

The project and status of the works

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INTRODUCTION

The Lyon-Turin line, which represents an essential part of the Mediterranean Corridor of the TEN-T European network, is a high-capacity railway line for freight and passengers which stretches over 270 km, of which 70% in France and 30% in Italy.

The 65-km long cross-border section, between Susa/Bussoleno and Saint-Jean-de-Maurienne, whose construction has been assigned to TELT, is co-financed by the European Union (40%), Italy (35%) and France (25%).

The main works is the Mont Cenis base tunnel, a 57.5 km twin-tube gallery which makes it possible to cross the Alps on level ground, reducing the time and cost required to transport goods and people.

The project's implementation is enshrined in seven agreements, four of which are international treaties

signed by Italy and France in 1996, 2001, 2012 and 2015. With the ratification of the Additional Protocol, signed in Venice in 2016, the two countries paved the way for the beginning of the works for the cross-border section of the line.

Crossing the Alps by way of a base tunnel guarantees higher standards in terms of safety, speed and reduced consumption compared to the Fréjus tunnel currently in use, which was built in 1871. This will help to improve the Alpine environment by shifting the equivalent of up to 1,000,000 lorries from road to rail, it will make transporting people and goods by train economically competitive, as well as connect and develop areas with different vocations, with positive repercussions for those territories. Each year, 42 million tonnes of freight travel along the Alpine arc between Italy and France, over 90% of it by road.



EUROPE'S NEW RAILWAYS

The Alpine crossing represents a crucial hub for commercial exchanges and for the mobility of people between European countries. In the last few decades, the need for faster and more efficient transport has been combined with the requirement to protect the environment, reducing pollution, above all in an ecosystem at risk such as that of the mountain areas. The European Union has focused on the implementation of the TEN-T network, the metropolitan railway of Europe, which provides for 9 corridors to rapidly, efficiently, and sustainably connect the continent across 17,500 km of tracks connecting ports, airports, interports and large urban centres.

The freight and passengers transport in Europe is thus changing. Distances are growing shorter and travel times are being cut down: from 152 to 73 minutes to go from Turin to Chambéry; from 7 to 4 hours between Paris and Milan, and to go from Madrid to Milan the journey is shortened by over 11 hours.

The prospects extend on a major international scale, because even Russia and China are building new lines, which form the new silk railroads.

In 1991 Italy had the foresight to sign the Alpine Convention, together with 7 other countries, which

aims to promote sustainable development of an area inhabited by 14 million people and where 120 million tourists are welcomed every year.

Cop21, the climate conference held in Paris in 2015, extended to all U.N. countries the commitment to limit the temperature increase to 1.5 degrees centigrade. To do so, ecological transport systems like the train, made competitive compared to the road by bypassing the mountain slopes, are and increasingly important part of European mobility strategies.

Along the Alpine arc, the seven base tunnels, already completed or under construction, are key projects for the TEN-T European railway network. They, are: the Koralm, Semmering, Brenner, Ceneri, Gotthard, Lötschberg and Mont Cenis tunnels. The latter will be operational in 2029, replacing the current railway tunnel which dates back to the 19th century.

Nowadays, trains must climb to an altitude of 1,300 metres to cross Mont Cenis, with a significant waste of energy and resources. Furthermore, the mountain route strongly limits the speed of the trains. All this entails up to 50% higher transport costs compared to the competition.



The Lyon-Turin line, central link of the mediterranean corridor

The railway between France and Italy is the central link of the Mediterranean Corridor, which will connect Algeciras in Spain with Budapest in Hungary, serving an area containing 18% of Europe's population that produces 17% of the EU's GDP. An axis which unites the Eastern and the Western part of the continent, crossing 7 of the 9 European Corridors financed by the EU.

The Lyon-Turin line, together with the Brenner, is the most significant rail project being implemented in Europe and it uses the most advanced excavation methods. The project is also an opportunity to experiment with cutting-edge procedures and technologies, developing innovative solutions in cooperation with universities and national and international study centres of various disciplines.

The cross-border section of the Lyon-Turin line, and especially the base tunnel, is at the centre of a technical-scientific partnership between TELT and the Politecnico di Torino, the Centre Etudes Tunnel Universitaires (CETU), and the Ecole National des Ponts et des Chaussées. This partnership includes research projects, technical consultancies, masters', doctorates, and degree theses in all fields of activity relating to the implementation of the project.

The historic Frejus tunnel forerunner of cross-border links

The Fréjus tunnel is the oldest rail tunnel in Europe, but freight and passengers travel between Italy and France through it still. The 13.7 km tunnel was commissioned by Cavour and inaugurated in 1871.

The historic tunnel was built by 4,000 workers, with pneumatic drills and technologies developed for the occasion, which allowed it to be completed in less than 14 years rather than the 40 needed with traditional excavation methods. The new tunnel is being excavated 800 metres lower in order to allow the trains to run on level ground.







BARDONECCHIA (IT) Entrance to the Fréjus tunnel, completed in 1871 Image taken from TELT's historical collection



BARDONECCHIA (IT) Entrance to the Fréjus tunnel Adaptation works were carried out on the historic line between 2003 and 2011



Fewer lorries on the roads AND COMPETITIVE RAIL TRANSPORT

The new railway will remove almost 1,000,000 heavy vehicles from the roads per year, with an annual saving of greenhouse gas emissions of around 3,000,000 tonnes of CO2 equivalent, equal to the amount produced during the same period by a city with 300,000 inhabitants (cf. Notebook 8 of the Technical Observatory of the new Lyon-Turin Line).

According to data collected by the European Commission and the Swiss federal Office of transports and diffused in July 2017 by the Transalpine Transport Observatory, 42,000,000 tonnes of freight cross every year the western Alpine arc, between Ventimiglia and the Mont Blanc tunnel. At present, over 90% of those goods travel by road. It is envisaged that at least half of this amount will be able to be transported through the new Lyon-Turin line instead.

The route, having no slopes, will allow a 40% reduction in energy consumption, due the diminished maximum gradients and the doubling of load capacity. It will make rail transport competitive with the road, with a considerable benefit for the environment. This is also one of the goals which the EU set for itself with the Transport White Paper: to transfer 30% of goods from road to rail transport by 2030 and 50% by 2050.

An ongoing shared project

The project was strongly endorsed by the European Union and the Italian and French governments of the last few decades, which have always confirmed their support for the project. The journey began with the Nice summit of 1990, when for the first time Italy and France expressed the need of studying a possible link across the Alps. The process of analyses, evaluations and decisions for reshaping the Lyon-Turin axis lasted 20 years. It is based on four international treaties between Italy and France signed in 1996, 2001, 2012 and 2015, the latter supplemented in 2016. Between the end of 2016 and the beginning of 2017, the Italian and French Parliaments ratified the agreement which paved the way for starting the final works.

The current configuration of the cross-border section in Italy is the result of a shared plan with the involvement of the local bodies in the Observatory on the Lyon-Turin line, set up by the Italian government in 2006 after the Venaus protests against the planned route of the works. After 205 work meetings and 300 hearings of technicians and experts, during which 11 alternatives were studied, the final layout was set. It was a route radically changed from the first plans. It was also decided to carry out the project in phases. Phase One, the so-called low-cost plan, includes the construction of the base tunnel, the capacity improvement of the old line for around 20 km between Bussoleno and Avigliana, the construction of the Avigliana freight/passenger gallery at the Orbassano logistical platform, which will be upgraded, and the adaptation works of the Turin node. Only in a second phase will it be assessed whether to proceed with the section in the lower Susa Valley (the Orsiera tunnel between Susa and Chiusa San Michele).

In April 2018, the Presidency of the Council of Ministers enacted a Decree through which the Government redesigned composition, tasks, and functions of the Observatory. It is now formed by groups of local bodies divided according to planned interventions and, within each group, according to location. This was a direct consequence of the approval in June 2016 of the document which defined the sections for conveyance, completion and upgrading of the railway infrastructure of the Turin node, and the definition of the variant at a new site for the Buttigliera Alta-Orbassano section. Therefore, the municipalities affected by the new sections joined the Observatory.



The socio-economic evaluations

The interchange between Italy and France

The usefulness of the Lyon-Turin line has been documented by seven studies from 2000 to date, carried out by qualified parties which took into consideration the volume of commercial exchanges along the Mediterranean corridor, traffic forecasts and the environmental impact in the fragile Alpine ecosystem.

The seven studies are:

2003 PWC & NESTEAR

First socio-economic analysis carried out by PricewaterhouseCoopers and Nestar.

2007 PWC

PwC study attached to the Declaration of Public Utility (DPU) in France.

2006 European Commission Study

Analyses of the studies conducted by the LTF regarding the cross-border section project of the Lyon-Turin line commissioned by the European Commission – Contractor: ECORYS Nederland BV (NL) in cooperation with: COWI, ECN (NL), Ernst & Young Europe (B) and Consultrans (ES).

2010 EGIS Mobilité – ISIS – NESTEAR – SDG

Economic and socio-economic studies attached to the Evaluation of environmental impact carried out by EGIS Mobilité – ISIS – NESTEAR – SDG, published in 2012 in Notebook 8 of the Observatory.

2014 Socio-economic analysis – Università Bocconi

Update of the socio-economic impact of the new TEN-T Lyon-Turin project with Fasaggio – Università Bocconi.

2014 Evaluation of the effects of the suspension of works – Università Bocconi

Evaluation of the economic effects of the temporary or definitive suspension of the cross-border section of the TEN-T Lyon-Turin project – Università Bocconi.

2014 Report of the European Commission on the Mediterranean Corridor

"Study on the Mediterranean TEN-T corridor, Final report" drawn up by the European Commission.

Large quantities of goods are transported across the Alpine arc, but the supply does not meet the demand.

The interchange between Italy and France is worth over 70 billion, with a positive balance of 10 billion in favour of Italy, whereas the interchange between Italy and Western Europe amounts to around 150 billion, with a positive balance for Italy of 20 billion.

The interchange value increases to 204 billion if we also consider the other countries which could potentially make use of the Lyon-Turin line (Portugal, Belgium and the Netherlands).

Furthermore, over 42 million tonnes of goods circulate on the Italy-France axis (more than the entire traffic through Switzerland, which has built 2 base tunnels at its own expense). Of these, over 90% travels by road, compared to 70% in Austria and 30% in Switzerland.



Seven tunnels under the ALPS

Trains are only competitive if they run on level ground and the only way for them to do so where there are mountains is to bore at the level of the plain i.e. dig "base tunnels". This is why seven base tunnels are being constructed in the Alpine arc. Besides Mont Cenis, they are:

- Gotthard: 57 km long, it links the Swiss towns of Erstfeld and Bodio. It was inaugurated on 1st June 2016 and opened to passenger traffic on 11 December of the same year.
- Ceneri: a 15.4 km twin tubes tunnel that has been under construction since June 2006 under Mount Ceneri, in Switzerland's Ticino Canton. It furthers towards South the Gotthard base gallery.
- Lötschberg: 34.6 km long, it links the Swiss towns of Frutigen and Raron and it was inaugurated on 16 June 2007. It was immediately made available to freight traffic, with passenger traffic starting on 9 December 2007.

- Brenner: this 55 km-long tunnel will connect Innsbruck in Austria to Fortezza-Verona in Italy. It will link up with the existing Innsbruck ring railroad, thus reaching a total tunnel length of 64 km. The preparatory works began in 2006 and those of the main tunnel in 2007. It is scheduled to be operational by 2026.
- Semmering: it is being constructed in Austria between Gloggnitz, in Lower Austria, and Mürzzuschlag in Styria. The construction of the gallery forms part of the Baltic-Adriatic corridor project. The works started in 2012 and the tunnel will be 27.3 kilometres long.
- Koralm: a twin tubes, 32 km tunnel, it is under construction under the mountainous area called Koralm, which separates the Carinthia and Styria regions in Austria.





PATSCH (A) Construction of a ventilation shaft for the Brenner base tunnel



BODIO (CH) Access portal to the Gotthard base tunnel



The work is underway in both countries

The cross-border section of the Lyon-Turin line is at an advanced stage of implementation: a total of 162 km of excavations are planned (57.5 for each tube of the tunnel, in addition to the connecting bypasses and the security sites), some sections of which have already been completed. Two international stations at Susa and Saint-Jean-de-Maurienne are also planned.

Some fundamental preparatory works of the Mont Cenis base tunnel form part of the project too: the Saint-Jean-de-Maurienne weirs, reinforcement banks of the Arc river with road systems, the artificial gallery of Saint-Julien-Montdenis, the 500-metredeep Avrieux boreholes, the motorway junction of Chiomonte on the A32 and the San Didero carport. Overall, 65 km of surveys have been carried out to date, which have made it possible to gauge indepth the nature of the entire massif traversed. At Maddalena di Chiomonte, in the Susa Valley, the 7,020 metre exploratory shaft was completed on 19 February 2017. The construction lasted for four years and provided jobs for 170 workers, 60% of whom hailing from the surrounding region.

At Saint-Martin-La-Porte, in Savoy a 9 km geognostic gallery is under construction using the axis and diameter of the future base tunnel. This activity is being carried out in the most delicate geological area of the Alpine massif, with frequent coal formations, and it provides work for 450 people, 70% being local manpower.

In addition to the 9 km of the Saint-Martin-la-Porte tunnel are as many winzes, or access galleries for the working equipment, already constructed in Savoy between 2002 and 2010: the 2,329 metre Saint-Martin-la-Porte winze; the 2,480 metre La Praz winze; and the 4,036 metre Villarodin Bourget/Modane winze.

This is only the first step of the infrastructure and in the next few years the main sites will start the works on both sides of the Alps. In addition to the Saint-Jean-de-Maurienne portal, the winzes will make it possible to use all the intermediate accesses. When fully operational, there will be 15 excavation areas and 7 TBMs which will advance simultaneously.

The works will last 10 years and the new line will be operational in 2029.

HE DEFINITIVE ROUTE

OF THE BASE TUNNEL

81 INVITATIONS TO TENDER TO IMPLEMENT THE PROJECT

The construction of the project was distributed among 12 operative sites which have generated 81 invitations to tender addressed to businesses operating in several sectors. TELT decided to activate a series of small-to-medium-sized contracts aimed directly at the SME network, which represents the main economic fabric of the Piedmont and Auvergne-Rhône-Alpes regions.

Of the 12 operative sites, 9 concern the civil works, broken down by geographic area (the junctions to the historic line in Italy and France) and the 3 related activities (use of excavation materials, security, plants and technologies). The tenders are dedicated to civil works organized in four areas (up to 5 million euros, between 5 and 50 million euros, between 50 and 500 million and between 500 million and one-pointthree billion euros) and in engineering services. The most significant contracts involve the underground operative sites and the exploitation of excavation material. It is estimated that the works will involve, between contracting and subcontracting, around 20,000 companies. The contracts will run the whole gamut, from smaller ones to the most important works.

89% of the route of the cross-border section will run through tunnels, reducing land consumption to a minimum.

The new line in Italy connects with the old one, between Susa and Bussoleno, through a first, 2 km long, tunnel section. After crossing the Dora River, the route goes through the Susa valley, the future site of the new international station, before entering the base tunnel that runs up to Saint-Jean-de-Maurienne. At the end of the 57.5 km of gallery, in French territory, the line will link up with the existing one at the north-western end of the Saint-Jean-de-Maurienne valley.

The municipalities directly involved in the works in Italy are Chiomonte, Giaglione, Susa and Bussoleno, as well as Salbertrand, where the factory for transformation of the spoils will be built. Caprie and Torraza Piemonte will house the non-reutilized material. Avigliana, Bruzolo, Chiusa San Michele, Condove, Mattie, Mompantero, San Didero and Venaus will be only marginally concerned.

In Italy, 70% of the surface areas involved in the works are already exploited or degraded: the latter are planned to be reclaimed and improved. In the Susa Valley plain area, the project covers 8 hectares of land, most of it already damaged. In this area can be found the only 3 buildings (2 homes and 1 commercial building) subject to expropriation in the entire Italian portion (12.5 km) of the cross-border section.



The longest railway tunnel in the world

SAFETY INSIDE THE MOUNTAIN

The principal element of the cross-border section is the Mont Cenis base tunnel, which at 57.5 km is the longest railway tunnel in the world. The project is composed of two parallel single-track tunnels, one for the passage of trains from Italy to France and the other for transit in the opposite direction. Communication branches are provided every 333 metres for ordinary maintenance activities or safety requirements. Some of these bypasses, one in every four, are equipped with service areas for the technological installations.

The construction of the base tunnel, like the Brenner tunnel currently under construction, and the 57 km long Gotthard, completed in 2016, will be carried out following the highest European standards for safety and efficiency.

The tunnel will have a diameter of 8.4 metres. Inside it, passenger trains will be able to reach a maximum speed of 220 km/h, with freight convoys attaining 100/120 km/h. In comparison, the current speed in the old tunnel is limited to 60 km/h. The base tunnel guarantees the safety of the passengers going through the gallery by means of a system of underground connections and ad hoc stopping areas. It is equipped with 3 underground safety sites, directly linked to the exterior via the La Praz, Villarodin-Bourget/Modane and Maddalena shafts. These sites were designed as stopping points for a convoy in difficulty. At the centre is a third tube excavated between the two main ones, for sheltering passengers should it be necessary to evacuate the carriages. This area, around 400 m long (the length of a passenger train) is linked to the railway tubes by means of branches every 50 m.

In addition, over a 750 m section (length of a goods train), the railway tubes are equipped with firefighting installations: thermo-sensitive cable, fire mitigation system by means of water spraying, smoke extraction.



SAFETY ON SITE

TELT has set for itself the goal of reducing onsite accidents to a minimum and of implementing healthy and comfortable environments for all, despite the complex and difficult working conditions underground.

To pursue this objective, a dedicated corporate function has been created, tasked with overseeing occupational health and safety on the sites, and with promoting and monitoring the application of standards, the use of new technologies and propagating the safety culture at every level of the company.

The objective is to achieve a level of zero incidents in the sites controlled by TELT. To achieve this, the public sponsor has decided to insert in the invitations to tender a reward system linked to safety: only those companies which offer innovative solutions for safety at work can obtain higher marks in the tenders for implementation of the Lyon-Turin base tunnel.

A COMPLEX GEOLOGY: 5 7.5 KM UNDER THE ALPS

The excavation methods

The tunnel crosses the Alps at a depth of between 1,000 and 2,200 m, going through very different geological zones, each requiring its own specific methods.

To investigate the characteristics of the rocky masses at the depth of the future railway tunnel, and hence determine the best way to excavate, 65,000 metres of surveys have been carried out in various areas, as well as 260 km of geophysical investigations and some preliminary works.

The gallery will have to cross 9 different geological zones, including the Ambin massif straddling the Italo-French boundary, consisting of the Clarea mica-schists and the Ambin gneiss.



The excavation of the 162 km of tunnels and galleries of the cross-border section is tackled with different excavation methods: around 40% in the traditional manner and around 60% with mechanized means.

MECHANIZED EXCAVATION WITH TBMs

TBMs – Tunnel Boring Machines – are imposing machines built to measure to excavate rapidly and safely underground. They are used in the longer sections, wherever the mountain allows. The drill is configured as a "travelling industry": making it possible to mechanize and automate all the operations of excavation, clearance and transport of the material, thus reducing to the minimum both the duration of the work and the number of operators who need to be present. The cutters at the head of the drill break the rock without causing abrasion, thereby limiting the formation of dust and hence its dispersion into the environment.

In some more complex sections (with material which could damage the drill or in the case of major water ingress) a shielded TBM is used, which strengthens the gallery ceiling with prefabricated concrete blocks at the same time that it carries out the excavation. This applies to the Saint-Martin-La-Porte gallery, where the Federica TBMI is currently at work.

In the other sections an open drill will be used and cladding will be applied to the gallery on completion of the excavation.

TRADITIONAL EXCAVATION WITH EXPLOSIVES

This is used in the more complex mountain sections. The technique entails boring holes in the rock wall which are filled with explosive and then detonated. Once freed of detritus, the rock face is strengthened with ribs and shotcrete. In some cases the dome may be reinforced with steel bars.

TRADITIONAL EXCAVATION WITH DEMOLITION HAMMER

Wherever the rock is less resistant and explosives cannot be used, the excavation is carried out with a demolition hammer, always consolidating the excavation with ribs and shotcrete.



SAINT-MARTIN-LA-PORTE (FR) Head of the Federica drill at work on the excavation of the 9 km geognostic gallery with the same axis and diameter of the future base tunnel of Mont Cenis



SAINT-MARTIN-LA-PORTE (FR) Technician at work onboard a borer used for the geognostic surveys

THE CROSS-BORDER SECTION

CHEMIN DE FER

The master plan for implementation of the cross-border section provides for over 22,000 activities, broken down in a WBS system – Work Breakdown Structure, in other words the list of all the activities of a project, articulated on 9 levels, for the commissioning of the base tunnel in 2030.

The Chemin de Fer illustrates the development of the works, detailing the progress of the works over time.

Three phases are planned:

• Concessions (engineering and preparatory works) to be completed by 2020

- Civil works by 2026
- Installations by 2029

The kick-off is provided by implementing four preliminary projects, three in French territory and one in Italian territory.

For the excavation of the Mont Cenis base tunnel, excavation solutions are planned, either mechanized with TBMs or using the traditional method, depending on the geological conditions of the individual sections.

A solution was developed which optimizes the works, exploiting the connection points in both directions, in order to guarantee compliance with the planning and to manage critical points.

The 160 km of galleries (115 for the base tunnel and 45 for connected and ancillary galleries) were subdivided into 6 operative sites, out of the 12 in total, which comprise the works in the open, management of spoils and railway structures.







Video of the works for construction of the artificial gallery





Video of the works for the banks on the Arc river

THE CROSS-BORDER SECTION



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A STUDY FOR THE SAFETY OF THE SITES IN THE SUSA VALLEY

The variant to the definitive project approved by the CIPE in March 2018 responds to a requirement issued by that Committee and it shifts the principal works area from Susa to Chiomonte. After a lengthy consultation procedure with the local bodies, the definitive project was finalized in 2013.

In response to the objections which followed the history of the project, in February 2015 the CIPE, with requirement No. 235, requested for the cross-border section of the Lyon-Turin line the study of an "alternative location of the sites, depending on the safety requirements for people and in accordance with the operative needs of the works". Hence the requirement for a Variant to the definitive project.

TELT entrusted the safety study to the Consorzio Nazionale Interuniversitario per i Trasporti e la Logistica (NITEL) [National Inter-university Consortium for Transport and Logistics], made up of 20 Italian universities with more than 500 researchers. Various options were studied, taking into consideration 40 parameters which measured the degree of 'sensitivity' (attractiveness and exposure) and 'impact'. The Variant eliminates any intervention in Val Clarea and drastically reduces the works in the Susa Valley.



Setting up the main works at Chiomonte, instead of Susa, ensures the safety of the workforce and the citizens. The site was already active for the Maddalena exploratory tunnel, which was completed in February 2017, and it is being extended by 4 hectares, reaching a total of 12. The site spans the municipalities of Chiomonte and Giaglione under the A32 motorway viaduct, in an area already used by SITAF during the construction of the motorway. Neither the vineyard areas, nor the nearby Neolithic necropolis of Maddalena are touched in any way.

A second winze parallel to the exploratory tunnel will be built here, having the same diameter as the base tunnel. During the works, this will be the access point of the drill which will begin the excavation in the direction of Susa, while during operation the winze will be used as a ventilation shaft.

This is also the new location of the safety site, initially planned 4 km further on (in France), which will be built at the intersection between the first Maddalena gallery and the base tunnel. Thus, the safety area will be 20 km away from the similar area of Modane, giving emergency services a greater speed of access in case of necessity.

The ventilation plant of the tunnel will also be built at Maddalena. It is designed as a semi-subterranean (partly buried) solution, with landscaped terracing with greenery, rows of vines, and apple trees in order to integrate it seamlessly with the territory. The plan is to use materials such as corten steel, wooden staves cladding, and local stone.

The new configuration was deemed by the competent authorities to be the most suitable for guaranteeing safety, keeping land consumption to a minimum, and limiting the inconvenience to residents.

The Piana di Susa

The new Chiomonte junction to the A32 motorway

The service roads will use a new dedicated motorway junction in order to avoid impacts on the roads of Chiomonte during the ten years of works. The junction will then remain available to emergency services, as an access road to the base tunnel, and to be used as a new link to the A32 for the local area. The project provides for the construction of a bidirectional viaduct of around 600 metres from the exit of the 'Giaglione' gallery, which will allow to reach the site directly. From there, the extracted material will be loaded onto lorries, which will reach Susa by motorway before reversing direction to travel to Salbertrand. There, from the service area, they will have direct access to the spoils exploitation site. It is estimated that around 260 lorries per day will be leaving the site for Salbertrand. The capacity of the A32 is 4,000 vehicles/day: at present it is used by 2,300 lorries/day and during the years of the works it is expected to see an annual increase of motorway traffic of up to 6.3%.

The new junction, built by Sitaf, requires 2 years of works and it will become operational at the same time as excavation of the tunnel begins. The variant reduces the environmental pressures on the Susa Valley, drastically reducing the works and installations. All that remains there are the sites for construction of the open air works: the International Station, the service area, and the junction with the historic line at Bussoleno. The duration of the presence of construction sites at Susa thus decreases by 36 months, from 9 to 6 years.

This result was obtained by distributing the activities between Chiomonte, with the main site of the project, and Salbertrand, where the spoils processing centre and ashlar factory will be built. The ventilation gallery in Val Clarea has also been eliminated – replaced by the second shaft at the Maddalena – as was the undeground cable duct portion which would have involved the territories of Susa and Mompantero. As a matter of cact, over 6 km of cable duct, out

of the approximately 8 planned between Venaus and Susa in the definitive project, were cancelled, because the pipes will be able to access the base tunnel directly.



MUNICIPALITIES AFFECTED BY THE NEW LINE

Municipalities physically concerned by new temporary or permanent works subject to the Environmental Impact Assessment / EIA of the site construction Variant and competent to issue new opinions: Chiomonte, Giaglione, Venaus, Salbertrand.

MUNICIPALITIES INVOLVED IN THE PROJECT

Municipalities involved according to CIPE resolution No. 19/2015, the requirements of which will be fulfilled by TELT in the executive planning phase, with the coordination of the Municipalities and administrations concerned: Avigliana, Bussoleno, Caprie, Chiusa San Michele, Condove, Mattie, Mompantero, San Didero, Susa, Torrazza Piemonte.



CHIOMONTE (IT) Operator at work near the Gea TBM



CHIOMONTE (IT) A technician marks the point where the geognostic tunnel has reached the border between Italy and France

The excavated material in salbertrand: 60% reutilized in the works

Only safe and inspected material will be transferred at Salbertrand. The processing installations for spoils, concrete, and the manufacture of ashlars, as well as the area for loading the technical material onto trains will be set up in decommissioned railway site spanning 14 hectares.

Once the works are finished, the Salbertrand area, which currently serves for storage, will therefore be returned to the Municipality, after appropriate ecological restoration operations which will include the planting of vegetation native to area.

The model is the one already tried out in France for the Saint-Martin-La-Porte site, where a former sawmill was converted into a factory employing up to 100 workers, 75% of which locals. The same applies to Italy: the activities will take place in enclosed environments to minimize the external impact, and the waste will be shifted by means of a covered and soundproofed conveyor belt.

The Chiomonte site aims to be self-sufficient, reusing in its works the rock extracted during excavations: over 60% of that rock will be transformed into concrete, to then be reused as tunnel lining and railway foundations.

The remainder, after proper environmental inspections, will be sent by rail to the sites identified by the CIPE at Caprie and Torrazza Piemonte.

At the peak of the works, it is envisaged that almost 1,000 tonnes of material will be transported daily to Caprie and Torrazza, where the material will not just be stored, but will also be used to fill in the pits, which will be later covered with earth. The landscape will then be restored with plants and bushes before returning it to the community.

Safeand inspected material

Strong environmental controls

The spoils transported out of the mountain are monitored carefully. Any green, potentially asbestoscontaining, rocks will be sealed directly in the galleries excavated during the works, without ever going in the open.

The strict controls of the excavation material carried out at the Chiomonte site have never detected the presence of contaminants and the new route minimizes the possibility of crossing green rock formations.

However, as a precautionary measure, the Variant provides for an ad hoc method for processing this material, in addition to further specific inspection measures to detect radon and uranium. Any asbestoscontaining rocks will be sealed in the gallery, without ever leaving the mountain. This is a procedure borrowed from old mining techniques and it was already tested successfully in the Cesana Torinese gallery. It avoids having to bring the material outside and it avoids land consumption, since it employs galleries that have already been excavated.

TELT's commitment for all of its sites can be summarized in the operative program "we protect the territory". It is a guideline that encompasses the environment taken as a natural habitat, as well as the system of historic and cultural values of the local community. The tools put in place are the territorialisation of the project, also by means of shared consultation in the Observatory, and a system of state-of-the-art environmental controls based on best practices already adopted during the excavation of the Chiomonte geognostic gallery, where 135 parameters related to various components were constantly monitored: subsoil, hydrogeological risk, surface and underground waters, air, vibrations, noise and electromagnetic fields. 5% of the budget of the Chiomonte tunnel, which, as planned, cost 173 million euros, was earmarked for environmental monitoring, an unprecedented investment among large-scale works on an international level.

The Ministry's Technical Commission for Environmental Impact Assessment praised the exploratory tunnel at Maddalena di Chiomonte, specifying that the project not only made it possible to confirm the knowledge framework of the rocky mass of Ambin, fundamental for building the base tunnel of Mont Cenis, but stated that in some cases "the real conditions proved better than anticipated", especially in terms of the geomechanical and hydrogeological aspects.

Environmental restoration interventions are planned in all the site areas, which promoted their reinsertion in the ecosystem once the works are concluded.

VIS - Valutazione di impatto sulla Salute / Health Impact Assessment

All the sites of the project will also be subject to Health Impact Assessments, conducted in the Maddalena area by the Occupational Medicine section of Università degli Studi di Torino. The HIA is a study which assesses the possible impact of a project on citizens' health. At Chiomonte, the 62,000 readings collected from 40 different stations prior to the start of the excavation and during the four years of works, detected no critical issues. The study drafted by the University revealed how environmental values were complied with at Chiomonte and there were no adverse effects on the health of the citizens who live nearby.

More informations on tuteliamoilterritorio.it

CHIOMONTE (IT) At the Lyon-Turin sites, water is considered an important resource: the tanks outside the gallery cool and purify the water before it is returned to the environment

SAINT-MARTIN-LA-PORTE (FR) The natterjack toad (epidalea calamita) is among the protected species living near the site. TELT has prepared a plan to encourage the survival and reproduction of this species in Val Maurienne

WATER A RESOURCE FOR THE VALLEY

Water is a precious resource stored within the Alpine arc. To preserve it, the project pays special attention to monitoring water sources: in Val di Susa, in the area comprised between the westernmost municipality, Exilles, and the easternmost, Chiusa San Michele, around 170 water points have been subjected to monitoring since 2009. The subterranean springs and surface waters (rivers, streams, etc.) are monitored, with the result that almost all the underground points present no likelihood of running dry, while only a minimum fraction have a low probability of doing so. TELT has however provided for other water points to be sought in the territory. Surface waters are not expected to see any major impacts.

The water recovered in the tunnel, vice-versa, constitutes a precious resource, which will allow to develop projects to employ it for drinking and energy purposes. The heat of the galleries is in fact an inexhaustible source of energy available to the territory, starting with remote heating, which has a potential estimated at between 2,000 kW and 10,000 kW. These solutions will be studied in detail once the real quantities and temperatures of the water are known.

More work in the Susa and Maurienne valleys

Tourism and the international stations

The sites constitute a business opportunity for companies in the Piedmont and Savoy areas. They will employ around 3,000 people directly and the same number will be employed in the supply chain. It was decided not to set up base camps: the workers will be accommodated in local facilities, creating a further development opportunity for the local economy. The aim is to encourage employment, as was already the case for the sites of the preparatory works, where over 50% of the manpower employed came from the area. It is estimated that 800 direct jobs can be generated in Italy, 400-450 of which on the main site of Chiomonte. The Italian and French Alps are some of the most frequented destinations by ski and mountain enthusiasts from all over Europe, who will be able to reach the ski resorts more easily thanks to the new line.

Indeed, a new international station will be built at Susa: a strategic node for accessing the Alps from the rest of Europe and from Turin Caselle airport, where winter sports charter flights already bring in more than 100,000 tourists a year. The project was drawn by Kengo Kuma & Associates, winners of a competition in which 170 architects from all over the world participated.

In France too, the Saint-Jean-de-Maurienne international station, will allow, thanks to its integration with local transport, to reach the ski slopes of Haute Maurienne and Briançon.

In addition to winter sports tourism, there is a growing interest in the project and its technologies by citizens and specialists, which has led to the inclusion of the Chiomonte site in the offers of domestic and international tour operators.

The commitment to transparency

TELT – Tunnel Euralpin Lyon-Turin - is the public promoter responsible for the implementation and management of the cross-border section of the Lyon-Turin line. Established by France and Italy in Paris on 23 February 2015, it has a shareholder structure that sees 50% of shares in the hand of the Italian State, through Ferrovie dello Stato italiane, and the other 50% in those of the French Ministry of Economy.

The company is chaired by Hubert du Mesnil and headed by Director-General Mario Virano.

TELT's structure includes an independent system to monitor the adequacy and efficiency of it activities, entrusted chiefly to two entities: Servizio Permanente di Controllo (SPC) [Permanent Monitoring Service] and Commissione dei Contratti (CDC) [Contracts Committee], both under French chairmanship and made up of 12 members, 6 of which are appointed by each government for a renewable period of 5 years.

The Permanent Monitoring Service ensures the proper use of public funds, the economic, financial and technical efficiency of the company, as in general, its smooth running. The Contracts Committee is tasked instead with overseeing all procedures linked to the awarding of above-threshold contracts, from the invitation to tender to the choice of the winner.

TELT is also a certified company. The public promoter has obtained 4 quality certifications for its own work: Health and Safety at work (OHSAS 18001), Environment (ISO 14001), Information Security (ISO 27001) and Quality (ISO 9001). The company chose to have its own business processes certified with international standards, with the goal of pursuing objectives of excellence in every field, from technical to environmental, to security, to compliance with laws .

The certifications were awarded by the international company Afnor, a group that is one of the world leaders in the certification sector: it is present in 40 countries with 11,000 clients and it has issued over 65,000 certificates in 100 nations.

A project with a certified costs

The fight against corruption: a priority

The cost of the cross-border section is 8.6 billion euros, certified by the international group Tractebel Engineering – Tuc Rail. The Lyon-Turin line is a rare example of infrastructure whose cost is certified by a third party.

40% of the cost is co-financed by the European Union. The remainder is divided between France and Italy (25% and 35% respectively).

Europe has financed the project since 1994 (founding of Alpetunnel), initially with annual allocations and subsequently with the 2007-2014 and 2015-2019 multi-annual plans. In total, around 1.5 billion euros were allocated for the studies and the preliminary works and a further 813 million euros for the works up to 2019 (Grant Agreement).

Italy contributes to the cross-border section with a share of around 2.9 billion euros (2012 value), 2.5 billion of which were already earmarked in the 2012 Financial Law.

The ratified agreement added the cross-border section of the Lyon-Turin line to the list of projects to be carried out in Italy with the legge dei lotti costruttivi [Law on Building Lots], just like the Brenner and the Third Crossing Point, both part of the European Union's TEN-T network. The base tunnel and the open air works in France have already been financed; the technological equipment and the open air activities in Italy have still to receive funding. The Lyon-Turin railway constitutes the first case in Europe of implementation of the anti-Mafia regulations, irrespective of the nationality of the sites. All the companies working on the project in Italy and France, including the subcontractors, are subject to inspections by law enforcement officers, coordinated by a bi-national structure headed by the Prefects of Turin and of the Auvergne Rhône-Alpes region. This procedure, which protects and guarantees the legality of the contracts awarded by TELT on both sides of the Alps, was agreed by the governments of Italy and France in the Additional Protocol signed at the Venice summit of 8 March 2016, later ratified by the two Parliaments, and it was set out in the Contracts Regulation drawn up within the Intergovernmental Commission. The structure became operational in April 2018. Companies which have all their papers in order are included in a transnational White List relating to the Lyon-Turin line, a kind of register of companies that are allowed to work in the sites. Registration is valid for 12 months, renewable subject to new audits.

The companies are also required to comply with TELT's Code of Ethics, which sets out the operational time horizon on matters to which the company is most sensitive: environmental protection, dignity of the individual, impartiality in corporate decisions. This charter seals TELT's November 2015 admittance to the UN Global Compact, which promotes a sustainable global economy.

GRAND CHANTIER

GRAND CHANTIER

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LA MAURIENNE LE CŒUR D'UN OUVRAGE EUROPÉEN ET MONDIAL

tunnel b tube de 57

8000 travailleurs

La Maurienne accueille l'un des plus grands chantiers actuels un furmel sous les Alpes qui facilitera la liaison entre Lyon et Turin par le rail. Cet ouvrage permettra un transport des mar chandises et des voyageurs plus sûr, plus rapple et plus écologique. Il est surtout au cœur du t réseau transeuropéen de transport relian. grandes capitales économigues de Lisbonne

Stéphane BOUILLON Préfet de la Région Auvergne Rhône-Alpes, Préfet de la zone de défense et de sécurité Sud-Est, Préfet du Rhône

MODANE (FR)

Signing the protocol of understanding for the bi-national anti-Mafia structure by the Prefect of the Auvergne Rhône Alpes region, Stéphane Bouillon, and the Prefect of Turin, Renato Saccone

LYON (FR) Entrance of the Palace of the Auvergne Rhône Alpes Region during the French stage of the TELT road show for companies

"TALKING CONSTRUCTION SITES AND OFFICES"

The offices and sites of the Lyon-Turin have been transformed into "talking places". Visiting the TELT headquarters in Turin's Officine Grandi Riparazioni complex equates to immersion in the project of the new line, from the geology of the base tunnel to its role in the European context, with a nod to history. The Council Room is home to a collection of original prints from the second half of the nineteenth century, published in the newspapers of the period to relate the feat of constructing the Fréjus railway tunnel. A collection that was at risk of being dispersed and which was acquired to be preserved and presented to the public.

In the offices of the Capital, housed in the Ferrovie dello Stato building, these concepts have been absorbed and placed in the context of ancient Rome.

TELT's Italian and French sites have become spaces for sharing information on the project, retelling, fully and transparently, its history, the objectives, the project in general and in detail, its technical characteristics and its peculiarities. This is a strategy which enables the public to imagine the future role played in their lives and in the territory by the project, which is increasingly conceived as a part of Europe projected towards the world. The Saint-Martin-la-Porte site in France is the first instance where TELT has put this new approach into practice, starting with the set-up: a pedestrian route with images and numbers which recount the development of the Lyon-Turin railway, the types of works, the territories and the environment.

At Chiomonte, more than 2,000 people have visited the site since 2014. For the most part they are staff, building sector professionals, geologists and students, but there also many citizens keen to learn about the project. Aware of the potential for industrial tourism and the prospects opened up by the building site variant, TELT is endeavouring to increase these visits.

The Promenade di Colombano, an open-air tour route with panoramic points and interactive exhibition spaces, will enable the public to discover the works area without interfering with the activities. There will be multifunctional areas for readings, meetings, artistic performances, laboratories, thematic exhibitions and educational tours. The Promenade will be a place of instruction at all levels, from children to university students, and it will house a centre of excellence in the environmental and landscape engineering fields.

TELT IN THE UNITED NATIONS GLOBAL COMPACT

In November 2015, TELT was admitted to the United Nations Global Compact, instituted in 1999.

The company was deemed suitable, together with 4,000 public organizations from over 160 countries worldwide, to represent the fundamental principles for creating a sustainable global economy through protection of the environment and the fight against criminality. A further commitment is to work while protecting the territory and tightening the net against Mafia infiltrations. This is a responsibility which must be maintained and demonstrated, with numbers and data, on penalty of exclusion from the Organization.

TELT is committed to integrating in its own management mechanism and in the implementation of the project itself, the ten principles that concern human rights, work, environment and the fight against corruption, shared with and derived from the Universal Declaration of Human Rights, the Declaration of the ILO – International Labour Organization -, the Declaration of Rio and the United Nations Convention against Corruption.

TELT will report every two years on the concrete actions undertaken to ensure its adhesion to the fundamental principles, through the Communication on Engagement (COE) of the Global Compact, and is committed to disseminating them among the French and Italian companies and institutions involved in the Lyon-Turin line.

On 9 September 2016, in order to define the operational horizon on the themes to which the company is most sensitive, TELT drew up its own Code of Ethics, which consolidates its adhesion to the Global Compact.

In November 2017, TELT delivered its first COE, to which the jury chaired by Laurence Monnoyer-Smith (photo below) awarded third place among nonprofit organizations for the Trophée des Meilleures Communications sur l'engagement.

CHIOMONTE (IT) The work of Simone Fugazzotto for the "Tunnel Art Work" project which saw three artists creating one work each within the La Maddalena site

SAINT-MARTIN-LA-PORTE (FR) Visitor tour itinerary in the external area of the site: the seven tunnels under the Alps

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