished in December 2012 new developments for the project had been initiated for which no documents were available to the consultants. VNF was not able to submit those documents because they either were not finalised or not released by the Ministry of Transport.
Conclusion: The remarks by the consultants on missing documents and transparency should not be interpreted as a general criticism of VNF’s communication policy.

VNF has been very helpful by submitting important documents which were released after December 2012. However, a most important document on the revisions of forecasts and CBA (SETEC, 2013) could not be submitted because it is still in the process of approval.

Conclusion: The procurement of such a complex project is a difficult process and the project managers usually are not willing to give all information to third parties. While we understand this situation we are not able to confirm that the data situation is transparent and that the project fulfils all essential criteria for maturity.

(3) Scientific remarks

European Models, p. 13

This comment is hard to understand. There have been attempts to construct European multi-modal models for more than 10 years. Several EU projects have been launched to build up data and modelling bases for this issue (SCENARIOS, SCENES, EXPEDITE). Data bases have been constructed (see the ETIS Plus projects of the EC) and used as inputs in the transport models for TEN-STAC (prepared for the TEN-T revision 2004) and TRANSTOOLS (prepared for the TEN-T revision 2011 and applied in the TEN CONNECT study). These models are based on NUTS 3 and project the different existing surveys (country surveys and Europe wide surveys like DATELINE) to a common base year, of course by partly strong assumptions. Our point is that the presently existing multi-modal models on a European scale need to be improved because they have not yet achieved a level of reliability which is necessary if they are used to check and co-ordinate country-based forecasting approaches. If the VNF comment should be understood in the sense that this improvement is not possible or even useless we disagree. Otherwise the comment would further back our arguments.

European added value and wider economic impacts, p. 13 and p. 43

There seems to be a misunderstanding about the issue of our study. It was not our task to define the European added value and to develop a measurement concept. Nevertheless we are grateful for the reflections presented on p. 3 of the comments because they partly underline our finding that further research work is necessary to come to a clear definition and measurement concept for the European value added of large scale projects or network configurations. At this point we cannot discover any point of disagreement.

However, we do not agree with the statement in the comments that wider economic impacts are less important compared with improvements dealing with traffic, environmental and climate change dimensions and a sensitivity analysis and risk management. We do not understand this mix of different subjects of evaluation. Wider economic benefit approaches are not intended to substitute CBA or environmental or safety impact measurements. They also are not in conflict with sensitivity and risk analyses. The idea behind a wider economic approach is that large projects may cause economic (structural) changes which induce second round impacts in the influenced area/corridor. Conventional CBA is not appropriate for measuring and evaluating these types of impact. The EU Commission has applied an approach for the evaluation of such impacts induced by the core network for TEN-T which is published in a communication from 2011, (European Commission 2011). We have referred to this publication, find it most interesting although it states that more research is needed to develop a harmonised approach on the EU level. Furthermore, we have quoted several research approaches which go into this direction and which can serve as a baseline for future research on this issue.

Coming back to the European added value we think that the quoted extended research approaches are in principle appropriate to serve as a baseline for measuring and evaluating the European added value.

Financing the Priority TEN-T Networks, p. 25, Table 2

This is a good point and there is no disagreement with it.

TEN-STAC project, p. 36

We are grateful for this argument as it supports our view which has been explicitly pointed out in the study. Of course we appreciate the remarks on the passenger model because we have contributed to its development. The remarks about the freight modelling part are obviously based on limited information. The freight model has been described in the first two TEN STAC deliverables, the data inputs are given in some detail in deliverable D3 of TEN-STAC.

Leverage effects, p. 43

This seems to be the main controversy on the scientific side. The relevance of secondary economic effects grows with the volume of projects and their interdependency among each other and with economic sectors. In the neoclassical partial equilibrium approach such effects are neglected. The suggestion made in the Comments to model such effects first within single countries is not understandable as secondary effects in particular may occur in a large spatial context and spread across borders. The issue of measuring a European value added cannot be tackled without an extension of the partial equilibrium approach. We share the opinion that the SCGE models are not yet mature and have stated that in the study. However, our literature review of this topic does not end with 1995 and we have quoted more recent approaches of equilibrium and disequilibrium modelling which show more promising prospects. This refers in particular to the assessment of different network configurations and the identification of parallel or over-investment on a network scale.

Concluding remarks

We conclude from the Comments that there is no basic scientific disagreement except with the treatment of wider economic impacts and the application of modelling approaches beyond partial economics CBA. The latter is still a matter of scientific debate and we understand the arguments brought forward in favour of focusing on the traditional CBA. We also agree that CBA is a necessary component of the economic evaluation of large-scale projects. However, we find that traditional CBA has a limited scope of capturing benefits of large projects or project bundles in an interdependent transport and economic system. The Rapport Quinet on the revision of the French evaluation method underlines in its chapter on "Enrichment of the Traditional Calculus" that the treatment of wider or secondary economic impacts is a challenging issue while it is presently not possible to include it into a standardised evaluation scheme. Therefore the Rapport suggests charging independent consultants with preparing an appropriate analysis and to monitor/audit this work by an expert group. The arguments in the Pauvros report and the underlying study of SETEC (2013) emphasise in particular this aspect of the CSNE investment, e.g. the impacts on regional economic structure and on employment. The increasing scope of the TEN-T context (from project via corridor to a core/comprehensive network context) also implies that the scientific base for assessing large scale projects, project bundles and network configurations needs further development.

Appendix 1: Chronology

The 350-tonne capacity Saint-Quentin Canal, built in the 19th century, was the first to be studied in 1975.

1978: Studies began on the 650-tonne capacity Canal du Nord, initiated in the early 20th century and completed at the end of 1965.

1983-85: Studies led to the preparation of a waterways master plan in which priorities for inter-basin links were defined, including two options for the Seine-Nord link.

In 1989, the Chassagne report urged France to join the European waterway system and recommended three scenarios: proposing the rehabilitation of the existing, out-dated network, construction of the Seine-Nord and Rhine-Rhône links to avoid losing a considerable amount of traffic to foreign networks, reducing transport costs and improving safety.

1990-1993: Studies were carried out focusing mainly on the eastern option of the Canal. In the same year (1993) the Secretary of State for Transport decided that the Seine-Nord Europe Canal project would be submitted to public debate. The project was formally included in the planned trans-European high capacity waterway network.

1993-1994: Débat Publique (public hearings).

1996-1997: Preliminary studies were carried out and were aimed in particular at identifying the routing path representing the optimum solution among 21 possible routing paths divided into three main groups: the first close to the existing Canal de Saint-Quentin, the second close to the existing Canal du Nord and the third covering the various intermediate solutions between the other two.

1999: The economic study “Conseil général des Ponts and Chaussées” concluded that the solution of a waterway of Class Vb on a new path (corridors 2A-EC-N3) was the only solution which guaranteed long-term efficiency.

2002: The path designated as N3, along the Canal du Nord, was adopted in March 2002 in recognition of its reduced cost and its lesser impact on the environment.

2004: Seine-Scheldt selected as a European priority project in TEN-T (PP 30).

2008: Declaration of Public Utility; Decision by EC to finance the project.

2008 - 2009: Diagnostics archaeological studies and launch of the Invitation to Public Competition (ACPA) procedure for Public Private Partnership (PPP); start land acquisition.

2009-2011: Phases of the competitive dialogue that will lead to the signing of the partnership agreement (CP).

2011: Seine-Scheldt included in the proposed European Core Network (Corridor n° 9 Amsterdam-Marseille).

2012: In France, the first quarter of 2012 was dedicated to the competitive dialogue with the two selected bidders on the basis of their provisional proposals sent in October 2011, including those for the technical, contractual and financial parts.

2013: Report Commission Mobilité 21. CSNE excluded from prioritisation.

2013: Mission IGF/CGEDD. Diagnosis of economic risks. Demand for revision of transport forecast and CBA.

2013: Report Pauvros. Reconfiguration of the project. Cost savings of up to EUR 650 million, underlining the economic importance of the project, in particular for Northern France.

2013: Study SETEC on economic impacts of CSNE. Relevance for freight transport markets. Wider economic impacts (employment).

Appendix 2: Selected bibliography

Year	Type	Title
2012	General	TEN-T EA (2012): The Seine-Scheldt inland waterway network - cross-border section between Compiègne and Ghent. Online: http://tentea.ec.europa.eu/en/ten-t_projects/ten-t_projects_by_country/multi_country/2007-eu-30010-p.htm (30.11.2012).
2012	General	European Commission (2012): Annual report of the Coordinator. Priority Projects 18 and 30. Karla Peijs
2006	Socio-Economic	VNF (2006a): Enquiry prior to Declaration of Public Interest. European Seine-Scheldt Waterway, Seine-Nord Europe Canal and related developments from Compiegne to Aubencheul-au-Bac, vol H – Socio-economic assessment, December 2006
2006	Environment	VNF (206b): Enquiry prior to Declaration of Public Interest. European Seine-Scheldt Waterway, Seine-Nord Europe Canal and related developments from Compiegne to Aubencheul-au-Bac, vol, F - Impact Study: Non-technical summary, December 2006.
2005	CBA/Traffic	Belconsulting N.V. (2005): Geintergreerd Strategisch Plan. Technische & Economische Analyse
2005	General	Belconsulting N.V. (2005): Geintergreerd Strategisch Plan. Opmaak van het ontwikkelingsplan

Appendix 3: Comments on the first study

The following final pages of this case study present the comments received from VNF on the first study (Schade et al. 2013) and which are referred to in the previous sections by using the quoted page numbers.

Comments on TEN-T Large Projects – Investments and Costs, Provisional version Study, 2013

VNF and the scientific committee in charge of supervising the traffic and forecast studies *comment* on points raised by the report draft, taking them in turn and emphasizing more specifically those concerning the Seine-Nord Europe project.

Decision making Process on TEN-T funding

p.13-14	Proposed decision-making process on TEN-T funding – Key points for Seine-Scheldt and Seine-Nord Europe
	As mentioned during the presentation in Brussels on January 22nd, we suggest to add in the scheme the main public and private stake-holders, and in particular the financing partners, as part of this process. For Seine-Scheldt the decision taken in March 2009 by the 3 Regions to cofinance the projet was the outcome of a consultation process which started in October 2004 and is still fully operational during the present procurement phase (of competitive dialogue with the potential private partners). In addition to the legal and mandatory environment and project development procedures, the installation of a "Consultative Committee" by the "Préfet coordonnateur" in October 2004, during the planning phase of the project, gave a regular forum (twice a year) starting in 2004 with 300 representative institutions and today with 1100 representative institutions in France and Europe. This approach gave a strong support for the planning and implementation phase of the project, in particular to take into account in the design of the project the expectations of the territories for land development, economic and employment issues. Similarly the consultation with the users of the transport system, the main beneficiaries of the project, allows to set-up the toll system of the project, a key issue for the financing of European transport projects. *Considering the importance of the "decision process" on such a large project with major impacts at regional, national and European level, specific dedicated advising bodies independent of the owner (VNF) and of its financial and technical consultants have also taken a specific role in the assessment of the project and the decision making process of Seine-Scheldt and more specifically for Seine-Nord Europe during the last 9 years:* • *An economic committee of 7 European economic experts, headed by Mr Emile Quinet, Professeur emerite Ecole Nationale des Ponts et Chaussées was installed in June 2004 to review the decision making process of traffic and economic studies, is consulted on a continuous basis since this date. The experts provided specific recommendations and advised at the various stages of the project, including recently for the update of the traffic forecasts in December 2012.*

	• *A scientific and technical committee of 20 European technical experts (France, Belgium, Nederland, Germany) headed by Mr Geoffroy Caude (former Managing director of the public institute CETMEF(Centre d'études techniques, maritimes et fluviales) was set-up in October 2004 to review the development of the project up to the approval of the outline design in November 2006; since 2008 they reviewed the performance criteria of the project for the preparation of the competitive dialogue documentation; after the selection of the bidders in 2009, they were continuously involved in the finalization of the Procurement documentation and, since June 2011, in the review of the technical proposals and solution of the bidders to optimize the project; early 2013 their recommendations are part of the actual final phase of competitive dialogue to draft the terms of reference for the final offer of the bidders.* • *A review team of 30 French and European experts was set up by the French Government in December 2005 to review the results of the traffic forecast studies before approval of the outline design; their recommendations published in July 2006 were incorporated in the outline design for the documentation of the public enquiry.* • *The PPP scheme assessment was evaluated in 2006 by the MAPPP (a specific independent body of the Ministry of Finance) and given a positive recommendation in October 2006.* • *Following the outline design approval in November 2006, a specific "Financing Mission"was set-up in January 2007to propose the financing plan of the project on the basis of the PPP approach; after meeting the various potential co-financers of the project, they issued an initial financing report in July 2007,including recommandations for EU support for the period 2007-2013. The initial financing plan was approved in 2008 and the associated financing protocol between the key co-financers was signed in March 2009.* • *The present IGF/CGEDD Mission installed by the government in September 2012 aims to review, independently of the Owner, the technical and financial results of the competitive dialogue held between April 2011 and October 2012 and to update the initial financing plan (set-up 4 years ago and before the financial crisis), specifically to take into account a potentially increased EU support for the works period (initially 6,22% to be increase up to 30%). This mission has also reviewed the traffic forecasts, taking into account the effects of the financial and economic crisis.*

European models

p. 13	require reliable multi-modal network models, which in particular for the European level do not yet exist. Further, the impact of the economic crisis in 2008/2009 had repercussions on
	It is hard to imagine how a multi-modal Europe-wide model could be built for a common year: it would require coordinating data surveys by mode across 27 countries. The only exception to this practical hurdle might be estimations of road O-D matrices from link counts, as described in the MYSTIC European project. *However, the multimodal model developed in 2004 by Setec/Stratec for Seine-Scheldt*

	describes the 3 transport networks associated with the maritime and inland ports for North of France, Benelux and part of Germany. Its complexity lies in the definition at the same date of the transport data for the 3 modes of transport and for the 4 countries. Since 2009, the model has been jointly developed between the 3 partners (France, Flanders and Wallonia) and has been recently updated end 2012 to take into account the crisis period and the "lost decade" scenario.

European value added and wider economic benefits

<table>
<tr><td>p. 13

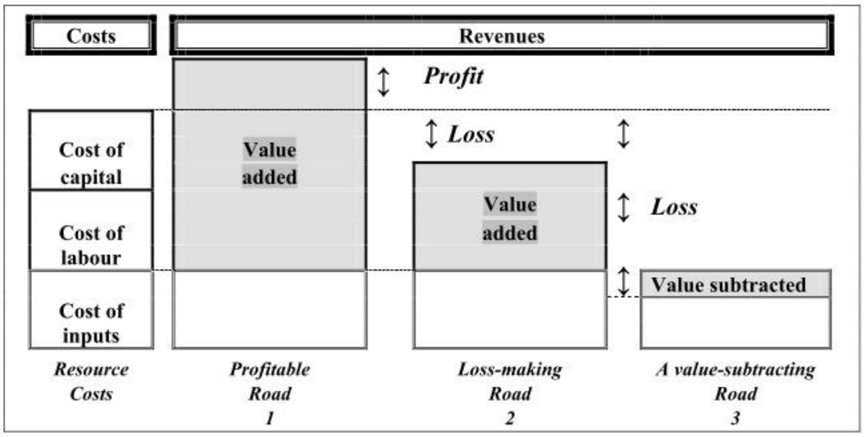
p. 43</td><td>construction work. Methods to consider wider economic benefits, including European added value, are either not yet developed or are not applied to improve the selection of projects.

more precise definition of the European added value which gives an opportunity for quantitative measurement.</td></tr>
<tr><td></td><td>

The expression "European value added" should be accurately defined to provide an harmonized evaluation approach. In principle, value added is obtained by subtracting project income from inputs costs, but typically the analytical accounts of expenses needed to distinguish expenses on input from expenses on capital and labour needed for any project are nowhere available. The point needs explicitation and clarification.

As shown in Table 1 for roads, the notion of value added has the advantage of making clear that projects that are subsidized may have positive value added as long as their input costs are covered. This is a key point because project that are subsidized but have positive value added merely transfer money between individuals; but projects that have negative value added make everyone poorer (decrease GNP) as well.

Table 1. GNP increasing and GNP reducing roads



Concerning wider economic benefits (WEB), this is an extremely complex matter that has recently begun to be addressed, for instance in an ITF/OECD Joint Transport Research Centre Roundtable 152, 1-2 December 2011. *It is not a mature topic but very much a research topic. At this stage, the inclusion of WEB in standard TEN-T evaluations would only obscure matters of evaluation and of comparison across priority projects. There are higher modeling priorities for the proper evaluation of competing projects. Concentrating on improvements in processes dealing with Traffic, Environmental and Climate change dimensions, and on sensitivity analysis and risk management, as stated on p. 13, is much more important than WEB.*
WEB should be rather qualitatively and/or quantitatively assessed on a case by case situation, according to the factors not taken into account in the standardized evaluation (new economic activities, reorganization of transport and supply chains, land development, employment, tax impacts,..)

</td></tr>
</table>

Definition of Seine-Nord Europe project and Climate assessment

p. 15	10 Seine- Scheldt waterway planning 5 900
	Throughout the study, there is confusion between the Seine-Scheldt cross-border link, the priority project N°30, and the new canal Seine-Nord Europe (one action of the priority project N°30), presented as if they were identical. Seine-Scheldt is the cross-border inland waterway link (350 km) between Conflans(FR) and Ghent(BE), and Seine-Nord Europe is the main bottleneck of the link between Compiègne and Cambrai (106 km long) associated with 4 new multimodal logistic and industrial platforms. *Concerning Seine-Nord Europe, all analyses carried out by VNF distinguish between cost, benefit and return values at European and at French levels (see vol H décembre 2006).* *The climate impact assessment for Seine-Nord Europe and Seine-Sheldt is included both in the technical assessment for the impact on water usages on a 100 years return period (see Vol A décembre 2006) and for CO2 impact (see Vol H décembre 2006) assessing the effect over a 50 years period, taking into account the evolution of the emissions of the 3 modes of transport during this period. This climate effect was specifically taken into account in the design of the project with the inclusion in 2005 of 2 bassin reservoirs.*

Financing the priority TEN-T networks

p. 25	**Table 2: Financing the priority TEN-T network, 1996–2013**
	The table concentrates on the EU financing portion and we suggest that the user contribution should also being considered as a key financing tool for the core network; historically, the main energy and transport infrastructures in Europe and worldwide have been developed considering the benefit for the citizen and the industry. The estimated value of time of cost reduction, and/or "added value of the project" have direct monetary impacts. For Seine Nord Europe the decision by the French government is based on the principle that up to 50% of the generalized cost reduction could be allocated to the toll paid by the users. The remaining 50% is allocated to the modal shift and the competitivity of the mode.

The TEN-STAC project that analyzed the 30 TEN-T priority projects in 2004-2005

p. 36	However, all of these models remained under the control of their developers
	The problem is deeper than what is stated. What matters for transparency is not "control" but the public provision of data and model information, preferably in the form of a legal deposit documenting the data and models (perhaps on the SPQR lines proposed by SpotlightsTN). *Take the case of the very important TEN-STAC project, which combines a model for passengers and one for freight: their outputs are merged on the network. Its technical proposal submitted to the European Commission in October 2004 contained basic information on the mathematical form of the passenger model, stating the specifications[65], but none on the freight model: nowhere is it stated in the submittal that it is basically derived from a 1986 model[66].* *In TEN-STAC presentations in Brussels, nobody asked to see the freight demand equations, or for that matter any equation. There was no contractual requirement to "deposit" data and model documentation for ex ante or ex post use.*

65 Schoch, M. (2000). VACLAV-VIA, The IWW-MKmetric Passenger Model, Institut für Wirtschaftspolitik und Wirtschaftsforschung, Universität Karlsruhe (TH), 20 p., September.

66 Taborga, P.N., Weaver, T. and P.M.F. Tardieu (1986). The Determinants of Modal Choice in the Freight Market, Proceedings of the World Conference on Transport Research, The Centre for Transportation Studies, University of British Columbia, Vancouver, 1986.

Leverage effects

p. 43	In an extended context the secondary effects on the economies stemming from feedback loops between transport and the economy outside the country of investment can be added. Examples are the approaches of IHS (2012), IWW et al. (2005 and 2009), Schade (2006) or Proost et al. (2010). The secondary effects include the repercussions which follow the initial direct effects and can be measured by welfare indicators or indicators of national accounting (GDP, GVA).
	It is our considerate opinion that primary project evaluation effects should remain concentrated on the classic partial equilibrium transport demand model process and on complementary environmental and climate impact assessments. *Indirect or leverage effects, and any effects addressed in Spatial Computable General Equilibrium Models, belong, like Wider Economic Benefits, more to the research than to the project evaluation literatures: they still raise enormous issues of uniqueness of solutions[67] (and therefore of reproducibility), and of realism (number of industrial sectors, representation of transport modes, number of endogenous land use prices, etc.), especially if flows, land prices and activity levels are to be modeled across multiple countries.* *One would expect such indirect effects to be first modeled adequately within single countries, and the procedures to be readily applied in national transport plans (an objective that is still in the future), before multinational problems are addressed.*

Seine-Nord Europe

p. 70	Timeline – Coordinated planning and implementation
	It's not realistic to say that the projects included in the Seine Scheldt Link have been implemented parallel one to each other. *From November 2005, the Seine Scheldt committee involving France, Flanders, Wallonia and The Netherlands has been created in order to coordinate the different projects.It has been changed into an Intergovernmental Conference in September 2009, gathering the representatives of France, Flanders and Wallonia.* *The operational side has been transferred early 2010 to a European Economic Interest Grouping Seine-Scheldt, the competence of which is the coordination for the whole project, for financial issues in particular, communication and consultation. The project is really co-monitored by the three parts since 2005. For project status please referred to comment on conclusion.*

p. 70	Timeline – Cost of the Seine-Nord Europe project
	The amount of 5.9 billion €, as per Annex 10 page 171(the only study table reviewed by VNF) refers to the whole Seine Scheldt priority project and not to the Seine Nord Canal Project. The estimated construction cost (excluding financial costs) for the Seine Nord Canal is 4.3 billion € .

p. 70	Time-line CBA
	It is regrettable that the authors did not question VNF before addressing such a statement on the uncertainty of the CBA and associated forecasts. Clarifications are provided here below. *The various 2006 EIRR calculations requested for the documentation of the public enquiry in 2007 aims to give transparency to the public according to the various financing options; in 2007 the EU available financing was less than 10% and can now target 30% or more under*

67 Mercenier, J. (1995). Non uniqueness of solutions in applied general equilibrium models with scale economies and imperfect competition. Economic Theory 6, 161-177.

	the CEF 2014-2020 program. The range of EIRR lie from 5,2% to 7,8% with a lower central value of 5,3% (scenario de base)and a higher central value 6,6% (Scénario logistique); these 2 values take into account a coefficient (COFP) of 1,3 on public contributions to take into account the budget effect on other projects; the 2012 updates of EIRR taking into account the revised toll system, the results of the consultation with the users and the development of the 4 multimodal platforms, the actual cost estimate during the competitive dialogue and the "lost decade scenario, is 6,0% for the lower central value (Scénario de base)

Transparency of assessment – public availability

p. 70	VNF, the leading party in the EEIG, has commented on our draft assessment but has failed to supply the relevant documents. In general transparency in terms of public access to relevant documentation is poor.
	This statement is totally misleading, both in terms of communication with the authors and in the reality of available documentation: ***VNF has never received a draft assessment (VNF only commented and rectified the table C10-01 of page 171) and has never been required to provide specific additional documentation:*** *During the very short time available for the study (2 weeks from mid- November 2012) VNF has not received specific questions or questionnaire usually prepared for research work and has not met the authors, which founded their conclusions only on documentation found on websites…* *The use by the authors of the documentation of a Press conference in November 2010 found on the website is certainly grossly insufficient (or misleading) with respect to the basic principles of project assessment and probably inadequate for the objectives of a research study.* *The documentation of the public enquiry in 2007 and all forecasts and studies are fully available since 2006 to the public and were the basis of the application for EU funding in 2007. They are on a website dedicated to the Seine Scheldt project or on request to authorized persons for specific or detailed issues. With regards to French legislation, it is compulsory to make them available and write them in French. More than 1000 comments on the project and positions from the various stakeholders have been provided during the enquiry from January 15th 2007 to March 15th 2007* *The availability of the comprehensive documentation in the French language might explain why the authors of the study are considering that most studies are missing. As it has been difficult to provide them with some relevant documents in English, they were therefore not able to access to the comprehensive information of the project. Nevertheless, some syntheses are partly available in an English version and have been provided to the authors.* *Since April 2011, other documents have restricted access status due to the running process of competitive dialogue, which requires confidentiality due to the inputs in the project by the bidders. The authors were not allowed to get this information.* *The project is monitored by the EU Commission and the TEN-T EA on a yearly basis since 2005; regular public presentations of the project have been organized with the public, the users and the cofinancers since 2004.*

p. 71	Funding
	The financing optimization of the project is a key objective of the process of competitive dialogue, especially at a time where the possibility to increase the various EU support is now open since 2007(First 2008 EU decision to finance studies and preliminary works). There is planned financing optimization work and no uncertainty up to the time the competitive dialogue is closed and the final bids received. The PPP financing component is mainly covered by the revenues of toll and additional activities (port dues, water transfer, tourism, renewable energies,..) which are also part of the actual competitive dialogue. The toll on the canal covered 100% of the running, maintenance and regeneration costs and about 25% of the capital cost.

p. 70	Conclusions
	We suggest to withdraw these conclusions as they seems subjective and not based on scientific or research work, due to the lack of questions sent to VNF and the limited information available to the authors in the 2 weeks time period, using only the communication website *On that basis, all study conclusions are unfounded:* *-The French law is restrictive in the field of environmental and climate impact. Studies are compulsory and have been made for the project.* *-Forecasts have been provided and regularly updated with regards to the new economic scenario adopted by the European Union.* *-The French government decided to get complementary and updated studies on financial conditions to realize the canal. This is a normal process of the competitive dialogue process and also of the development of the project at the end of the planning phase, before starting the implementation phase to optimize the financing plan. Neither the government nor the candidates have decided to withdraw from participation in the project.* *Adequate conclusions for this research study could be drawn when the conclusions of the presents studies of the French government will be available*

p. 74	In general, it seems favourable that a dedicated project promoter is involved to provide continuous support to the development process of a large project and to improve the assessment of the project interested public at an early stage. However, not all project promoters of today's large projects seem to have learned this lesson, as the limited information available on the Seine-Scheldt waterway has shown.
	The assumption from which the Seine Scheldt promoters haven't provided continuous support is as unfounded as mistaken, as a specific dedicated team has been created in 2003 within Voies navigables de France to develop Seine-Nord Europe, and a specific European body has been created between the European partners in 2005 to coordinate the full Seine-Scheldt link. *There is also no information in the study to back up the assertion that only limited information was available to the authors: no evidence is provided by the authors on this point.* *The promoters could have accepted a partial summary view imputable to the very limited time (2 weeks) allocated to the authors of the study and to their difficulties in securing sufficient information and studies in English: these impediments have been sources of deep misunderstandings of the reality of the project.* *But the lack of time and available information in English should not prevent the authors from*

	investigating further in order to get relevant elements and make up their minds: from our perspective, it seems that these elementary assessments haven't been made and that all conclusions are at this point only founded on personal convictions. If the authors had duly made their own investigations, they would have found the expected elements on the way the promoters are driving the project, on the partnership built with the economic actors, on the update process of forecasts and on studies carried out by meeting the future users, as well as on the permanent dialogue with all stakeholders… *The summary statements made are in total contradiction with the facts and with the development process of the project during the last 9 years (see above comments), which **are clearly unknown to the authors due to the lack of time dedicated by them** to this project for their study.*

p. 76	Two recommendations could further improve the outcome of the planning and decision phase: first, adding a risk premium to the estimated cost considering both reference classes of risks and the probability that cost increase remains below the planned cost including the risk premium (e.g. for rail project a risk premium of 40% would be added to remain below this total cost with a probability of 50%) (Flyvberg 2008), and second to not only rely on one ex-ante study (in particular transport forecast and CBA), but on several produced by different stakeholders (Flyvberg 2009). Of course, our recommendation of transparency of studies is required for all of those such that their outcomes can be compared and validated independently.
	These recommendations seems contradictory to the transparency approach of project development and cost assessment and with the required risk reduction approach during the planning phase of a project, and seem insufficient to assess the future of mobility in Europe. *Seine-Nord Europe is one of the large projects in Europe where the development phase was designed since 2004 with a progressive "risk reduction" process; the risk component of the cost of the project was assessed on an analytical and quantified approach in order to identify continuously the mitigation actions during the planning phase to reduce the risks: this is the essence of the planning phase, and not only on environmental issues…* *For example:* *• the large consultative process from 2004 to 2007 allowed to reduce the risk of recourse during the public enquiry (1 recourse over more than 1000 individual expressions);* *• the"independent advising bodies" reduced the risk of inadequate forecasts or design of the project and provided a robust basis for the PPP procedure;* *• the anticipated preliminary works (land acquisition, archeological surveys, premininary works, preparation of various approval procedures,…) reduced the risk of a premium added by the bidders in their cost estimates;* *• the consultation of the future users of the canal during the planning phase aims at providing in the outline design of the project the required services for the operation of the transport services on the canal and the inland ports and reduced the risk of late mobilization at the date of opening of the canal.* *The estimated cost includes always an element of risk premium, but it should be quantified and regularly reassessed during the planning phase. It is dangerous to fix a ratio as it is difficult to balance between 2 approaches : a high ratio such as 40% which is likely to stop any proper risk evaluation and risk reduction process during the planning phase, or a low risk premium ratio such as 5%, suggested by the authors for specific projects, which is totally unrealistic as it does not consider the risk premium already included in the initial cost estimate. This average ratio of 5% does not reflect the probability range of cost variation of such large projects in Europe and in the world.* *The risk reduction approach is fundamental part of the planning phase to secure the date of*

	time to deliver the project and consequently avoid overrun in time and costs. *Concerning the forecast approach, the ex-post analysis is frequently used, and was largely taken in consideration for Seine-Nord Europe with the benchmark of the development of "Canal Albert" build on industrial grounds in the 1930's between Antwerpen and Liege, and now developed on a strong logistic basis for European distribution centers (EDC), similarly to the approach of Seine-Scheldt link. However, the development of the multimodal models is crucial to test the sensitivity to different assumptions in terms of cost, tolls, macroeconomic scenarios and multimodal services.* *Key issues for the CBA are also the assessment of indirect economic effects on large scale European projects not taken into account in the national and European assessment procedure and not provided by ex-post analysis. Assessment and construction of the future mobility of goods in Europe needs the experience of the past, shared views by the different stakeholders and particularly from the various industries involved for the different type of goods (automotive, cereals and agro-industry, chemical, biomass, energy, construction materials, steel, consumer goods, containers,…) but also anticipation, multimodality and innovation such as building circular economies to reduce the footprint for the available resources.*

Appendix 4: References

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