

HS/HC TREVIGLIO - BRESCIA

five extraordinary years



HS/HC
TREVIGLIO-
BRESCIA
five extraordinary years



THE MUSIC OF THE RAILWAY

Watching a railway line being built is like being at an orchestral concert, where perfectly tuned instruments and players are in complete harmony, contributing their notes and rhythm to the creation of a symphony: this is how the men and women of Cepav Due, Rete Ferroviaria Italiana (RFI) and Italferr (company in the FS Italiane Group) and other participating individuals combined their skills, all playing to the same complex and innovative music score, leading to an important infrastructural creation which will serve people for many years to come.

Franco Lombardi
President of Cepav Due



INTRODUCTION	6
Key words of the Treviglio - Brescia line.....	8
CEPAV DUE, CLEAR DETERMINATION	11
The people, the squad, the team that built it	22
THE CHAPTERS OF A STORY WITH A HAPPY ENDING	27
FASTER, CLOSER	
The numbers say it all.....	33
The route and the project.....	39
BRINGING TO FRUITION	
The site in a race against time.....	45
A mix of expertise and culture for the project.....	50
Tracks, technology and train trials.....	58
QUALITY, ENVIRONMENT AND SAFETY	63
Watchword: quality in every aspect of the works.....	64
Respecting the environment	66
The green heart of high speed	70
Workplace safety and management system OHSAS 18001.....	72
THE COMPLEXITY	77
The efforts of a commissioning body.....	78
In dialogue with authorities and the local area.....	82
The delicate issue of expropriation.....	84
Substituting a quarry was no joke.....	86
Archaeology and ordnance clearance, the secrets underground	88
Legal checks as antibodies	94
Theft and robbery: copper fever	96
NEW INFRASTRUCTURE IS A LEGACY FOR THE COUNTRY	99



INTRODUCTION

Closer to Europe; ahead of the times; more links in Italy; faster and better connections: the new High Speed/High Capacity (HS/HC) Treviglio - Brescia line is all this and so much more.

The first stone was laid on 7 May 2012 and work on the new railway line through the provinces of Milan, Bergamo and Brescia was completed on time, an extraordinary feat in itself given the building of infrastructure in Italy is so often adversely affected by delays, cost increases and local problems.

Moreover, this new railway infrastructure is a new part of the Trans-European Ten-T Mediterranean Corridor and another building block in the completion of the HS/HC Milan - Verona line.

The project, commissioned by Rete Ferroviaria Italiana (part of the FS Italiane Group), was completed by the Cepav Due Consortium, the General Contractor comprising a team of top Italian companies, with Saipem representing 52% of the Consortium, together with Pizzarotti which owns 24% and Società Italiana per Condotte d'Acqua and the ICM Group owning 12% each.

The completion of this new section of railway meant taking on a real challenge in terms of the engineering, building and organisation of this 52 km-long project with 7 viaducts, 9 tunnels and 7 overpasses, combined with

the complex challenge of working alongside the building of the new motorway through Lombardy, known as the BreBeMi.

Moreover, the project entailed the employment and management of over 5,000 people contributing in various ways to its completion, with over 12,000 working days in the busiest months and simultaneous progress along the entire 51.4 kilometres with excellent statistics regarding both the frequency and severity of accidents.

Yet the completion of the Treviglio - Brescia High Speed/High Capacity line was not just a success for all the people involved but it should rightly be seen as an example of how infrastructure can and should be built within established budgets and timescales.

Massimiliano Carbonaro

KEY WORDS OF THE TREVIGLIO - BRESCIA LINE

#cepavdue #treviglio-brescia #highspeed #highcapacity #passengers #goods #ertms/etcslevel2
#300km/h #highspeedrail #cipe #ontime #onbudget #rfi #eni #AICQ #OHSAS #copper #viaducts
#towns #tunnels #overpasses #embankments #lovernato2 #underpasses #route #cutting
#generalcontractor #oglio #serio #transeuropeancorridor#TEN-T3 #italferr #reteferroviariaitaliana
#ferroviedellostato #supplementaryact #corridor5 #saipem #impresapizzarotti #icmgroup
#societàitalianapercondottedacqua #environment #brebemi #consortium #interferences #HS/HCl ine
#objectivelaw #ethicalcode #cipeapproval #agreement #contracts #60%40% #pegasoingegneria
#extraroadsystems #tracks #technology #interconnection #railroadswitches #constructionlots
#engineering #team #technologicalbuildings #archeologicalsurveys #constructionsites #solutions
#antimafia #environmentalreclamation #noisebarriers #steel #concrete #metalstructures #sleepers
#quality #safety #approval81/2009 #GU03032010n51 #conventionaltrack #pioltellotrevigliojunction
#civilworks #westbresciainterconnection #primarytrack #contactline #lombardy #covoquarry
#environmentalmonitoring #powerline #unieniso14001/04 #unieniso9001/08 #arpa #ordnanceclearance
#trials #excavatedearthreuse #environmentalmedia #undergroundworks #schedules #durc #progress
#construction #caravaggioviaduct #lovernatotunnel #oglioviaduct #serioviaduct #sanmartinoviaduct
#trevigliorailwayoverpass #workplacesafety #accidentstatistics #5000workers#codeofethics



Cepav Due, clear **DETERMINATION**

Cepav Due is a consortium with a mission: it was set up on 19 July 1991 to act as General Contractor for the High Speed and High Capacity Milan - Verona line and, more specifically, to instigate the creation of the HS/HC Treviglio - Brescia section.

Cepav is an acronym which stands for Eni High Speed Consortium (in Italian: Consorzio Eni per l'Alta Velocità), but the consortium actually brings together some of Italy's most important companies in the field of infrastructure.

The Cepav Due consortium is comprised of Saipem Spa, based in San Donato Milanese in the province of Milan and representing 52%; Impresa Pizzarotti from Parma has 24%; Società Italiana per Condotte d'Acqua, with its headquarters in Rome has 12% and the ICM Group from Vicenza owns the remaining 12%.

The project was commissioned by Italian Railway Network, Rete Ferroviaria Italiana (RFI), whilst overall supervision was entrusted to Italferr, both companies being part of the Ferrovie dello Stato Italiane Group.

What is unique about the Cepav Due Consortium is that from the very beginning it was built on an organisation, management and control model which comprises a code of ethics capable of guiding the entire corporate structure both in its internal operations, mindful of the many people involved, as well in external relations, considering the numerous public sector stakeholders. This model also took into consideration the complex series of operations to be completed whilst maintaining, above all, high quality and safety standards on the construction sites thanks to ongoing monitoring and prevention.

In fact, it was clear from the very beginning that an industrial enterprise involving four partner companies, each with its own unique his-

tory and framework, needed a compass to guide and standardise the various collaborations.

“Bringing together a team of people,” comments **Franco Lombardi**, President of Cepav Due, *“comprising top professionals from different backgrounds and used to different working methods meant there were many unknown variables to deal with. It was necessary to successfully enable everyone to work together in the best possible way by maintaining a complex and collaborative organisation system over a long period, paying great attention to the issue of workplace safety. It was therefore necessary from the very beginning to set off on the right foot and take a far-sighted view, even of indirect aspects. Thanks to careful planning and rigorous procedures, we achieved great results in terms of workplace safety.”*

Thanks to the design and cinematic characteristics of the HS/HC line, passenger trains can reach top speeds of up to 300 km/h, whilst goods trains can travel at up to 120 km/h with existing wagons and up to 140-160 km/h with new freight wagons.

It is not just a question of speed, but in general terms this is a method of transport which relies on advanced traffic control technology, enabling the safe transit of an increased number of rail vehicles. In the specific case of the Treviglio - Brescia section, an excellent European Rail Traffic Management System/European Train Control System (ERTMS/ETCS) level 2 signalling system was adopted to manage, control and guarantee the safety of rail traffic.

Moreover, the creation of a high speed section enables medium and long distance traffic flows to be separated from regional traffic, thus achieving better flow of movement and even more punctual and regular services both on a local and wider scale.

“This group had to tackle numerous crucial issues,” explains **Lombardi**, *“in fact there was the issue of the public procurement system which requires that 60% of civil works are contracted by means of public tenders on a European scale in line with the procurement code. This is certainly not the ideal solution for a General Contractor which is responsible for the final deadline of launching the line, not to mention all the related bureaucratic aspects. We had to constantly interact with the various stakeholders, like for example those working on the BreBeMi motorway which runs alongside our route. There were many obstacles, but this was to be expected with such a complex operation. What should be noted is that in Italy it is not typical for a task of this kind to be completed within the dedicated timescale and budget.”*



“Bringing together a team of people comprising top professionals from different backgrounds and used to different working methods meant there were many unknown variables to deal with.”

There is something special in the DNA of Cepav Due as it successfully managed to bring out the best of each of its partners to create a consortium which genuinely mirrors the old saying: “the whole is greater than the sum of its parts”, starting with the contribution of Saipem, recognised as a world leader in services of drilling, engineering, procurement, construction and installation of pipelines and large-scale plants in the oil and gas sector, both on and off shore, with a strong focus on operations in challenging environments, remote areas and deep water. The company has over 40 thousand employees and operates in more than 60 countries worldwide. Moreover, it is a company with a long history: Saipem was founded in 1957 and is listed on the Milan Stock Exchange.

“Saipem completed the Treviglio - Brescia High Speed/High Capacity railway line through the formation of the Cepav Due Consortium,” explains **Pasquale La Zazzera**, Saipem’s Infrastructure Director, “mindful of bringing together the specific skills of various companies and creating efficient harmony between expertise, techniques and company cultures to form a pool of human resources and materials capable of tackling this complex challenge in the best possible way. In fact, a project like a High Speed train line needs a wide range of diverse fields of knowledge in design, management and construction, ranging from expropriation to administration, building site works, and the ability to relate to the local area.”

Dating back even further is Impresa Pizzarotti e C., a company founded in Parma in 1910. Over the course of more than a hundred years Pizzarotti has succeeded in becoming a leading player in the completion of civil constructions and industrial infrastructure and, more generally, in large-scale public works in Italy and, since the 1970s, also abroad. The company has always focused on the transport sector which is one of its key areas of interest, including railways, metros, airports, roads and ports.

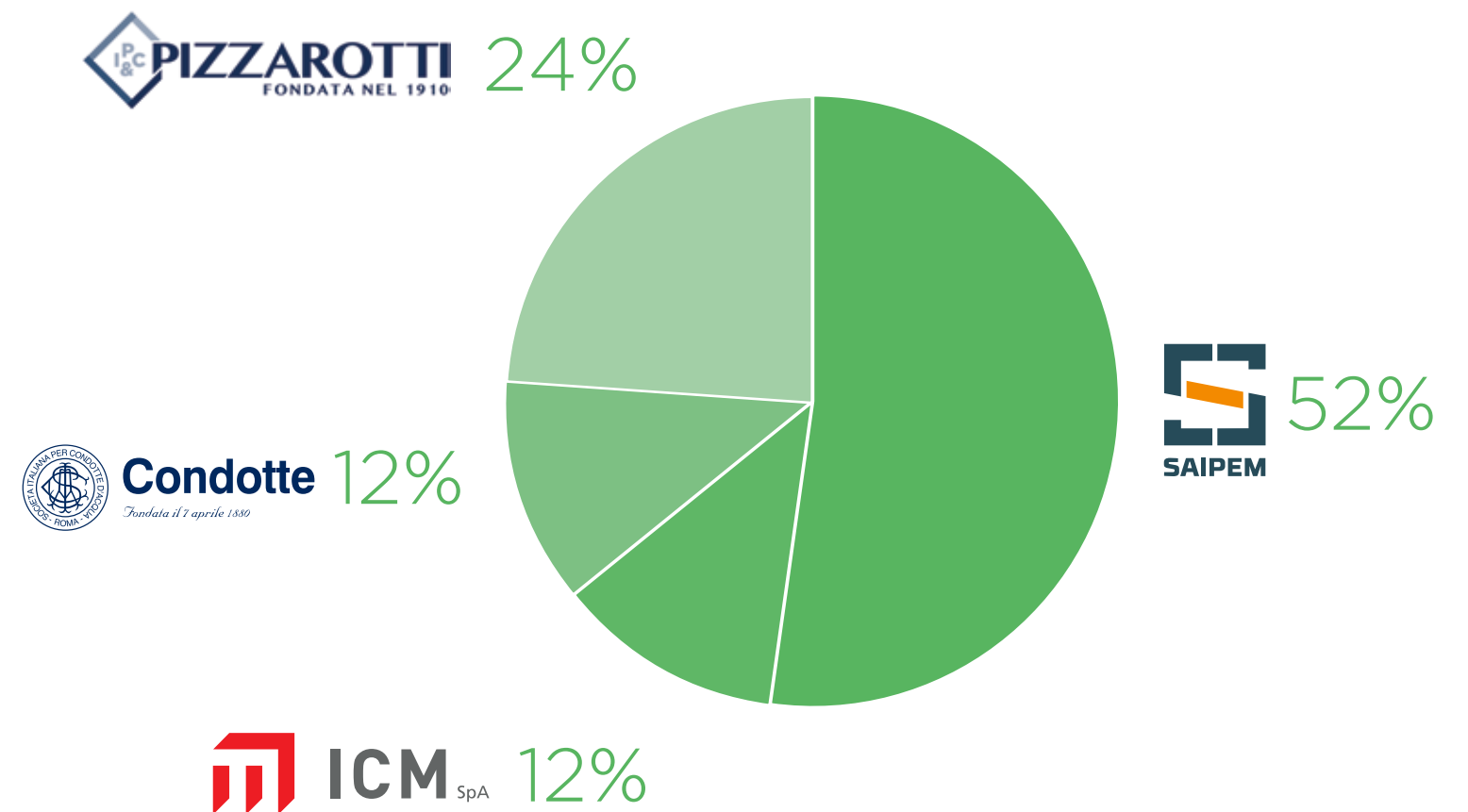
“After the experience gained over the past decade in launching a great infrastructure operation like the HS/HC Milan - Bologna line,” recalls **Michele Pizzarotti**, Vice President of Impresa Pizzarotti e C. SpA, “we came into this new challenge with enviable design, organisation and executive know-how under our belts, mainly based on the ability and dedication of valuable people: the real fulcrum of success which was expected but not taken for granted. With the completion of the HS/HC Treviglio - Brescia line, we believe we have given the best we could possibly give with great satisfaction for ourselves and future users of this important and vital infrastructure for our country. Furthermore we are certain that the experience gained in dealing with such a wide range of complex issues helped us and will continue to help us with creating new and similar infrastructure projects both in Italy and abroad.”

Società Italiana per Condotte d’Acqua is Italy’s oldest construction company, with its first enterprises dating back to 1880. In its first decades, the company designed and created hundreds of aqueducts before also focusing on the rebuilding of bridges and railway viaducts in 1944. Soon after, the company began to also operate in the sectors of construction, dams, tunnels and hydroelectric plants. In 1965 it completed the

Mont Blanc Tunnel and, in 1967, the Polcevera Viaduct in Genoa, Europe’s first concrete cable-stayed bridge. By the end of the sixties, the Condotte group covered all sectors of the building industry, before expanding into restorations and the maritime sector, for example with the Bandar Abbas port complex in Iran. After being

controlled by IRI for a long period, in 1997 it became a private company and is owned entirely by Ferfin. Railways, motorways, metros, dams, airports, civil works for thermal and nuclear power stations, residential buildings, offices, sports, industrial and hospital buildings, environmental and monument conservation: all this is

Structure of the Cepav Due Consortium





the Condotte Group today. A world-renowned company which is faithful to its history which dates back over 100 years.

In the words of **Duccio Astaldi**, President of Condotte, *“Whilst in the sixties it was the Autostrada del Sole which paved the way for the essential process of modernising and uniting the country, from the eighties onwards high speed railways have been completing this process. Proof of this is the completion of the HS/HC Treviglio - Brescia line, also thanks to the unique team spirit which was created. And so it was, and is still the case, that Italy is recognised around the world as a model of excellence in the construction of motorways and HS railways. The goal is to achieve the most efficient and fastest connections possible. But great projects should not be limited to this sector, despite its importance, as there are many diverse fields in which interventions are required. Given that it is not development that leads to infrastructure but the other way round, and that investing is important not only to sustain the economy in the short-run, but also to maintain a high level of competitiveness, it is vital that our country is more aware of its talent and moves quickly.”*

Impresa di Costruzioni Giuseppe Maltauro, now known as ICM SpA, is the operational holding company of the ICM Group which brings together industrial companies operating in the building sector. Founded in 1921 in Recoaro Terme in the province of Vicenza, the company relocated to Vicenza in the fifties, increasing its turnover and, over time, building up extensive experience in the public and private building sector by working on large residential, office and commercial complexes as well as on infrastructure works including roads, railways, airports, tunnels, special foundations, plumbing works, aqueducts and sewerage systems, dams and maritime works, reinforced concrete and metal structure viaducts. In the seventies the company expanded abroad, purchasing significant works in Libya and extending the scope of its operations to Central Africa, the Middle East and Eastern Europe, markets where it still operates today.

“Infrastructure works in Italy are different from those abroad in that they are more complex as a result of the high concentration of human activity and presence. I think that increasingly,” states **Sergio Da Ros**, Italian Manager for ICM, *“rather than new works in our country, we will be looking at expansions, adaptations and major maintenance works on existing infrastructure. In this sense, the creation of the High Speed line is almost a unique case: it is comparable to large-scale infrastructure works abroad and represents a demanding test for*

construction companies, both because of the high standard of execution required by RFI and the tender contracts and its scale in the local area and in Italy, where 2% of public spending is invested in works of this kind."

It was necessary to bring together the various individuals of the Consortium, and to find a way to draw on their inspirations, even with informal moments such as dinners on the construction site or other convivial moments. Yet the fundamental aspect was each person's willingness to work together to reach a shared goal, successfully living side-by-side for five years. "Perhaps the most interesting and challenging aspect of Cepav Due," suggests **Stefano Sangalli**, assistant to the Director of the Cepav Due Consortium, "was the diverse backgrounds, even cultures I'd say, of the people who were involved. For example, the Consortium is like the UN, with individuals from different worlds, as each of our business partners sees the project from their own personal and practical point of view. All the various fields of expertise and approaches had to be brought together to successfully form a team and overcome any conflicts which would otherwise have hindered the final result."

In fact, there are so many variables which can affect an operation of this scale, even just the unpredictable nature of the weather. In this case the weather conditions were favourable, as the winters of 2015 and 2016 were particularly mild; it didn't snow and it was possible to manage the construction site carefully, something which certainly helped.

Corrado Bianchi, Director of Engineering and Construction for Cepav Due, recognises how the real crucial issues are connected to the early stages of the project: "It was necessary to form a team, we had to get to know each other, plan and get the work underway, as well as establish a series of necessary criteria to reach our objective. But this familiarisation stage cannot last forever, it has to be a brief process. So we had to work quickly in order to be able to manage the execution of the works and the public tender bids with all the resulting management complexities. But all this is history as in the end we managed to cross the finish line in an extraordinary way."

The entire project was commissioned by the Rete Ferroviaria Italiana (RFI), a company which is part of the Italian State Railway Group, Ferrovie dello Stato Itali-

ane. RFI is responsible for safely managing railway traffic; keeping the national railway infrastructure operating efficiently, guaranteeing that standards of safety, reliability and quality are always kept at maximum levels; planning and carrying out investments to improve existing infrastructure and its technological facilities, as well as planning and building new lines and rail systems, sometimes through subsidiary companies and in line with the five-year plan laid out with the government in the "Planning Agreement - Investment section". The HS/HC Treviglio - Brescia line is the tangible result.

It is known that the Italian High Speed/High Capacity system has already changed the way millions of Italians get around, for work, study, tourism or leisure, bringing large cities closer together in terms of journey times. "The High Speed line has also promoted an increase in integrated and sustainable mobility," comments **Maurizio Gentile**, Chief Executive Officer and General Director of Rete Ferroviaria Italiana, "and thanks to the completion of the Milan - Venice HS/HC line, 75% of the Italian population will be served by fast trains. The High Speed line has responded to, and will continue to meet, the needs of all citizens for fast journeys, including me-

THE KEY PLAYERS

Authorised with the Planning Agreement to arrange the development of the HS/HC lines



THE COMMISSIONER



OVERALL SUPERVISION

Carries out overall supervision of the work of the Consortium



WORKS MANAGEMENT

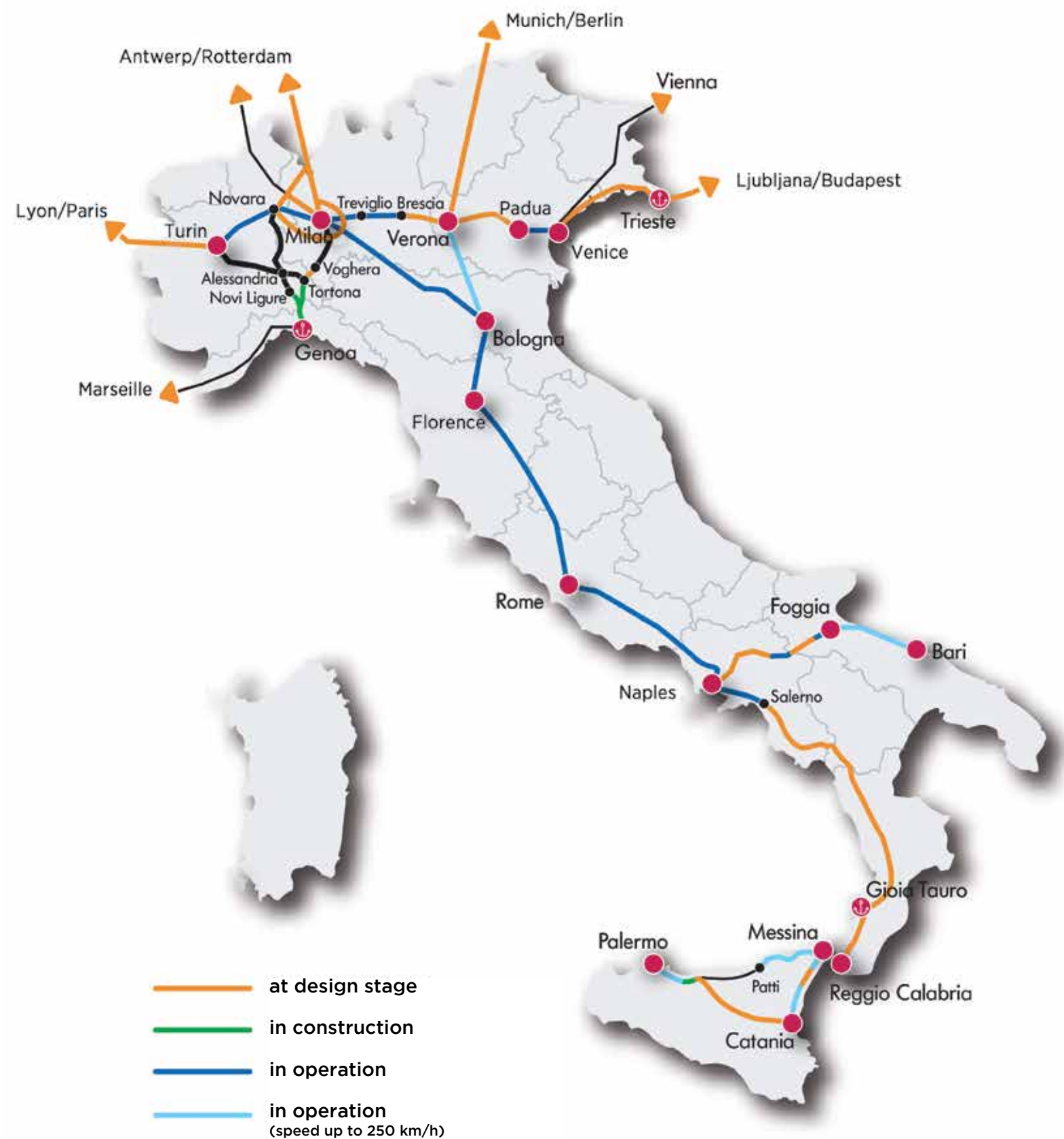
Ensures that works are carried out perfectly and conform to contractual documents

Designs and builds the railway section to top standards and in line with regulations and contractual documents.



THE GENERAL CONTRACTOR





dium and long distance commuters. Furthermore, positive outcomes can be found in other sectors thanks to the increase in trade transactions and tourism, especially foreign tourists, together with a reassessment of the housing market and a sharp reduction in road accidents and pollutant emissions."

Overall supervision was entrusted to Italferr, also part of the Ferrovie dello Stato Italiane Group, who took on the strategic role of Project Management Consultancy.

Another fact to consider is that the building of the Treviglio - Brescia High Speed/High Capacity line was a sort of unique case as it was the first time a project of this kind was carried out alongside another important infrastructure project, namely the BreBeMi, the motorway which connects Milan and Brescia. *"Therefore, Italferr, the engineering company of the FS Italiane Group,"* explains **Carlo Carganico**, Chief Executive Officer for Italferr, *"coordinated the planning of the motorway and railway works, making full use of the technical expertise gained and eliminating the difficulties which arise from the complex situation of building two important*

yet challenging projects at the same time. The two infrastructure projects were planned and then carried out in the same infrastructural corridor, in close proximity of each other, a unique case in the planning and completion of motorways and HS/HC lines to date in Italy."

Moreover, for Italferr, in its role of overall supervisor of the new railway line, it was fundamental to supervise the executive design and construction of the works, for the first time incorporating an integrated system for quality, the environment and safety.

The final important building block in the completion of the Treviglio - Brescia HS/HC line was the Pegaso Ingegneria company, which, with its extensive experience in the completion of other large-scale infrastructure projects like the Milan - Bologna High Speed/High Capacity line, Milan's metropolitan lines and the BreBeMi motorway, was in charge of management of the works and safety coordination in the execution phase of the works.

THE PEOPLE, the squad

THE TEAM THAT BUILT IT

Looking along the series of tracks which follow on from each other between Treviglio and Brescia, extending into the countryside of Lombardy, while trains run along the established route, it's easy to forget that this impressive creation was just a building site and that thousands of people toiled to achieve this result. Yet the building of this infrastructure demanded all their hard work and dedication - hard work and dedication which must not be forgotten. Because for every one of them, the Treviglio - Brescia HS/HC line represented something personal.

A combination of emotions, experiences, and stories, which some of its characters remember:



“It was like contributing to the completion of a giant puzzle where each person...

Learning and managing a new job independently was a great challenge for me personally. My best memory is of the colleagues who enabled a tranquil working environment to be created, as well as the thought that I have contributed to such a large-scale and long-lasting project.

Marcella Abeni

I will always remember the constructive feedback from colleagues from the Consortium, both on a professional and personal level and all the other professionals I met on this journey: from designers to management, from clients to suppliers, from unions to organisations in general.

Francesco Impellizzeri

The best memory I will take from this great adventure is the people I worked closely with and with whom I formed a relationship of esteem, respect and gratitude - these are things that stay with you in life.

Silvia Casnigo

Integrating and interacting with a group of people with different experiences and from different business culture backgrounds has enriched all of us. The result of this is the launch of the railway line which we all worked on for 5 years.

Michele Fazzari



...brought their own piece, however big or small, some more visible than others, but all absolutely essential.”



I was catapulted from university into the world of work and into one of the most important projects in Italy, and I found myself faced with the world of Quality Control: a harsh yet fundamental environment for monitoring work and ensuring it is done well. The biggest challenge was joining a team which was already in action, and reasoning in terms of “quality”, dealing with acronyms and normative references. Having contributed to the completion of such a large scale project, designed to last for years and years, is, and will always be, a reason to be proud.

Manuele Vezzoli

What we should all be proud of is that we have successfully completed the job without any serious injuries thanks to the commitment and professionalism of everyone: from management who didn't impede the use of human resources and material means to better manage workplace safety to the local authorities who guaranteed prompt medical support in the event of an emergency.

Luigi Carlo Pugliano

Behind a great project there are men, women and intense moments. What will stay with me is the proud feeling of having played a part and contributed to the development of our wonderful country.

Claudia Carè

This project was a challenge for me as an accountant, given the importance of the works, with the numerous design and construction contracts which were constantly evolving, the new working environment and the many suppliers I had to deal with in terms of the progress status of operations. I will always have positive memories of working together, the collaboration, trust and often friendship with colleagues and superiors.

Alessandro Martinelli

After 40 years of experience, problems are solved more quickly but the adrenaline never ceases.

Giorgio Tortini

Being part of a big project like this one and learning about the mechanisms of the world of large-scale constructions for me, as a young graduate, was a real challenge which had its difficulties but which also gave great personal and professional satisfaction which will always stay with me.

Federico Pedretti

Just the thought of having participated and contributed in an active way to the achievement of a strategic objective for our country fills

me with pride. The ability and willingness to manage complex situations, sometimes with contrasting and varying points of view, was probably the biggest challenge I had to face. I don't have a “favourite memory” which will stay with me at the end of this journey, because the very idea of having contributed to this project, helped by exceptional, collaborative people, is in itself the best memory I could imagine and this is what will stay with me forever after this experience.

Salvatore Mallia

It was all a challenge for me, coming from 30 years on civil and commercial construction sites, I offered my experience and in exchange I had the opportunity to learn new skills and understand what it means to build a large-scale project. I am pleased to have contributed alongside all my colleagues who I would like to thank and who have always provided great collaboration. You are all the best memory, everyone who has run, sweat and worked hard with me to complete this.

Marcello Moranda

One hundred years from now I hope that this project will be able to talk and say to my grandchildren's grandchildren: “Did you know that one of your ancestors worked on this section of HS railway!”

Domenico Altamura

My professional journey on the High Speed line began in 2002 and represents a very important cross-section of working life. During this period I have experienced the various stages of work, with its “stops” and “starts”, revisions and hopes. Then, finally, its completion: the embankments, the tracks, the superstructure and the train trials! This experience took me onto the building site for the first time, sharing in the knowledge and kindness of the many colleagues who followed on from each other. I am proud and grateful for having been part of this.

Laura Naspardi

Collaborating and interacting with colleagues and suppliers, each with their own personality, their own character, their own way of thinking and acting - the result of their diverse personal and working experiences - was both complex and stimulating. My favourite memory is of the first person I worked with, the engineer Marco Lucchini, who from the very beginning transmitted to me the necessary dedication and commitment for completing a task as important as this one.

Alessandro Grippa

...I will always remember the people...

Luca Floretti

The work of coordination aimed at designing the civil works for the technology systems required considerable commitment and meant overcoming numerous difficulties. I will always remember this experience with great joy thanks to the professional and personal development and for the opportunity to contribute, through daily hard work and effort, to the completion of such an important and significant enterprise.

Florenzo Grifi

The creation of infrastructure is something which is destined to change the horizon for the future. The Treviglio - Brescia railway project has shown how knowledge, determination, and the mediation skills of a group of people has enabled such an important objective to be achieved, for the benefit of everyone.

Pierpaolo Venzano

Even though we were a group of people from different backgrounds, over time we joined together to work towards achieving a shared goal: bringing the high speed line to Brescia.

Massimiliano Ferri

I have been lucky enough that the beginning of my career coincided with the launch of this great project. I was born in the countryside of Brescia and my favourite memory is having grown up there and experienced its modern transformation first hand.

Davide Pitozzi

Before starting construction there is a long, necessary preparatory stage: for example acquisition of the areas, managing and establishing the rights, needs and issues of the numerous landowners, private individuals or local authorities, without losing sight of the time scales for building. It was a pleasure for me to contribute to minimising the disputes we had to deal with in the local areas, whilst at the same time respecting the work schedule.

Gianluca Cimolato

The biggest challenge for me was working with so many people. My favourite memory is coming home feeling satisfied about the work carried out.

Filippo Lazzaroni

The biggest challenge I had to face was actively collaborating with a team of very experienced professionals who helped me grow as a professional and as an individual, following the enterprise throughout all of its stages. My best memory of this experience is the long days and nights spent on site together with colleagues and the many companies, following the progress of the project day after day.

Guglielmo Franzé

The most stimulating aspect of this project and this experience is the fact that it has given me the opportunity to work in a multifaceted environment, so different from the theoretical approach at university.

Paola Pollini

It was like contributing to the completion of a giant puzzle where each person brought their own piece, however big or small, some more visible than others, but all absolutely essential.

Stefania Scaramuzzi

It's a hard task to sum up in a few words the experience of a project of this scale and extent of engineering and construction. But something I would like to stress from a personal point of view: it all began with a mixed group of people with diverse experiences, backgrounds and cultures which over time became a team worthy, also in light of its achievements, of the title "General Contractor".

Italo Chiara

Having had experience with the Rome - Naples and Milan - Bologna High Speed lines, I think the Treviglio - Brescia project has been unique, partly because the method of surveying work progress was detailed and meticulous, leading us to work with extreme precision.

Alrazem Majed

Working in the legal department for the High Speed line was, in itself, the biggest challenge faced in years of experience with Cepav Due. The ongoing dealings with various high level institutions and individuals, as well as the complex issues dealt with, all enabled me to develop both professionally and personally. I will always remember it as a unique, one-of-a-kind experience because of the completion of a large-scale public enterprise, and the context of competent and passionate individuals brought together for the project.

Adriano Peloso



A challenging and important enterprise in which I hope to have made a modest contribution.

Gaetano Ciani

In my imagination I began travelling on this train in 1992, but now we've done it. Imagination has become reality, in spite of thousands of setbacks and difficulties.

Lorenzo Gresele

Travelling, meeting new people and the completion of a great project.

Roberto Basili

Our objective: to anticipate problems and solve them in order to launch the HS/HC line on time.

Michele Valentino

It is strange to think that where there was nothing before, there is now a railway, in places passing along the top of a 15-metre embankment.

Marco Laffranchi

I am proud of having contributed to the completion of this project in my homeland, for my country.

Alessandro Baga

It's a great feeling to see the completion of this project after these long years.

Giuseppe Bruno

EUROPEAN CORRIDORS IN ITALY

- BALTIC-ADRIATIC
- MEDITERRANEAN
- SCANDINAVIAN-MEDITERRANEAN
- RHINE-ALPINE



The chapters of a story **WITH A HAPPY ENDING**

The story of the Treviglio - Brescia High Speed/High Capacity line began a long time ago when, in October 1991, the Cepav Due Consortium signed the agreement for the design and completion of the Milan - Verona HS/HC railway line with TAV, the FS Italiane Group company which was set up for the creation of High Speed lines in Italy and which was absorbed directly into Rete Ferroviaria Italiana in 2010.

Overall, it was an ambitious project and an integral part of the Milan - Verona HS/HC line, which forms part of the interventions for the first Programme of strategic infrastructure envisaged by the so-called "Legge Obiettivo" (Law 443/2001). The Milan - Verona HS/HC line extends over 142 km, crossing 31 municipalities in Lombardy and 4 in Veneto. Furthermore, it is part of an overall vision of railway connections called the Mediterranean Corridor which connects some of the most important cities in northern Italy from west to east, from Turin to Trieste, passing through Milan, Brescia, Verona and Venice. This vital architecture is part of the trans-European transport network where people and goods can travel easily and quickly.

It wasn't until 2001 that substantial steps were taken towards its completion: in resolution number 121 of 21 December 2001, CIPE (Interministerial Committee for Economic Programming) included the Milan - Verona line in its Infrastructure Programme in accordance with Law 443/2001 before approving the preliminary project for the whole railway section in 2003 (resolution 120).

Only in 2007 with the CIPE resolution no. 13 of 5 April was the importance of creating the entire infrastructure in functional sections confirmed and it became clear that the Treviglio - Brescia HS/HC line took priority as the first section of the interventions along the entire corridor. Thus the Treviglio - Brescia line became an important element within a wider context, adding to the completed 27km HS/HC section between Milan and Treviglio in operation since 2007, and joining the railway hub in Brescia via the West Brescia interconnection and the urban crossing section which leads right to the station.

Following the CIPE resolution, on behalf of the Ministry of Infrastructure and Transport, Ferrovie dello Stato, in particular RFI, put together the final project for the Treviglio - Brescia HS/HC section. On 19 March 2008 an important turning point was reached with the conclusion of the Services Conference on the final plan for the Treviglio - Brescia HS/HC line; this was followed by CIPE resolution no. 81 on 22 September 2009 which approved the final project (registered at the Court of Auditors on 18 February 2010 and published in the Official Gazette on 3 March 2010) and established the budget for its completion.

The final project having been approved, the new line regained momentum and force, even though with the relative supplementary act, the general contractor had to follow the international public tender procedure for 60% of the civil works and track construction.

This presented a difficulty of course, because it entailed the General Contractor also taking on the role of commissioning body, but the Treviglio - Brescia line was going ahead and this was the main thing.

On 18 November 2010 CIPE, in resolution no. 85, authorised the start of works on the Treviglio - Brescia section by means of construction lots, with this resolution being registered at the Court of Auditors on 14 April 2011 and published in the Official Gazette on 26 April 2011.

At this point the approval procedure had practically reached its conclusion; all that remained was the signing of the supplementary act with the General Contractor to acknowledge all of these stages, and this was completed on 19 April 2011 between RFI and Cepav Due. The supplementary act came into effect the following month.

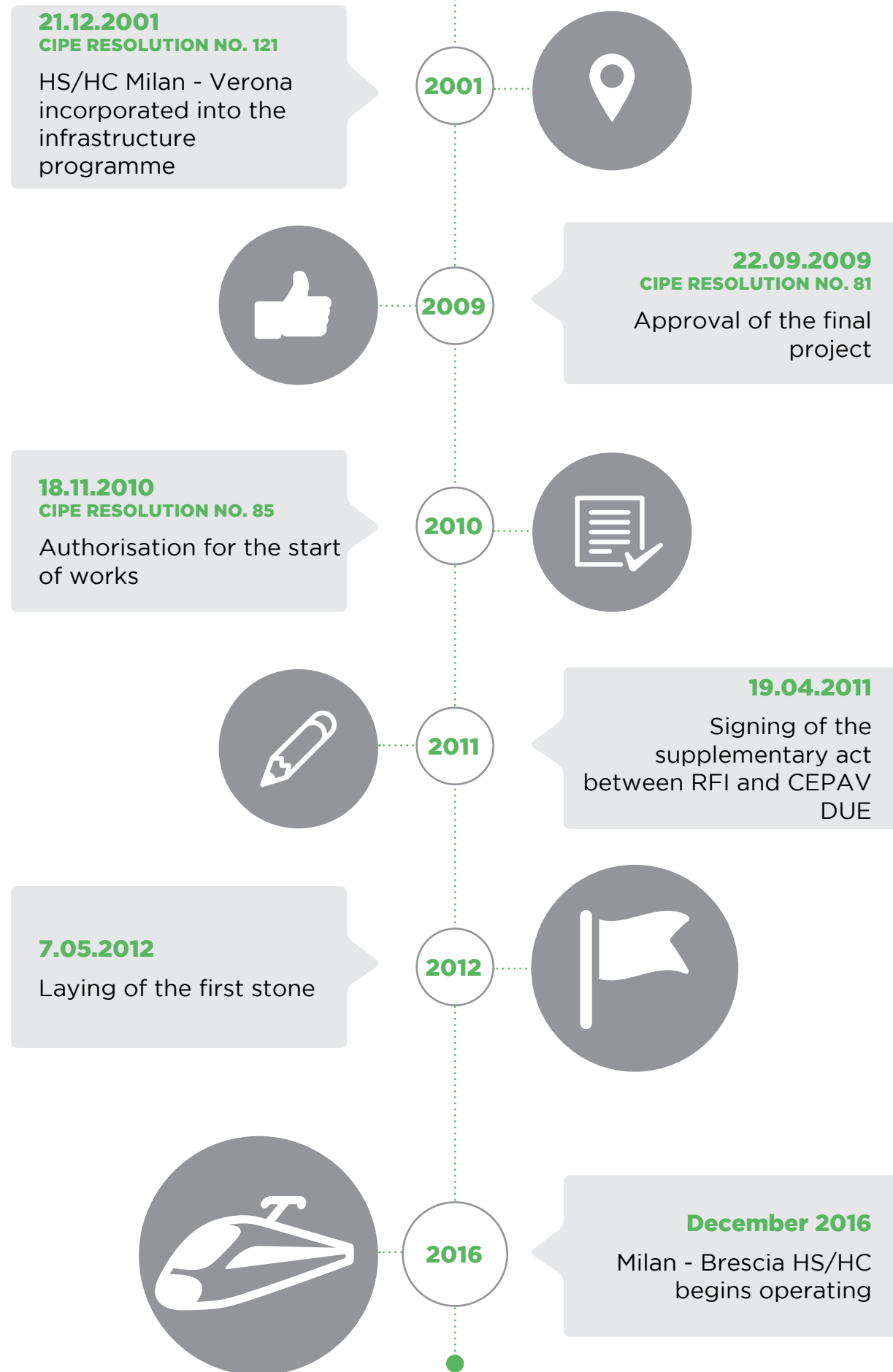
*"There were structured negotiations concerning the conditions which made up the final supplementary act," recalls **Roberto Uberti**, President of Cepav Due until 2015. "In practice it was a process which took months of work as all of the clauses of the 1991 agreement had to be updated to reflect the schedule for completing the job. Between the commissioner and the Overall Supervisor a relationship of respect and trust was formed because we all wanted to reach a shared synthesis. What inspired us and continues to drive us on is the awareness that the High Speed railway is without doubt changing the way of living and travelling in Italy and that we are contributing to this change."*

On 6 December 2011 with another resolution, no. 85 (registered at the Court of Auditors on 20 March 2012 and published in the Official Gazette no. 79 on 3 March 2012), CIPE allocated the funds to complete the financial framework of the enterprise.

And so, on 7 May 2012 the operation was given the official green light and the construction site was opened in the presence of the then Minister of Economic Development, Infrastructure and Transport, Corrado Passera; the President of the Region of Lombardy, Roberto Formigoni, and the Chief Executive Officer of the Ferrovie dello Stato Group, Mauro Moretti.



➤ *"I think the high speed line is a vital step for the progress of transport in Italy," explains **Franco Lombardi**, President of Cepav Due, "Our consortium is proud to be one of the players contributing to building a better country, starting with its foundations: infrastructure. Let's not forget the global and political importance of this project which unites Italy with Europe, knowing that in the past it was trains which brought nations, people and cultures closer together."*



➤ One can argue about whether a project originally planned in 1991 is still suitable today, if it's still relevant and necessary. The answer given by **Corrado Bianchi**, Director of Engineering and Construction for Cepav Due, offers no shadow of doubt: *"We are providing Italy with infrastructure which was planned more than twenty years ago and completed in just 5 years; it is a shame it took so long to get authorisation to start work. Nowadays, the only valid alternative to cars for quick connections between cities with precise timing is trains. The truth is that the High Speed/High Capacity railway system is necessary, relevant and essential for the modernisation of our country. The only regret we can have is that it wasn't authorised sooner"*.



FASTER, CLOSER THE **NUMBERS** say it all

It is one of the building blocks of the Mediterranean Corridor which will connect Western Europe with Central and Eastern Europe passing through the Iberian Peninsula, France, Northern Italy, Slovenia, Croatia, through Hungary and towards the Ukrainian border. Within the scope of works carried out by Cepav Due, the High Speed/High Capacity Treviglio - Brescia line is part of the more extensive HS/HC Milan - Verona line and, first and foremost, will improve connections between Milan and Brescia, shortening journey times by more than 30%.

The line was conceived, designed and created for two means of application: as a High Speed line to allow passenger trains to travel at 300km/h, the current maximum commercial speed in Italy, and as a High Capacity line to allow, by means of advanced traffic control technology, for a higher frequency of passengers compared to a conventional line managed in terms of "sections" or "blocks".

In terms of rail management, these two combined characteristics improve punctuality, safety and flexibility in the event of unusual situations, for example where there are convoys, passenger trains and goods trains travelling at different speeds at the same time.

These new railway tracks, as well as providing for the movement of an increased number of trains, result in a significant reduction of movement on the conventional line, improving levels of regularity and punctuality of regional, medium and long distance traffic and the transporting of goods.



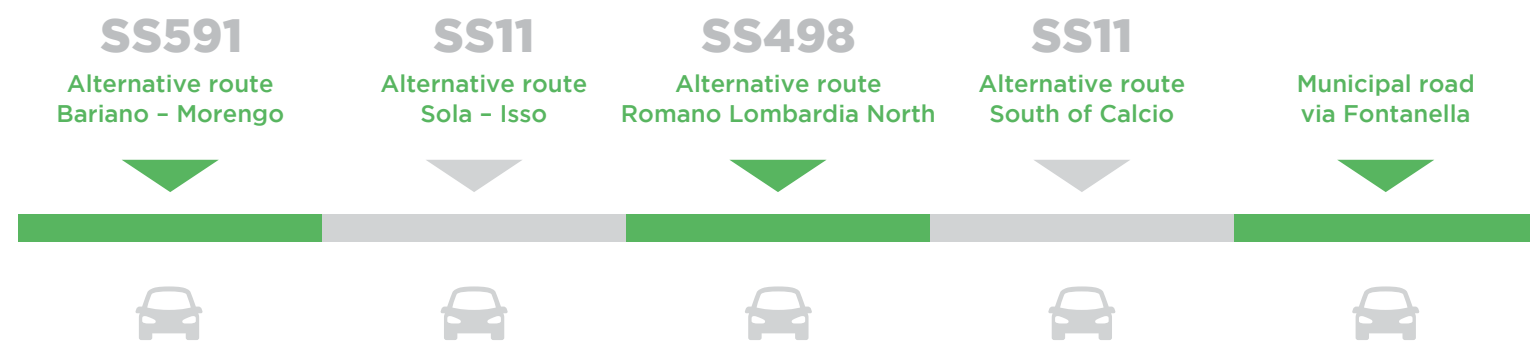
Work on the Treviglio - Brescia functional lot includes the HS/HC section built by the Cepav Due Consortium over a distance of 51.4 km, as well as the works completed directly by Rete Ferroviaria Italiana, by means of tenders, to incorporate the new line into the Brescia hub over a section of 6.9 km to reach Brescia Central Station. The data provided refers to the work carried out by the Cepav Due Consortium.

The HS/HC Treviglio - Brescia section and the relative power lines which accompany and power the line, extend through three provinces in Lombardy: Milan, although only to a small extent, Bergamo and Brescia, covering an overall distance of 51.4 km of rail track (39.6 km of HS/HC line and 11.8 km of interconnection at West Brescia).

The infrastructure built by Cepav Due, mainly on embankments, runs alongside the BreBeMi motorway for 43 km and incorporates 7 viaducts for a total distance of 3.2 km, with the main viaducts crossing the rivers Serio and Oglio; 9 tunnels, including both motorway and railway tunnels, for a total distance of almost 1 km; and the positioning of 8.7 km of noise barriers.

In addition to the railway site where sleepers and tracks were laid, the Treviglio - Brescia project also dealt with seaming together the local area, with 7 overpasses and 34 railway underpasses, as well as various waterway connections and wildlife passages. Furthermore, five new road systems were built, covering an overall distance of 17.5 km, and a new car park serving the Fara Olivana cemetery.

The 5 new ROAD SYSTEMS



The construction of the line required the use of 87 thousand tons of steel, 700,000 cubic metres of concrete and 8,500 tons of metalwork.

Careful clearing of war ordnance was carried out, entailing an area of almost 4 million square metres to be examined, with the discovery of three bombs dating back to the Second World War. In carrying out the works, Cepav Due managed to reuse a large part of the rock and stone from excavations for a total of 3.3 million cubic metres.

"For the creation of the Treviglio - Brescia line," recalls **Roberto Liani**, Engineering Manager of Cepav Due, "in addition to project management, considerable efforts

were required to coordinate the Cepav Due project team with numerous external professionals and the BBM Consortium working on the BreBeMi motorway infrastructure project."

Up to 500 contractors participated with a workforce of more than 5,000 on site; there were peaks in March, July and October 2015, with over 12,000 working days involving simultaneous activity along the 52 km section.

"Initially there were around 50 people a day working on site," recalls **Michele Angrisani**, Human Resources Manager for Cepav Due, "then once works were in full operation we had on average between 150 and 300 people each day. The flows of workers varied but during

key months we had peaks of more than 800 people a day on site, often doing night shifts and weekends so that we could respect the schedules for completing works.

There were times during the busy work periods when, remarkably, up to 3,000 cubic metres of cement were used each day.

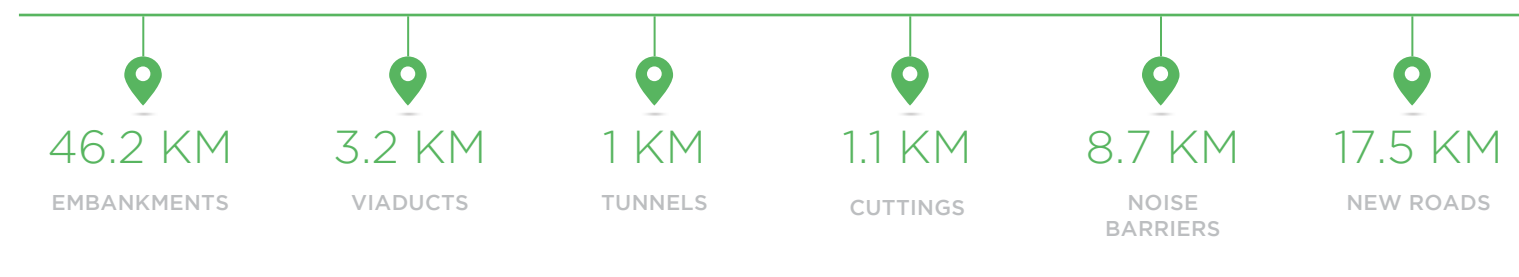
Overall it took immense organisational efforts to stick to the deadlines, with a strong reliance on prefabrication and speeding up works on site and the management of the railway tracks.

"There are three key points in this project," underlines **Giancarlo Giotto**, Director of Works for Pegaso

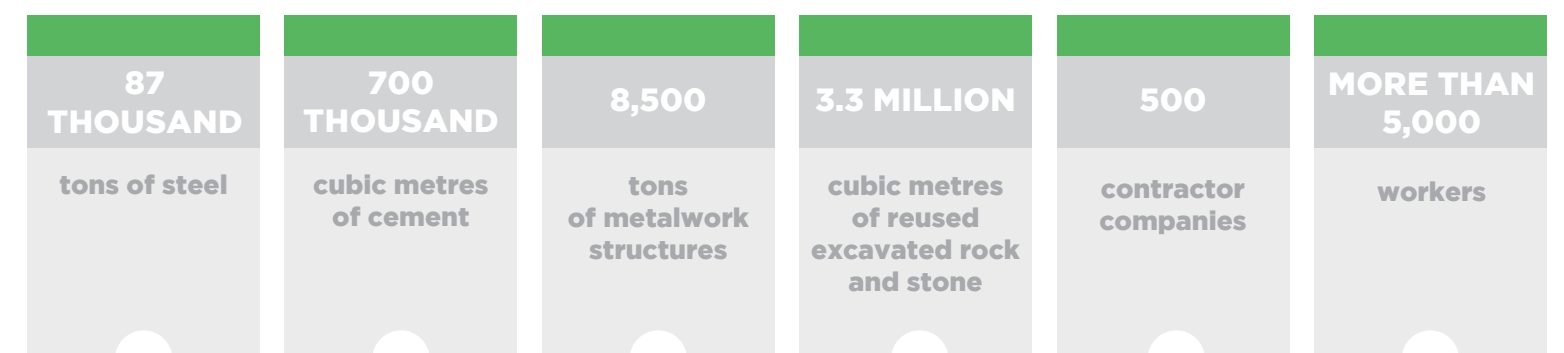
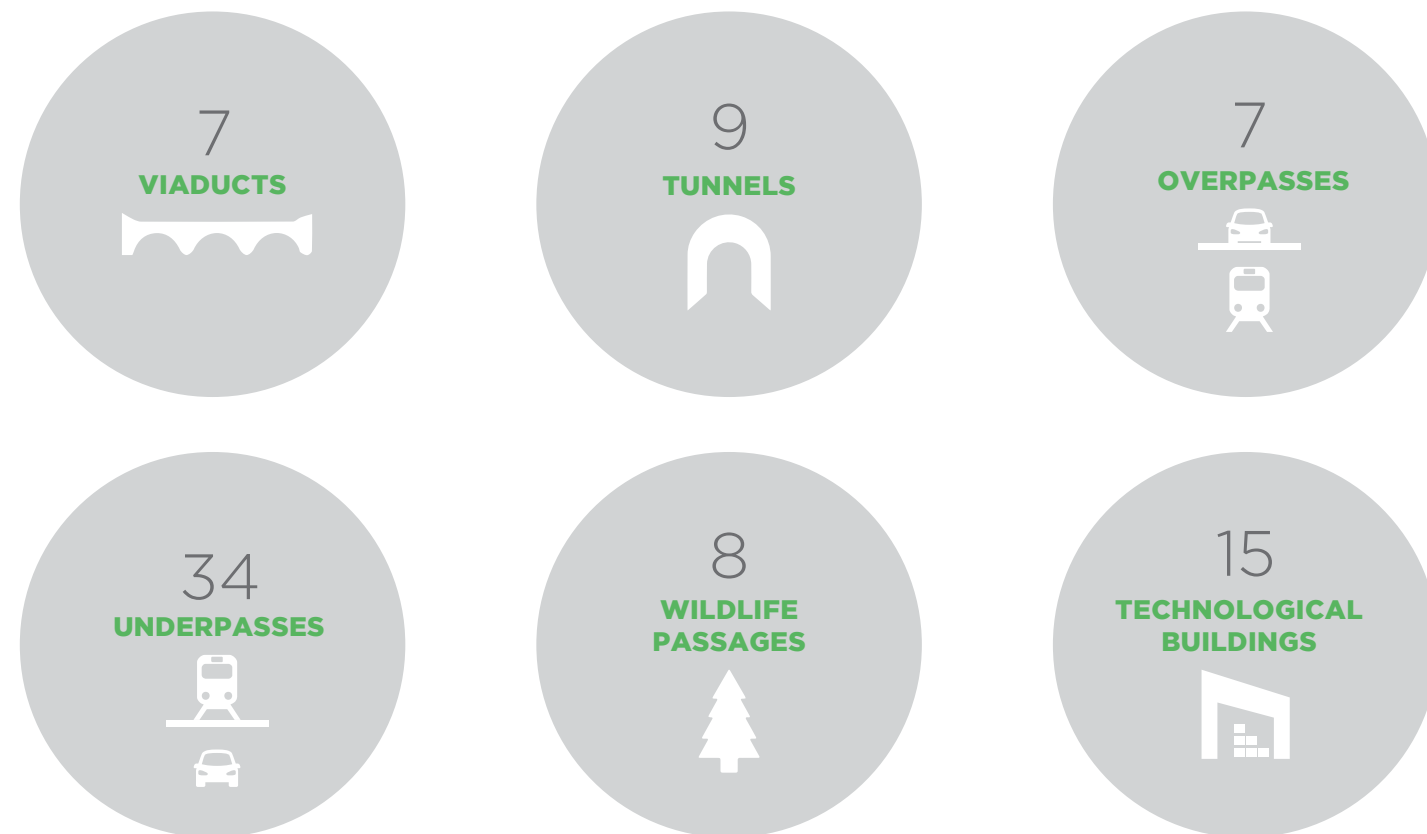
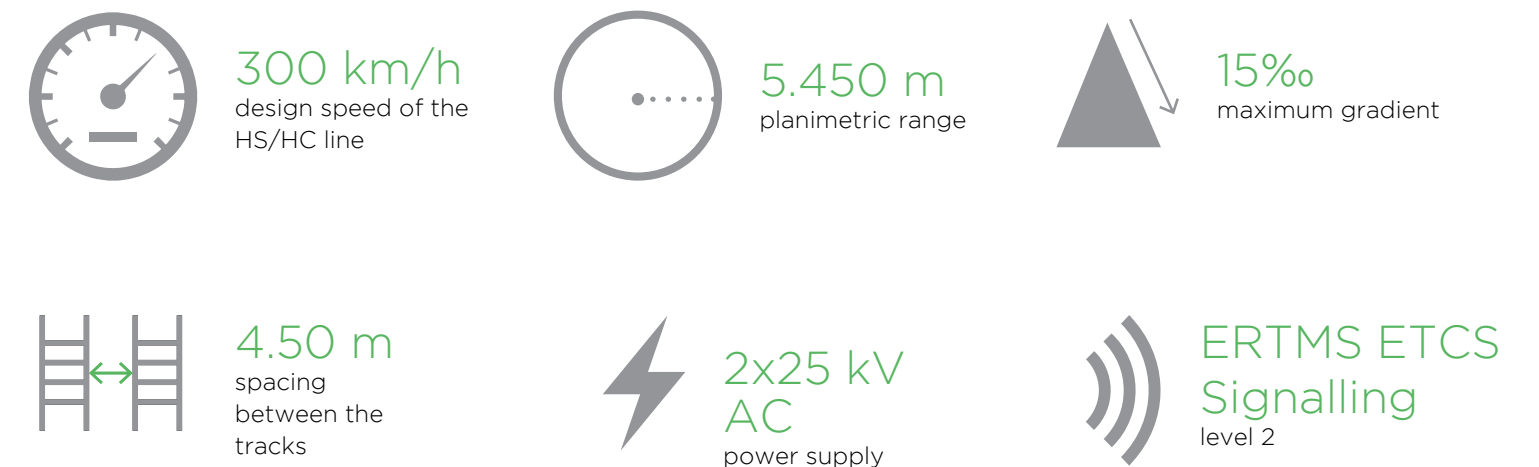
Ingegneria, "the first is that 51 km section was built in five years, which meant the creation and management of a complex organisation which had to work simultaneously along the whole line from the very beginning of works. The second element is that the system was successful in that we were able to reach the completion of the works without serious injuries or any deaths. This result is certainly not down to good luck, but thanks to the vast experience and expertise of the professionals and the people from various backgrounds working in the field. The third relevant feature is that the budget was respected, which is not an insignificant feat for an operation of this scale and in relation to the territory where it was built."

Cepav Due, the numbers

51.4 KM | LENGTH OF RAILWAY LINE, 39.6 KM OF WHICH IS HS/HC RAILWAY LINE AND 11.8 KM IS INTERCONNECTION



PERFORMANCE AND TECHNICAL FEATURES





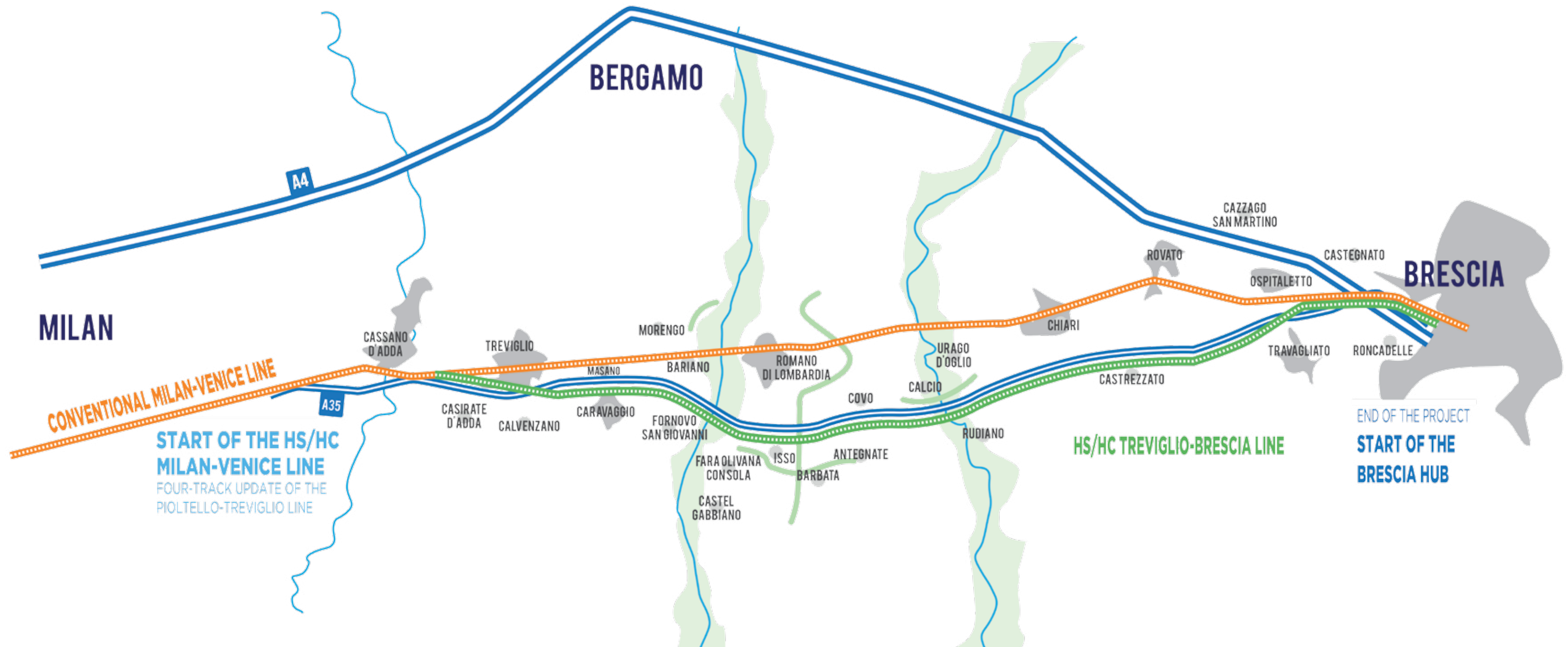
The route and **THE PROJECT**

Careful attention was paid to ensure that such a significant project would not intrude on the local area and alter existing infrastructure and equilibrium.

“For this reason,” explains **Carlo Carganico**, Chief Executive Officer of Italferr, the engineering company in the FS Italiane Group, *“related works were identified to limit the impact on the local areas affected by the construction sites and the more critical areas such as bridges and viaducts, to find the most suitable technical solution with the lowest environmental impact. Various issues were overcome in relation to the historical and artistic context of the local area so that existing works of art were not affected. This approach required significant technical commitment. Moreover,”* concludes **Carganico**, *“state-of-the-art technology was installed, in line with the latest European standards for advanced interoperability even in relation to similar existing systems on the previously-launched HS/HC sections, thanks to the updating of previous standards and protocols for signalling.”*



THE ROUTE



The route of the new railway line starts at the West Treviglio intersection by the town of Cassano d'Adda, to the north of the BreBeMi motorway.

The infrastructure follows the morphology of the land on low embankments with almost horizontal gradients and small-scale water crossings including, in particular, the Fontanile viaduct after around 3 km.

It then crosses over the conventional Treviglio - Cremona line via the Caravaggio viaduct, and around 8 km after the start of the section, it meets and crosses over the BreBeMi motorway which it continues alongside for a good part of the journey.

The HS/HC Treviglio - Brescia line then crosses two viaducts over the Serio and Oglio rivers respectively, after which it continues on embankments of an average height of about 3 metres through the countryside to avoid interferences with the numerous road and water systems serving the area, arriving at Rovato where the HS/HC line ends and the Brescia interconnection begins, continuing to the municipality of Roncadelle at the edge of the city of Brescia.

In the final section of its route, the train crosses the San Martino viaduct, goes through the Lovernato tunnel and, lastly, climbs up to travel alongside the conventional Milan - Venice railway line, going through a tunnel to cross the A4 Turin - Venice motorway and then the ring road south of Brescia.

Whilst ongoing urban access in Brescia and town planning works on Brescia's central station are being completed in stages, the line currently joins the conventional line to continue its journey to the Brescia railway station.





Bringing to fruition THE **SITE IN** a race against time

The Treviglio - Brescia line, built by Cevav Due, can be summarised as three segments according to the three provinces it passes through, which together make up the 51.4 km distance.

The first section, in the province of Milan, breaks away from the conventional railway line at the West Treviglio intersection by the town of Cassano d'Adda, and continues next to the A35 BreBeMi motorway, initially passing north of it and ending at the Fontanile viaduct which crosses the Roggia Moia, a canal which originates from the spring, or fontanile.

The route then enters the province of Bergamo where, after the Caravaggio viaduct, on the border between the municipalities of Treviglio and Caravaggio, it crosses the BreBeMi motorway, continuing alongside the south side of it, followed by the tunnel at the East Treviglio interconnection, then the viaduct over the river Serio, and then over the river Oglio, watershed and natural border between the provinces of Bergamo and Brescia.

Having crossed this water course, the route enters its third part through the province of Brescia, as far as the tunnel and viaducts at the West Brescia interconnection which signal the end of the HS/HC line. The interconnection then continues towards Brescia on the San Martino viaduct which crosses the junction of the A35 motorway with the existing provincial road SP19, and then sinks into the Lovernato system of cuttings and tunnels, designed and created to avoid modifying the landscape balance of the area, before resurfacing and continuing for the remaining 5 kilometres alongside the conventional Milan - Venice railway line and, after passing under the A4 Turin - Venice motorway and Brescia's south ring road, it currently joins the conventional line at the provisional Roncadelle junction and arrives in Brescia.



In reality, however, the entire project was designed and completed as a single complex operation; building the Treviglio - Brescia line literally meant setting up and working together on a huge site extending over more than 51 km.

"A work site is always a place of balancing acts and surprises," comments the engineer **Pierpaolo Tommasini**, Building Director for Cepav Due until 2014, *"you need to find solutions and overcome the problems which constantly arise. There is a risk in a site of this size of losing sight of the overall purpose, yet you need to respect quality standards and schedules. But every issue was solved thanks to expertise, combined with people's willingness to move forward together in the same direction."*

Five operational camps were set up where the directors and staff of each site lived, and material and technical resources could be placed. Two logistical and operational camps for technological equipment were also set up, where all the necessary material was stored for creating the railway bed (ballast, sleepers, tracks) and the technological works (electric traction posts, pylons, cables, electrical and mechanical equipment).

Furthermore, as regards technological works, it was necessary to work at the stations of Milano Greco Pirelli and Brescia, and carry out coordination with the building of systems for the Turin - Padua railway line by RFI.

In addition, further difficulty arose from the fact that

the works were being carried out alongside the building of a motorway (the two projects had to work together on a daily basis to enable both operations to proceed efficiently without breaks and obstacles) and alongside an operating railway in the Brescia interconnection section.

The issue of the provision of supplies was very delicate as they had to be repeatedly reorganised as works progressed, requiring meticulous precision for the complicated task of tying everything together.

"Completing a project of this kind," explains **Roberto Rutigliano**, Site Director for Direct Hiring and Project Control for Cepav Due, *"is a kind of challenge against the clock, as well as against the complications and technical difficulties of each operation. On a tight timescale we had to put together a complex organisation of people and technical elements, and from day one we had to consider all of the details which would affect us over the years. In all of my previous experiences, as well as in this one, the initial stage - even though there is none of the work site dirt, mud and water which stays with you throughout the process - is perhaps the most complicated stage, as you need to organise the sequence of events, both on the ground and in the office, using precision and experience to plan each detail. If you can do this carefully, with skill, common sense and good organisational skills, the difficulties which arise later can be resolved more easily."*





VIADUCTS



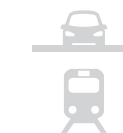
FONTANILE VIADUCT
CARAVAGGIO VIADUCT
SERIO VIADUCT
OGLIO VIADUCT
WEST BRESCIA INTERCONNECTION VIADUCTS
SAN MARTINO VIADUCT

TUNNELS AND CUTTINGS



EAST TREVIGLIO TUNNEL
WEST BRESCIA TUNNEL
LOVERNATO TUNNEL
A4 MOTORWAY TUNNEL
BRESCIA SOUTH RING ROAD TUNNEL
LOVERNATO CUTTING

OVERPASSES



TREVIGLIO SP 472 OVERPASS
CARAVAGGIO SP EX SS 11 OVERPASS
CARAVAGGIO VIA VALLICELLE OVERPASS
CARAVAGGIO SP EX SS 591 OVERPASS
COVO EX SP 104 OVERPASS
OSPITALETTO OVERPASS
ROMANO DI LOMBARDIA OVERPASS

A mix of expertise and CULTURE FOR THE PROJECT

“Bringing together two imperfect worlds like engineering and construction is a battle between theory and practice.” This battle was part of completing the Treviglio - Brescia line for **Francesco Aguglia**, assistant to the Construction and Engineering Director.

In particular, some of the works presented challenges not so much from a technical and engineering point of view but because of the complex management of interfaces. There were genuine critical issues which had to be overcome to guarantee deadlines were met and the Treviglio - Brescia line was completed by the end of 2016.

“The most interesting operation, because of the complex nature of the execution stages and the management of safety was possibly the creation of the tunnels below the A4 Turin - Venice motorway embankment: a box tunnel for the new HS/HC railway line and a twin-tube tunnel for the A35 BreBeMi motorway connection with the South Brescia ring road,” explains **Roberto Liani**, Engineering Manager and Integration Designer for Cepav Due. *“These works required a review of the project from a technical point of view as well as of the*

different stages, adopting a top down construction system and execution in parts, so as to enable works to proceed safely both for the workers and for motorway users, maintaining high levels of accessibility for the constant, intense flows of traffic.”

A similar construction system was adopted for the creation of the system of cuttings and tunnels at Lovernato, covering a total distance of around 1,600 metres; to minimise the impact on the local area and to safeguard the Santuario della Madonna in Lovernato, cuttings through bulkheads of posts as well as tunnels were used.

The creation of the tunnel was also a delicate operation, under the project name GA10, as it enabled access into Brescia, passing beneath the Brescia South ring road. *“In this case the complexity arose from the unexpected*



need to also demolish and rebuild the existing structure on the adjacent conventional Milan - Venice railway line, thus building a new twin-tube tunnel: one side for the conventional line and the other one for the High Speed line, whilst maintaining traffic flows above and guaranteeing the progress of adaptation works on the Brescia South ring road and the slip roads connecting to the new BreBeMi motorway junction,” explains **Francesco Aguglia**. *“The work was divided into stages which were coordinated with the Section Manager of the conventional line, the BBM Consortium and the Province of Brescia, with the aim of not interrupting rail or road traffic and sticking to agreed schedules.”*

Similar problems, although with less impact, were presented by the building of the overpass structure crossing the conventional Milan - Venice railway line section by the new road at Romano di Lombardia and the building of the Caravaggio Viaduct on the Treviglio - Cremona line.

Even though we were working with simple structures with proven reliability, like the platforms supported by

a pre-compressed reinforced concrete structure with 4 caissons with 30 metre gaps, it was still exciting to design and build the two Serio and Oglio viaducts - 957 and 1,287 metres long respectively - to cross these two rivers, as explained by **Roberto Liani**: *“The most delicate design element was the two-dimensional water modelling of the bed, with the aim of evaluating the extent of the undercutting phenomenon, as requested by the Inter-regional Agency for the River Po and by the Po River Basin Authority. As a result, it was determined to bury the plinth piles in order for them not to be affected. From a practical point of view, we used the longest sheet piles which were available on the market and soil plugs, with all the related complications of both working on a river bed and in terms of the natural environments protected by the Park Authorities.”*

Other interesting design elements relate to the solving of some road issues, for example in the Caravaggio area where the box structures required the use of building technology and details which are typical of water table works.



Also of interest was the building of two underpasses in the province of Brescia: the Via Cavallera underpass, technically known as SL68, on the border between the provinces of Castegnato and Roncadelle and the Via Mandolossa underpass at Roncadelle, known as SL69, both of which were built off site and placed in position using the "Essen System", a system of pistons and jacks below the conventional railway line which is kept in operation and protected by special support structures.

Because of the complex nature of the works, particularly clever solutions were also required for the testing phase. For example, for testing the viaducts, as it was not possible to apply loads normally used in road testing because they were insufficient. It was necessary to reproduce the load conditions on the viaduct platforms

which would occur as a result of railway traffic. *"The idea put into practice was to use modular carriages, each with a carrying-capacity of 40 tons of weight on each axle, therefore comparable to the weight of an entire road lorry",* recalls **Francesco Aguglia**. *"This way we managed to load 1,600 tons on the track to reproduce the maximum stress which could be placed on the viaducts."*

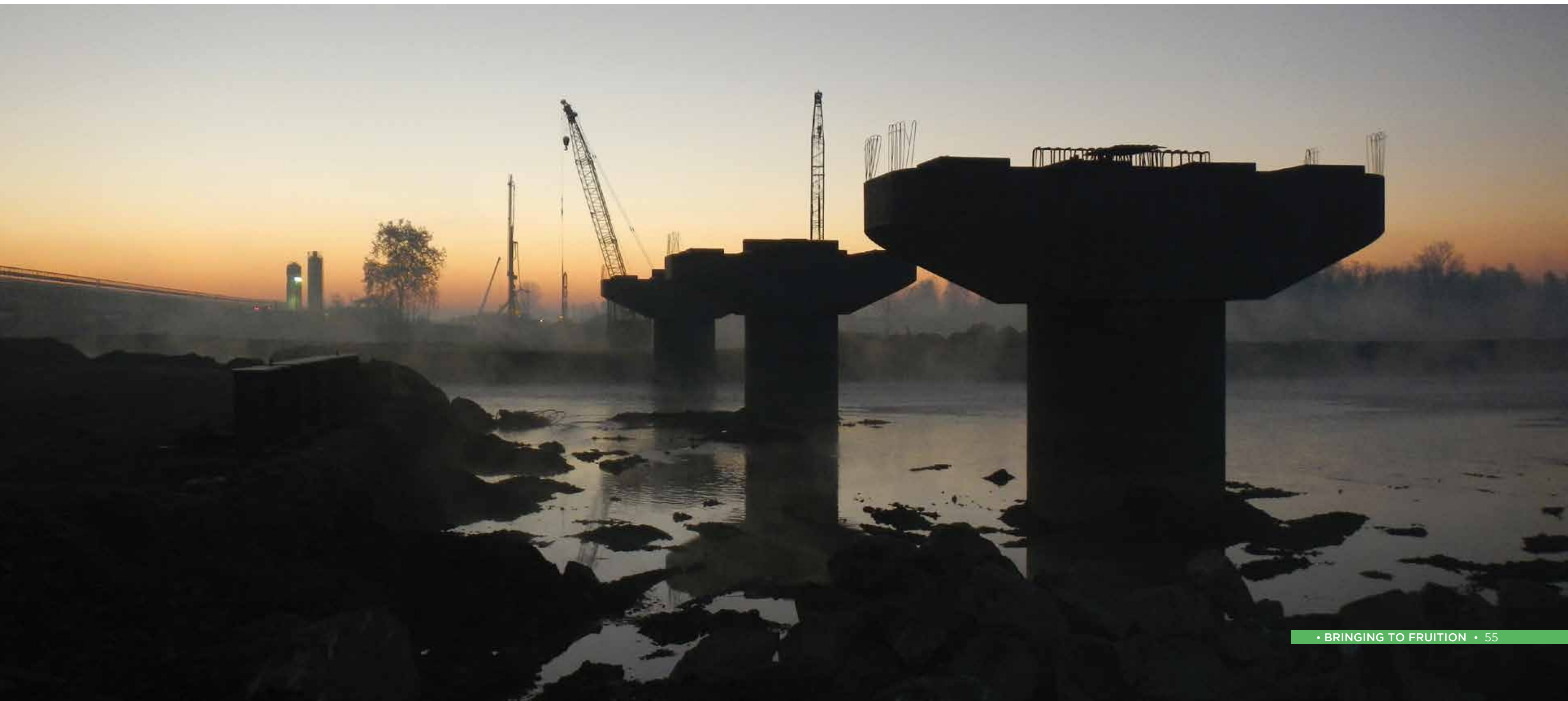
A completely different challenge arose with the Covo quarry, for which even the process of gaining authorisation for use had been complex.

After we had been given approval for expanding the quarry in operation, it was necessary to remove large quantities of material whilst efficiently managing access for the numerous vehicles.

"During peak periods we were extracting more than 10 thousand cubic metres per day," continues **Aguglia**, *"the comings and goings of heavy goods vehicles required correct documentation for transport but the manual registration system was out of the question; we needed a verification and documentation system which did not result in excessive time being wasted."*

And so Cepav Due adopted a number plate recognition system which used optical character recognition at the quarry entrance to record incoming vehicles. Once a lorry was loaded, it was weighed and transport documents were automatically produced: this approach resulted in excellent levels of efficiency at the supply quarry.

Over ten months, 1,600,000 cubic metres of aggregate material were extracted from the Covo quarry, resulting in around 100,000 journeys, each requiring a transport document. *"If we had managed these procedures manually, we would never have been able to coordinate these kinds of quantities in under a year,"* concludes **Aguglia**.



The railway INFRASTRUCTURE

> CIVIL WORKS

SECURING THE SUPPORT FOUNDATION FOR THE RAILWAY TRACK



ACCOMMODATING ROAD SYSTEMS IN THE AFFECTED AREA



SOLVING ISSUES WITH PUBLIC SERVICE NETWORKS



MITIGATING THE IMPACT ON THE LOCAL AREA



> RAILWAY SUPERSTRUCTURE

GUIDING THE ROUTE OF THE TRAIN AND TRANSFERRING LOADS TO THE UNDERLYING CIVIL WORKS



> TECHNOLOGY SYSTEMS

POWERING AND CONTROLLING THE TRAIN'S MOVEMENT



Tracks, technology and **TRAIN TRIALS**

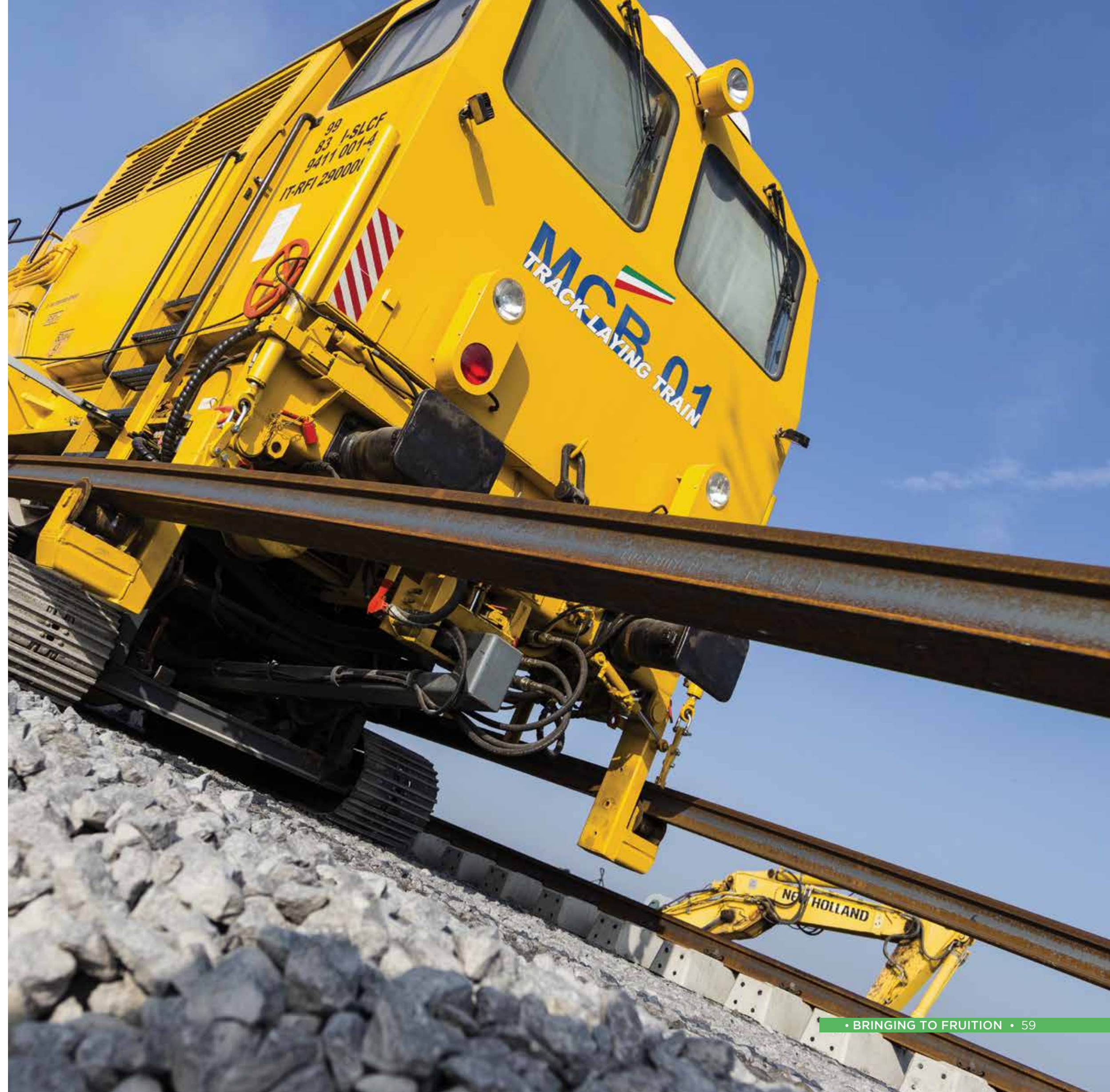
Another element which cannot be overlooked is the entire railway superstructure which is made up of the tracks and the trackbed, designed to guide the route of the train and, above all, support the enormous stress and weight of the trains and transfer these loads to the civil works.

The entire railway superstructure was built with the aim to optimise mechanised construction systems as much as possible. There were various laying stages leading to the completion of the railway formation: special machines were used to lay the ballast, followed by the positioning of the electric traction posts and the other stages for completing the absolute base. The sleepers and tracks were then laid using a specially-equipped train, and works were carried out on the line to complete the laying of the railway line and the subsequent contact line.

After these construction stages came the well-known trial runs, us-

ing diagnostic Rete Ferroviaria Italiana trains equipped with specialist technical instruments to test the railway line first at 150 km/h and then at 300 km/h, the maximum commercial speed.

"The testing phase with the first train shooting down the line," describes **Guido Destefani** Director of Construction Contracts for Cepav Due, *"was one of those unforgettable moments in life, not just from a professional point of view. Getting the line in operation was the culmination of months and years of hard work with the uncertainty that something might not go to plan and the exciting feeling of reaching your goal."*



The building of the Treviglio - Brescia line also required the use of various technologies and the most noteworthy aspect was most certainly the plant design used, with the high voltage line for powering the electric traction. For this section, it was necessary to build three new power lines to safely guarantee an adequate service.

In specific terms, the technological installations extend along the whole track and require a special dedicated facility roughly every 10 km, with a range of advanced technology equipment which is controlled from a central station dedicated to the management and supervision of the railway section.

With regard to the power lines which supply energy to the entire infrastructure, it was decided that they would be connected to the existing Rete Ferroviaria Italiana power line and the existing electric substation, a solution which minimised the impact and reduced the length of the electricity line.

A fundamental element was the system for the management, control and protection of the railway traffic, which is why, in line with Italian HS/HC line standards, the European Rail Traffic Management System/European Train Control System (ERTMS/ETCS) level 2 was adopted.

“When travelling at 300 km per hour maximum safety levels are necessary”, comments **Giuseppe Maggi**, Technology and Track Manager, *“which is why innovative signalling systems were used to enable the trains to travel at a suitable distance apart and at high speeds. The standards used are at the forefront of signalling and are a credit to our country and, above all, mean our trains can operate in other European countries.”*



➤ *“When travelling at 300 km per hour maximum safety levels are necessary, which is why innovative signalling systems were used to enable the trains to travel at a suitable distance apart and at high speeds.”*



Quality, environment and **SAFETY**

A project like the HS/HC Treviglio - Brescia railway line demands an innovative approach not only with regard to modern construction but also in relation to the meticulous application of Management systems for Quality, Environment and Safety. Ultimately, such complex works cannot ignore particularly delicate and important issues like respect for the environment, safety and quality.

Therefore, along the 51.4 kilometres of the line, the following were applied:

- the best methods of protecting the environment, aimed at preventing any risks relating to hydrogeological matters or wildlife, as well as minimising the environmental impact.
- the finest quality standards to guarantee the safety and reliability of railway operations and to significantly lower management costs for the entire life-cycle of the operation.



Watchword:
QUALITY
in every aspect of the works

“We have guaranteed, with the attention of the Consortium management, all-round quality of all the works completed by applying specific procedures to guarantee that contractual requirements were met” explains **Lorenzo Pascale**, Quality Assurance Manager.

The construction schedule for the railway line was tight, but the time factor never took precedence over quality. The Cepav Due Consortium strictly abided by this principle because, as the geologist **Lorenzo Pascale**, Quality Assurance Manager for the Consortium explains, *“in this work, quality is an element which is fundamental to every aspect: from the safety of workers to installation materials, as well as technology and the environment. Without ongoing accurate monitoring of each area of the chain, true quality cannot be achieved.”*

The Cepav Due Consortium implemented the Quality Management System according to the ISO 9001/08 standard requirements, aimed at taking a planned, systematic, controlled and documented approach to the management of all operations which affect the quality of products and services, i.e. the construction planning, supplies and building.

The Suppliers and Subcontractors who worked for the Consortium also operated with a Quality Management System in line with ISO 9001/08.



Respecting THE ENVIRONMENT

Building the HS/HC Treviglio - Brescia line affected both the existing conventional line and also involved some necessary complementary works to resolve interferences with the local area, from waterways to roads and motorways. An impressive operation, with a significant impact on the local environment.

The Cepav Due Consortium succeeded in this environmental challenge thanks to the various parties working as a team to solve the numerous environmental issues which arose.

An Environmental Management System was implemented following the requirements of the UNI EN ISO 14001/04 standard and the decision was made to become members of the Regional Environmental Monitoring Body (from 20 July 2011), a technical organisation which was set up to ensure the provision of complete and correct information to local citizens on issues relating to environmental protection during important infrastructure construction works. The environmental monitoring of the HS/HC Treviglio - Brescia section, defined in the stages prior to, during and after construction re-

lated to 10 components (including noise, electromagnetic fields, water and soil), and in the regional context met with constructive dialogue regarding the local area.

One of the most significant challenges was overcome with the environmental restoration of 18 areas, where various waste was discovered, including construction and demolition waste, untreated waste and waste containing polychlorinated biphenyls (PCB). The following cases provide a summary of the environmental complexity of these interventions: the first, between the

"We expected to have 8 critical sites to manage during the progression of works commented Luca Bellizzi, Environment Management System Manager. "The truth was very different in that we found we had to restore 18 areas, including land reclamation and waste removal. We didn't lose heart and with great commitment, within time schedules, we found solutions to the environmental liabilities."



municipalities of Ospitaletto and Castegnato, required decontamination; whilst the second and third cases involved the removal of waste, in the municipalities of Calcio and Chiari respectively.

"In the first intervention, under the project name OS04-CT101," explains Luca Bellizzi, Environment Management System Manager, "we were faced with the disposal of around 14,000 cubic metres of underground waste, some of which was dangerous and contained high levels of polychlorinated biphenyls (PCB). The location presented a further challenge as it meant we had to work next to the conventional Milan - Venice line."

Considering the delicate nature of the intervention, the "like-for-like" replacement method was adopted, with the aim of progressively removing the special waste and promptly replacing it with certified material so as to guarantee the stability of the ongoing works.

The second case, in the area of Bergamo and given the project name SL38, saw the significant disposal of about 25,000 cubic metres of special waste, aimed at allowing the underpass of the provincial road, SP 106, to be built. During excavations, in addition to various production waste, a total of 360 kg of chunks of asbestos in a compact matrix were discovered. The sorting and removal of this material required the ongoing attention of specialist operators over a long period.

The third restoration was given the project name RI21, and compared to the previous cases this one required

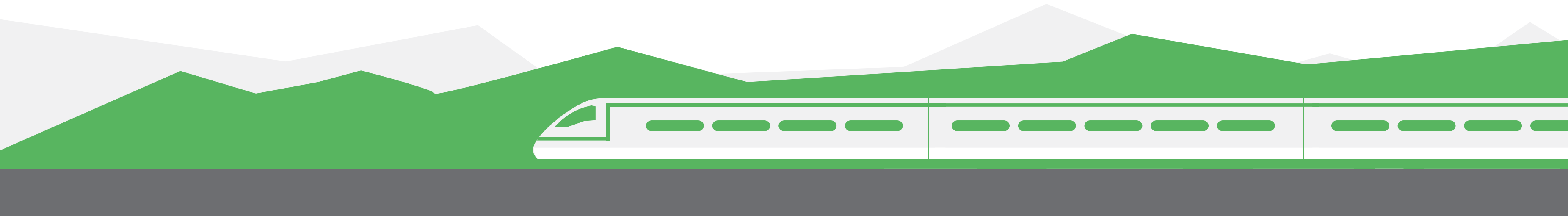
significant structural works because of its vicinity to an expansive and deep illegal landfill.

In correspondence with the railway enclosure, a 136.80 m bulkhead with drilled posts was built to a depth of 26.50 m which significantly simplified the environmental works of waste removal on the mark that would be left by the future embankment of the HS/HC line (around 20,000 cubic metres).

The theme of reclamation played a fundamental role in this project, considering the handling of 3.3 million cubic metres of excavated material, including soil and aggregate material. The terrigenous surplus from the works on the HS/HC line was assigned to the local area for environmental development projects in sites authorised by the Provinces of Brescia and Bergamo.

This modus operandi, pursued with maximum precision and efficiency, meant that works could be completed with a limited environmental impact, providing an important legacy for the local population. *"The biggest challenge was combining speed and quality in dealing with unexpected environmental issues during the progress of works. However, we have left a considerable positive legacy,"* explains Luca Bellizzi, Environment Management System Manager, *"for environmental sustainability and public health. An important and memorable showcase for a project which was complicated but very rewarding."*

Environmental elements subject to **MONITORING**



- >
- Atmosphere
- Surface water courses
- Underground water courses
- Soil
- Vegetation
- Noise
- Vibrations
- Electromagnetic fields
- Landscape
- Wildlife



The green heart of HIGH SPEED

Cepav Due's respect for the environment in building the HS/HC Treviglio - Brescia line was not only demonstrated by the attention it paid to the reclamation of the 18 polluted sites which were discovered. Nor in its ongoing re-utilisation of excavation material and more generally in adopting an efficient environment management system in compliance with UNI standards. Special attention was also given to the renovation of green areas surrounding the entire railway structure.

The green areas unite the railway track with the surrounding area thanks to a network of ecological corridors connecting the various natural and agricultural environments.

New green areas were introduced which reflect the character of the local flora providing the perfect syn-

thesis between man-made works and the environment. This did not mean creating simple mitigation structures but the ability to blend human presence into the natural environment, going beyond the landscape and ecological objectives of the railway infrastructure project.

From the very beginning, the goal of the Cepav Due Consortium was to optimise the insertion of the railway infrastructure into the territory and to limit its impact on the local area. It was later understood that the building of the Treviglio - Brescia line had led to the detection of certain points of pre-existing degradation over an extensive area and that the project would give the opportunity for rebalancing it by means of targeted interventions.



“The choice of various environmental mitigation solutions,” explains **Luca Bellizzi**, Environment Management System Manager, “took into account the characteristics of the local area. And so two main landscape areas were identified: the agricultural landscape of the countryside in Lombardy and the river landscape characterised by the presence of the rivers Oglio and Serio. The types of solutions used were, in brief terms, the following: grassy areas, connecting shrubs (mesophilic, hygrophilous and riparian vegetation), rustic shrub islands, multiple hedgerows to encourage wildlife passages, mixed and riparian woodland.”

The incorporation of mitigation interventions enabled a sort of green infrastructure to be built parallel to the railway line, acting as a mask for the new railway track, creating numerous ecological corridors connected with the unique features of the territory and also promoting the existing natural elements.

The natural vegetation belts which were built for mitigation purposes act as a sort of buffer along the route between the track and the local area, made using plants

which reflect the local flora and capable of increasing biodiversity: a green complex which took root easily.

The greenery was carefully selected in relation to the existing plants: therefore very rustic local species were chosen which were non-invasive, resistant and destined to last over time, and also useful due to their fire-resistance during the stages of ignition and fire propagation.



Workplace safety and management system OHSAS 18001

No truly serious accidents took place despite the complex logistics of a large-scale site where work progressed simultaneously along a distance of 51.4 km.

“This was the first project on a national scale, whose Supplementary Act called for the adoption of the BS OHSAS 18001 standard (Occupational Health and Safety Assessment Series) which certifies the voluntary application within an organisation of a system which guarantees adequate monitoring for the Health and Safety of Workers, as well as respecting mandatory rules on safety. This is an internationally-recognised Safety standard.” These words of **Matteo Pio Tomaiuolo**, OHSAS18001 Safety Management System Manager for Cepav Due and Works Supervisor, best describe the spirit which differentiated the work of monitoring and prevention to maintain high safety standards on the work sites of the new Treviglio - Brescia line.

The General Contractor was equipped with an internal organisation which exceeded the legal requirements: in fact, system management roles were identified, such as the Safety Coordination Manager to enable more efficient coordination and links between the other company roles, and a Works Management Office led by an official in the role of Works Supervisor, as well as the relevant on-site employees (Inspectors) with the task of checking how system procedures were implemented, working closely with the monitoring bodies and experimenting with new shared safety management methods which resulted in a Memorandum of Intent with the monitoring and supervisory bodies of the Provinces of Bergamo and Brescia.

The various points set out in the Memorandum included the additional inspection visits made by the Local Health Authorities, training provided by Cepav Due along the whole chain of works and a board of experts with quarterly discussion meetings.

Furthermore, where shortfalls in the distribution of personal protection equipment by the subcontracting companies were identified, the Protection and Prevention Service of Cepav Due compensated for these shortages.

“It was a challenge to draw up a Memorandum of Intent between us and the management of the Local Health Authorities in Bergamo and Brescia,” adds **Matteo Pio Tomaiuolo**, *“which shows the attention to social responsibility in this project.”*

In practice, ongoing operational checks on the work sites, supplies and possible critical areas combined with periodic audits to evaluate the level of enforcement of the rules along the whole project execution chain. The result was an extraordinary reduction in the accident figures, regarding both frequency (fr 16.57) and severity rates (sr 0.61).

“We had chosen to aim for much lower figures than in similar projects but we managed to lower them even further during works and this is an extraordinary result,” continues **Matteo Pio Tomaiuolo**. **Elisabetta Vallati**, Legal Department Manager for Cepav Due, adds: *“The part concerning Quality, Environment and Safety Systems was managed with great skill and professionalism, by creating a structure which achieved excellent results in spite of the various problems faced as works progressed on site and without major legal issues.”*

Confirmation of this came back in May 2014 with the award from the Associazione Italiana Cultura Qualità (AICQ). At the national AICQ conference on Workplace Health and Safety which took place in Milan, Cepav Due received the Best Practices Award 2014 given to a company which demonstrated good practices for Workplace Health and Safety. The following title was displayed on the Best Practices award: *“The safety coordination model in planning with a dynamic approach”*.

The award was given thanks to the ability to *“make some of the planning processes of coordination systematic in order to give objective practical use to the implementation of models originating from the experience gained*

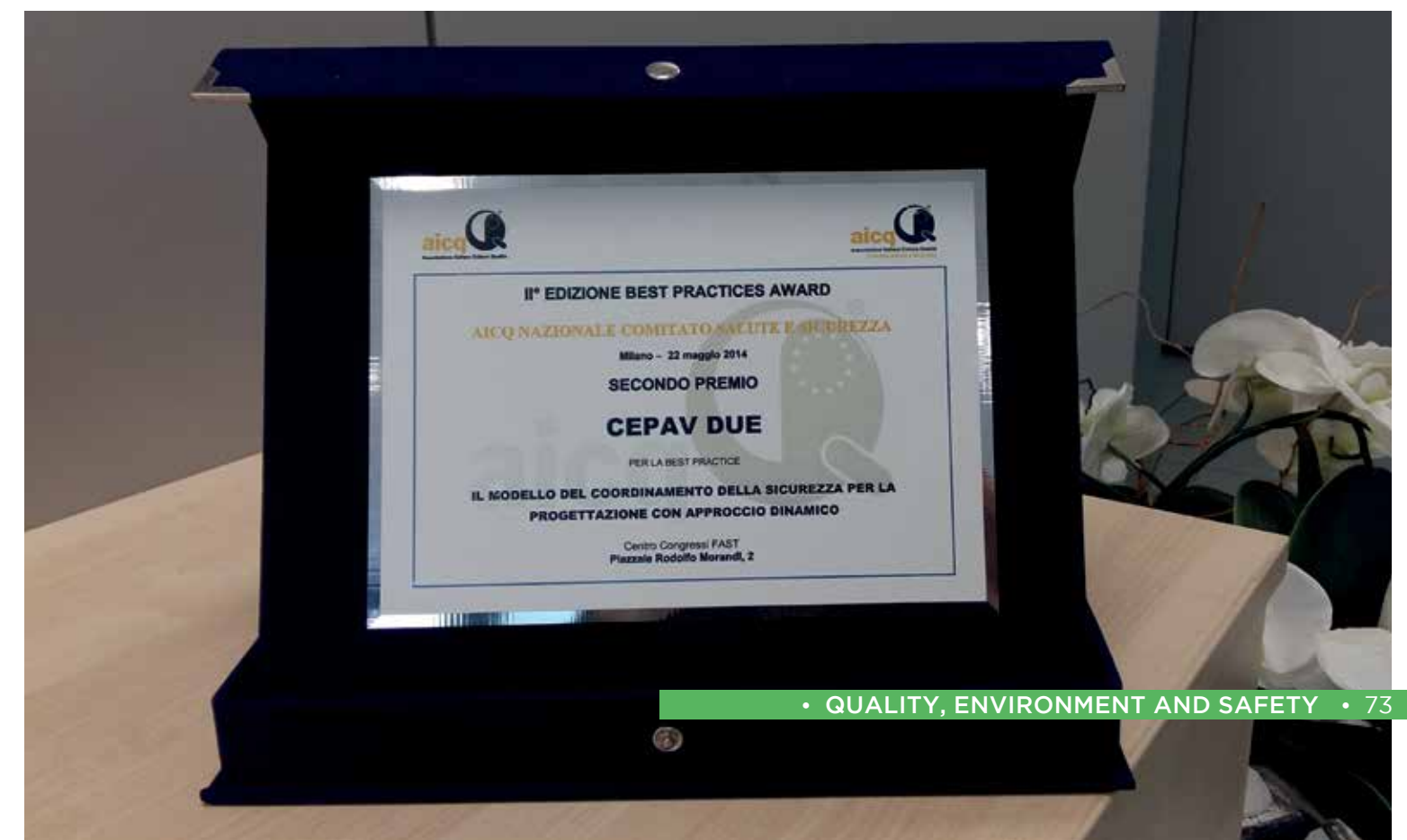


in leading construction and engineering companies and therefore adapted to the needs which arose when carrying out works on behalf of the Eni Consortium for High Speed, Cepav Due.”

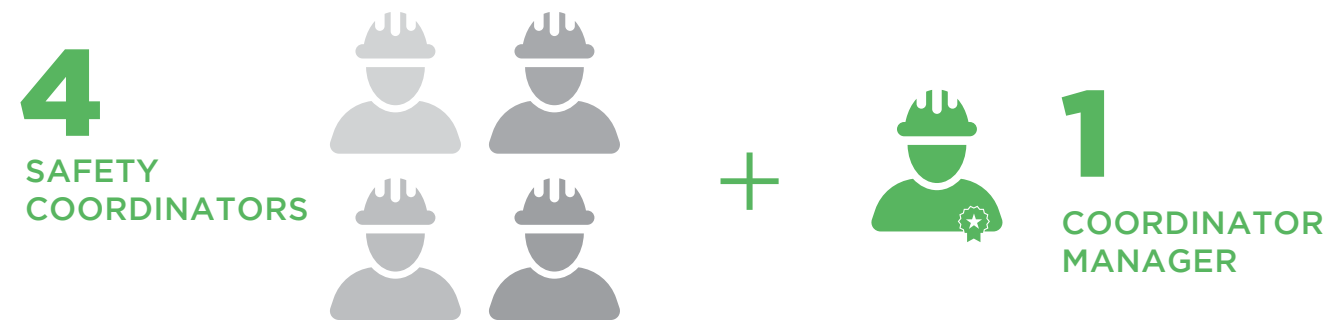
These results were also achieved thanks to the work and productive collaboration with colleagues in the prevention and protection services of all the contractor companies, first and foremost the Protection and Prevention Service of Cepav Due, coordinated by the architect Luigi Carlo Pugliano, and the structure of safety co-

ordination during the execution stage by the company Pegaso Ingegneria.

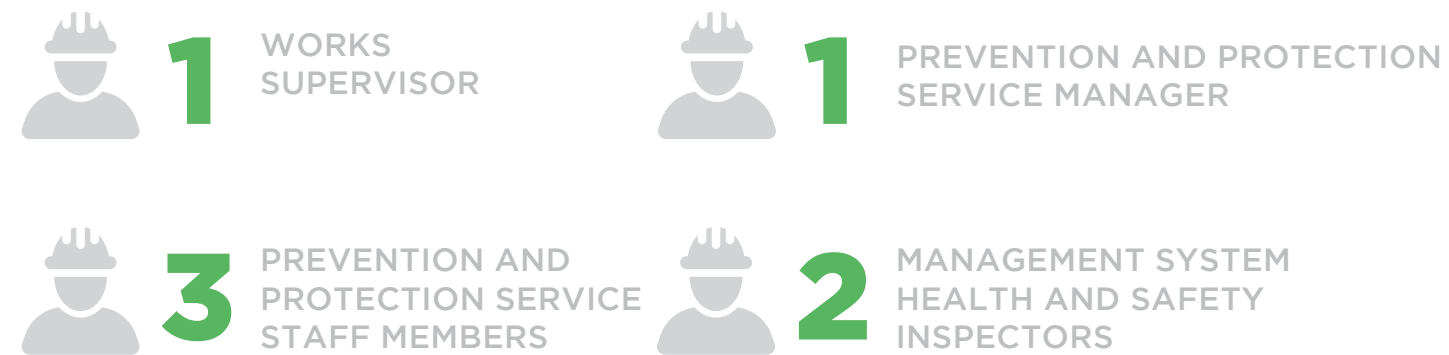
The Cepav Due Protection and Prevention Service was also in charge of planning a special Emergency plan in agreement with the AREU 118 Healthcare Service and to carry out emergency tests to verify the timings of rescue services.



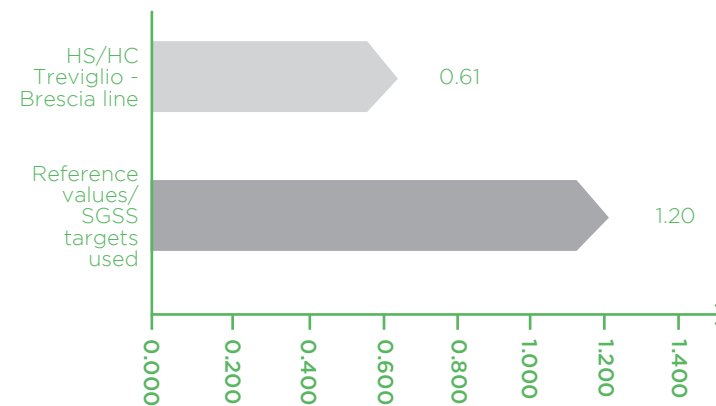
The numbers for SAFETY



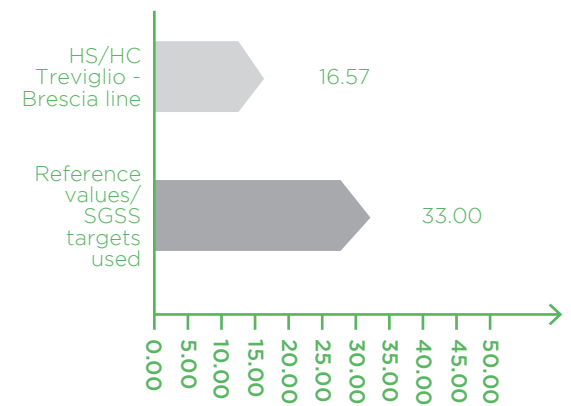
SAFETY STRUCTURE



SEVERITY RATE



FREQUENCY RATE



DATA FROM THE START OF THE PROJECT UNTIL 30.06.2016



HAVE OPERATED ON THE WORK SITES SINCE THE BEGINNING OF THE PROJECT



The **COMPLEXITY**

“When you think about a railway it is easy to imagine the tracks and the ballast,” comments **Franco Lombardi**, President of Cepav Due since October 2015, and also the sole overall project manager responsible for the progress of the project and involved since 2011, *“but before getting to that stage there are numerous extremely complex and intricate phases for which you need a control booth capable of planning, managing complexities and overcoming any difficulties so that the railway line is completed within expected time frames and budgets.”*

Just think for example about the necessary and obligatory preliminary works,” continues **Lombardi**, *“like the executive plan, expropriation, ordnance clearance, archaeological finds, the solution to issues of road systems or existing underground services, as well as environmental management. After having worked through all these stages, it is possible to start building the civil works, the tracks and the technology. We managed to do this; fundamentally we are a General Contractor and this is what a General Contractor should do: manage and overcome all obstacles in the best possible way.”*



The efforts of a COMMISSIONING BODY

One of the critical points that Cepav Due had to face was in relation to its obligation to assign 60% of civil engineering and track works to external companies by means of a European public call for bids. Therefore the General Contractor found itself also having to take on the role of commissioning body, assigning six contracts through international public tenders.

"It was like entering a vortex," comments **Stefano Sangalli**, assistant to the Director of Cepav Due *with this very vivid image, "basically just five years to complete a project of this kind might seem like a lot but it is not, especially when you consider that we had to manage six public tenders as laid down in our contract. It was a constant challenge to guarantee deadlines were met and it was looking very difficult at the end of 2015 especially; now we can say with pride that we managed it successfully, demonstrating the added value we could provide as General Contractor."* From a procedural point of view, it took 6-7 months to overcome this obstacle and determine the tenderer companies.

Keeping to a strict deadline, we started by developing the tender specifications, then the draft contracts as well as all the technical and contractual documents and details of the procedures to follow.

Overall this operation was carried out excellently. **Elisabetta Vallati**, Cepav Due's Legal Department Manager, can confirm that: *"the excellent preparatory work in the public tender stage meant that there were no administrative appeals."*

Moreover, for each tenderer company, checks had to be made on its financial soundness, compliance with wage and contributory obligations, and anti-mafia checks



also had to be carried out. And yet despite all of this preliminary work, during the following years some companies ran into corporate problems and went into liquidation, thus abandoning the project. For Cepav Due, the process of assigning 60% of contracts via European public tenders predominantly meant the consortium had to carefully plan the management of sites with external companies which in turn had to work together in harmony with their staff.

"The real challenge, for managing the bids, was starting to think from the point of view of a commissioning body, yet still having to stick to the given time schedules. Only the perfect harmony of technical, administration, accounting and legal skills enabled the tendered works to be completed in line with the rest of the project, with the aim of not compromising the date of deployment of the line," recalls **Francesco Aguglia**, assistant to the Construction and Engineering Director.

In detail, these were tenders for the completion of civil engineering works and railway tracks which took between 98 and 184 days to conclude.





"We selected which works to assign by considering the overall time scale of allocating contracts," comments **Guido Destefani**, Director of Construction Contracts, *"to harmonise the needs of the site and the fixed deadlines for completing the project. Dealing with the allocation of six contracts was complex because behind each individual public tender there were potential uncertainties and possible delays. For the final objective it was necessary to monitor both the technical management aspects of the contracts as well as bidders' requests for clarification. It was actually an intricate process which lasted the whole duration of the project."*



In dialogue with AUTHORITIES AND THE LOCAL AREA

One of the complex issues which the Cepav Due Consortium had to deal with was definitely the relationship with government administration, organisations and the local area, and in general terms, dealing with the elaborate system of authorisation and Italian bureaucracy. This was a feat in itself, primarily because it meant dealing with numerous institutions including 5 Ministries, 2 government offices, 1 regional government, 4 provincial administrations and a total of 26 municipalities. Another consideration to make is that the line had to cross an area packed with various types of underground services and for this reason it was fundamental to set up an ongoing relationship with the various companies connected to these issues: an arduous task of seaming elements together which led to 300 conventions being drawn up. In the end there was a total of 650 issues which had to be resolved.

In fact the new line extends through an area where there is a high concentration of various public services, including gas, oxygen and water pipelines, sewerage systems, high, medium and low voltage power lines, copper and fibre optic phone lines, as well as waterways and road systems. Invading an area with such an intricate operation comprising tracks, steel, embankments, tunnels, viaducts, overpasses and underpasses was not easy due to issues relating to the building phase, issues of compensation and a series of obstacles relating to adapting public services to the railway infrastructure.

The completion of this new project also called for ongoing collaboration, mainly with the Municipal Authorities, but also with the Ministry of Infrastructure and Transport, the Ministry of the Environment, Land and Sea, the Ministry of Cultural Heritage and Activities and Tourism, the Ministry of Economic Development and the Ministry of Defence.

It was necessary to work closely with the Government offices of Architectural and Landscape Heritage and of Archaeological Heritage, with the Local Health Authorities (ASL), the Regional Environmental Protection Agency (ARPA) as well as with the Lombardy regional government, the provincial administrations of Milan, Bergamo, Cremona and Brescia, BreBeMi and the Irrigation Associations.

"An aspect which was fundamental to enable smooth progress of works on the new railway line," explains **Mauro Gozzo**, Manager of Relations with Authorities, *"was laying down agreements with local authorities to*

get the project, which had been approved by CIPE (Inter-ministerial Committee for Economic Programming), into operation, signing dozens of agreements or deeds of commitment with Public Administration bodies and public service companies. One of the biggest difficulties in incorporating such a complex project into the local area is gaining authorisation, consent and clearance from authorities every time you come across property, structures and public infrastructure, thereby overcoming each obstacle one and at a time and dealing the relative difficulties to enable colleagues in construction to proceed with their work according to the given schedule."

These problems may appear foreseeable but they always conceal new, specific challenges which first have to be identified, coordinated with the relevant staff on site and then solved as quickly as possible: from gaining a road closure order to identifying alternative traffic routes, setting up a school bus service because of road closures, diverting waterways or creating temporary diversions for public services.

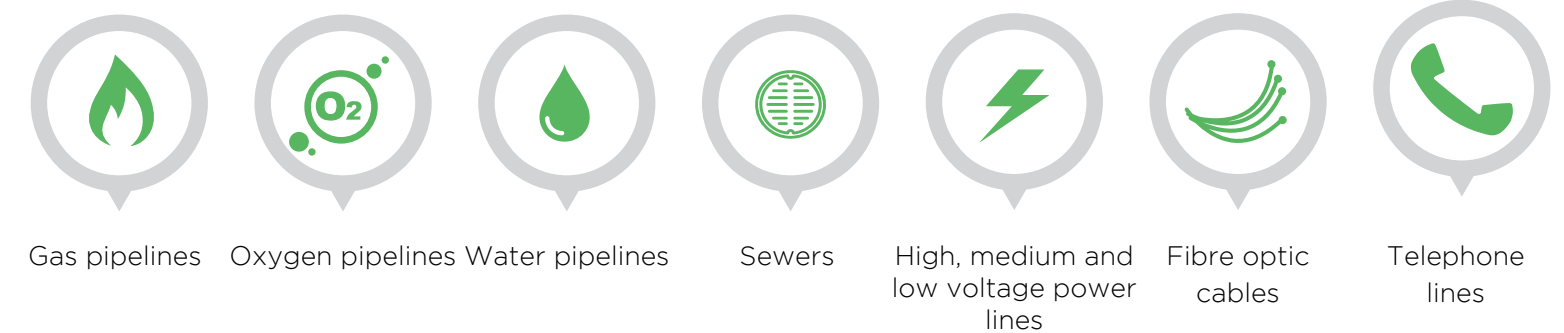
Above all, it was a particularly delicate, constant task because the numerous external interfaces and construction needs called for constant commitment to finding new and diverse solutions.

Gozzo continues: *"The biggest surprise came from the irrigation and land reclamation authorities, which are numerous in this area due to the presence of many springs in the Prealps area and due to the claims to authority and rights from the past by the irrigation associations*

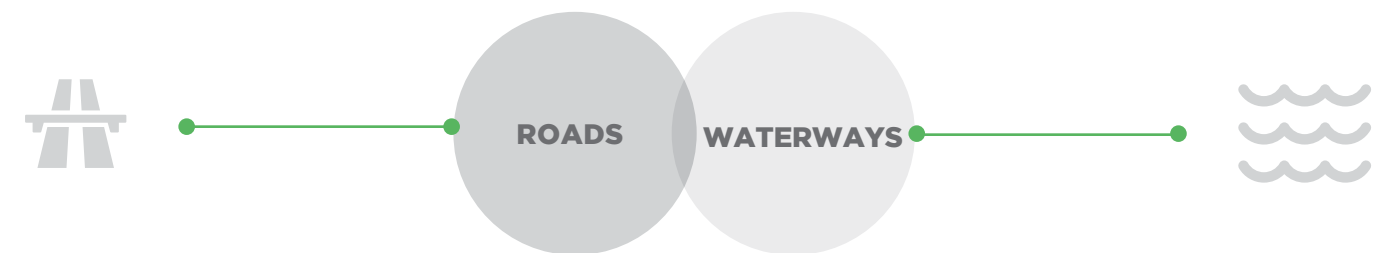
against the land reclamation authorities. Their massive presence was a surprise and the exact final number was identified by carrying out a detailed survey of the area. In the end, we signed 25 conventions with these associations."

The choice of a strategy based on paying attention to problematic issues, on willingness and ongoing communication with local and central government enabled a solid climate of agreement and acceptance of the public works to be created.

350 PUBLIC SERVICE ISSUES



300 ISSUES ON ROADS AND WATERWAYS



INSTITUTIONS

5 Ministries

2 Government Offices

1 Regional Government

4 Provincial Administrations

26 Municipalities

2 Local Health Authorities

4 Regional Environmental Protection Agencies

The delicate issue OF EXPROPRIATION

Expropriation was a delicate process for the local areas which had to put up with the burden of losing property for the benefit of public interest and the entire community.

In order to take a rational approach to limiting the use of land, the majority of the Treviglio - Brescia HS/HC line was planned and built in coordination with the new motorway between the provinces of Brescia, Bergamo and Milan: as a result the railway line runs parallel to and alongside the BreBeMi motorway, taking a strategic approach to the two infrastructure systems.

The chosen route limited the impact of building the new railway line and the communicative approach taken with those involved did the rest. Even though it was a public works project which benefits from the coercion force of the expropriation procedure prescribed by law, the Consortium aimed in all circumstances to proceed in accordance with the Memorandum of Intent with the Farmers' Associations, aiming to always be open to constructive communication and dialogue with the local area.

Overall the project required the construction of 39.6 km of High Speed line and a further 11.8 km of interconnections with the existing railway line, as well as power lines to supply the new railway line with electricity, in addition to the road and waterway crossings and the construction of various new road systems and numerous environmental mitigation works. It was therefore necessary to permanently acquire around 3 million square metres for the railway line and temporarily occupy around 1 million square metres for completing the works, as well as a further 500,000 square metres for the connected road systems.

*"In particular, explains **Luigi Tezzon**, Expropriation Manager for Cepav Due, "the majority of the necessary land for building the infrastructure was made up of farming land: almost 90%. Essentially the track affected an area characterised by low urbanisation levels and a limited number of production facilities. The building of the railway line affected about 1,500 land registry records, 1,000 of which were expropriated by following the detailed and precise procedure prescribed by the Consolidation Act."*

Being aware that this was the most delicate aspect of the project in terms of relations with the people who live in these areas, Cepav Due put together a team of experts and lawyers who worked with the Consortium to limit difficulties and solve any diatribes thanks to an in-depth, precise and communicative approach with the local area.

*"The main critical issues," continues **Luigi Tezzon**, "arose, as is often the case, when*

we had to work on residential buildings, but thanks to professionalism and expertise in communication, we succeeded in our goal without any particular tensions or difficulties. To sum up, I can confirm that our work was mindful and sensitive, and this was possible thanks to the sharing of real estate valuation criteria, rapid negotiations, quick indemnity payments and definite time frames for the transfer of areas. This modus operandi provided answers and guarantees to land owners and enabled us to develop and maintain good relations with the local area by means of mutual trust

and open dialogue, essential factors for such complex and yet dynamic projects."

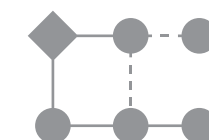
Once again this approach proved successful considering that, where possible, a solution was found that satisfied the needs of both the owners and the Consortium, ensuring the availability of land in line with the time schedule for construction.



39.6 KM
of High Speed line



90%
farming areas



11.8 KM
of interconnections



1,000
expropriations



1,500
land registry records

Substituting a quarry WAS NO JOKE

Building the new Treviglio - Brescia HS/HC line called for the overall movement of approximately 3,300,000 cubic metres of excavated material including aggregate material and soil.

The final plan for building the line, approved by CIPE with Resolution 81/2009, included authorisation for excavating from a borrow pit in the Municipalities of Fornovo San Giovanni and Mozzanica, where the majority of the necessary materials for building the new railway was to be extracted.

At the start of works, the imminent quarry activity in these areas met with some reluctance from local administration, prompted by the idea of defending the local area which is rich in brooks and farming fields and the fear of an excessive impact on the environment.

Mindful of the needs and requests of the local area, Cepav Due began to examine the alternative of delocalizing the borrow pit to another site; this possibility required the agreement of the Ministries of Infrastructure and the Environment and the Regional government of

Lombardy. The possible solution was identified in the Municipality of Covo by extending the quarry which had been recently used for other public works.

After receiving the agreement of the affected local bodies, all the relevant authorisations needed to be obtained in just a few months so that the contractor companies could make use of the necessary aggregate materials for building the new railway line.

It was necessary to pave an effective authorisation path in a limited time period, with the involvement of the Ministry of Infrastructure, the Ministry of the Environment, the Environmental Impact Assessment Commission of the Ministry of the Environment, CIPE, the Court of Auditors, as well as the Regional government in Lombardy.



*"From a certain point of view, recalls **Franco Lombardi**, President of the Cepav Due Consortium, "it was one of the most crucial situations we found ourselves in. We did not want to blindly impose on the area by opening new quarries, even though we had authorisation to do so, because we rightly believed that collaboration and our straightforward approach in dealing with the local area were essential for the success of the project. This always gave us a good degree of credibility in the eyes of our interlocutors."*

Therefore a possible critical situation was managed in such a way that satisfied the needs of the work site whilst respecting the local area.

*"In record times," explains **Mauro Gozzo**, Manager of Relations with Authorities, "in under a year and with an already-assigned contract, we managed to obtain the long sought-after authorisations from ministries and the CIPE approval to start excavating the Covo quarry, with assent from the local area."*



Archaeology and ordnance clearance, THE SECRETS UNDERGROUND

The building of the High Speed/High Capacity line also presented the opportunity to rediscover underground traces of ancient cultures in Lombardy. In particular, the building of the Treviglio – Brescia line enabled hugely important historical relics to be brought to light, as well clearing the area of some military ordnance which had been dormant since the Second World War.

After receiving CIPE approval for the railway project in December 2003, a wide-ranging investigation was launched with the aim of identifying the areas of possible archaeological interest. The commitment of the Cepav Due Consortium, helped by the Lombardy Government Department of Archaeological Heritage and specialist companies working in the field, enabled dozens of archaeological sites from various eras to be brought to light and subsequently surveyed.

During excavations, soil analyses were carried out to check for the presence of potentially active military ordnance, thus enabling an area of almost two million square metres of land to be cleared.

“Ordnance clearance and archaeological works progressed at the same time as the pro-

*ject thanks to the great professionalism and pragmatism of the protection authorities: the Lombardy Archaeological Department and the Military Engineering Landmine Clearance Department from Padua,” explains **Roberto Rutigliano**, Site Director for Ongoing Works and Project Control for Cepav Due, “When we were faced with discoveries, everyone worked in a highly professional way, always preserving the safety of works and the scientific and cultural importance of the finds. This all took place as quickly as possible to safeguard progress on our work site and our time schedule.”*

The ordnance clearance work led to the identification of three unexploded bombs from the Second World War which were deactivated. All the local inhabitants were saved from this potential danger.





“When we were faced with discoveries, everyone worked in a highly professional way, always preserving the safety of works and the scientific and cultural importance of the finds.”



➤ *“These operations were carried out by specialist companies under the supervision of the Superintendency to guarantee the surveying of sites and the recovery of finds without modifying their characteristics,” assures **Rutigliano**.*

On the archaeology front, from the end of 2011, a total of 44 sites of historical value and importance from various eras were identified. The most affected area was between Cassano d’Adda and Antegnate, with some very interesting finds from the Bronze Age (12th century BC) up to the Renaissance period (15th century AD).

Thanks to the guide and supervision of the Superintendency, some specialist companies completed the first stage of research (place name survey, study of aerial photographs, archaeological surface survey) before proceeding with the archaeological digs which, once completed, enabled the Consortium to proceed with works on building the railway line.

*“These operations were carried out by specialist companies under the supervision of the Superintendency to guarantee the surveying of sites and the recovery of finds without modifying their characteristics,” assures **Rutigliano**.*

Starting from the proto-historic period, there were 5 discovery sites in the areas between Caravaggio, Covo and Antegnate in the province of Bergamo, and Castel Gabbiano in the province of Cremona. Important remains of wooden houses were found at these sites. Dating from the Roman age, numerous necropolises were unearthed, some of great importance, like the one at Caravaggio, with 55 burials and a wealth of prestigious grave goods.

Near Roncadelle in the province of Brescia, the remains of a rustic villa were unearthed at the probable site of a small settlement in an area where there were no previous significant signs of historical settlements, whilst at Castrezzato, again in Brescia, a necropolis with 35 burials was discovered. The area was still largely inhabited in the Early Middle Ages and the Middle Ages, as shown by the presence of vast necropolises, like the one in Casirate d’Adda in the province of Bergamo, with a total of 100 burials, and small sites with extraordinarily beautiful and important remains, like at Masano in the municipality of Caravaggio in Bergamo, with grave goods and a

wooden case with the burial of a warrior in excellent condition thanks to the clayey characteristics of the soil.

In Castrezzato and Chiari, both towns in the province of Brescia, the excavation works brought to light various brick kilns which are testimony to the concentration of production facilities in the area and to an industrial vocation which still continues today.

At Romano di Lombardia in the province of Bergamo, an early-medieval settlement was unearthed with well-preserved wall structures which enabled a plan of the a village to be reconstructed with around 30 dwellings spread around a central courtyard and a necropolis with 155 burials. Lastly, from the Renaissance period, a furnace was found in the Masano hamlet near Caravaggio and a system for the flow and regulation of water to Covo, both in the area of Bergamo.



Legal checks

AS ANTIBODIES

Protecting the site and the completion of the works from infiltration by companies connected with criminality which, like predators, try to interfere with the completion of major works, was a complex yet successful task for the General Contractor. Furthermore, it is widely proven that working within the law also guarantees workplace safety. With this mantra, checks on the workers, resources, engineers and employees involved in building the Treviglio - Brescia line were carried out hand in hand with checks on individual companies.

The Cepav Due Consortium invested time and resources in tight monitoring of the legitimacy of companies involved in the works as **Elisabetta Vailati**, Cepav Due's Legal Department Manager, explains: *"In all of the contracts and sub-contracts concerning the execution of major works of significant economic and social importance for our country, the insertion of commitment to the 231 Law and an Ethical Code was prescribed, as well acceptance of the Legal Protocols aimed at preventing illicit and disreputable practices and guaranteeing maximum administrative transparency. For this project in particular, legal protocols were agreed with the Prefectures of Brescia, Bergamo and Milan to guarantee checks on potential mafia infiltrations in relation to contractors, subcontractors and suppliers for the Consortium. Around 2,300 anti-mafia records were processed in the 5 years of carrying out the works.*

In specific terms, all of the successful bidders had to follow principles of fairness and transparency sanctioned by the applicable laws and include stringent anti-mafia clauses in contracts with their own sub-contractors, sub-bidders and various bodies engaged in carrying out works. In this way, all of the sub-contracts following the awarding of the six contracts based on public tenders organised by the General Contractor were subject to preventive implementation of anti-mafia checks. Moreover, a series of clauses were provided which, in the event of illegal practices, gave the right to revoke the authorisation to the sub-bidder and to automatically terminate the contract, with the resulting elimination of the company from the site.

This was a sizeable task, yet the results were positive, as **Gianluigi Gauzzi**, Administration and Finance Manager, explains: *"The tight legislation and the Protocol for the Traceability of Cash Flows meant we were involved in a meticulous task of procuring extensive data from suppliers. This challenging operation brought its rewards, as in fact there were very few notable cases, whilst on the payment front, thanks to the traceability of flows, everything unfolded in a regular way, in line with legal and contractual deadlines."*



5

years of work



2,300

anti-mafia records

Theft and robbery: COPPER FEVER

Theft and damage as a result of strategic looting of the work site which was targeted in various places: this was something else Cepav Due had to deal with. Well-organised gangs of criminals entered the work site to steal the copper cables which were essential to the entire railway system.

In addition to the thefts, the structures along the line were vandalised, increasing the amount of damage caused to the whole work site.

The frequency of thefts, the sudden escalation of criminal acts and the damage which usually accompanies these raids were a tough challenge for Cepav Due which had to bring all of its resources into play to put an end to the looting of the work sites. *“It was an unexpected situation,”* explains **Francesco Raspanti**, Construction Director, *“they began to steal the extensive electric lines which run in both directions, and so the area they were operating in covered 50 km. It was a real disaster and we struggled to thwart these criminal acts given the length of the area to protect simultaneously.”*

The damage was not only economic, it was putting the continuity of work at risk and the possibility of keeping to Cepav Due’s tight deadline.

“In fact, the stolen material was not easy to recover, we needed time which we didn’t have and material had to be resupplied” recalls **Riccardo Scorsone**, Supplies Manager.

Not to mention the fact that it was then necessary to reintroduce the material into the project, but not even a night guard seemed to be able to put an end to the predatory ability of the thieves. In fact, the frequency of the thefts had become such a problem that it would have disrupted forecasts if a solution had not been put in place quickly.

Therefore Cepav Due involved the Local Authorities, including the Police Force.

“What was also needed was a bit of common sense and a pinch of imagination,” explains **Francesco Raspanti**, *“to resolve the situation. Classic surveillance agencies were not enough in this case and so we had to invent new standards. We equipped ourselves with advanced video surveillance systems which we had to purchase abroad because they are based on technology which was not available in Italy. They were in fact custom-made for our specific needs and climatic conditions, as there is often limited visibility as a result of fog in these areas. In practice we monitored the whole railway line with the help of the staff, the Police Force and technology, and from then on the situation improved.”*

“In fact, the stolen material was not easy to recover, we needed time which we didn’t have and material had to be resupplied”

Riccardo Scorsone





New infrastructure IS A **LEGACY** for the country

There is no exact science to calculating the effects that building a project like the Treviglio - Brescia line will have on the country, but the completion of the High Speed/High Capacity line has resulted in immediate benefits in the organisation of the rail service between two of the economic driving forces in Lombardy: Milan and Brescia.

Above all, journey times between the two main cities will be reduced, with the result that initially it will be possible to travel from one city to the next in 36 minutes, and when the urban access works to Brescia's Central station are completed, this will be reduced to 30 minutes. The journey time will be reduced by 30% compared to the current 46 minutes. It will also be possible to differentiate regional traffic flows from medium and long distance traffic, improving the punctuality and regularity of railway traffic in Lombardy, of medium and long distance connections with the rest of Italy and of transporting freight. Although these are the most obvious benefits of the new infrastructure construction, in reality this project leaves a long series of legacies, starting with reducing pollution thanks to better traffic management between Brescia and Milan and increasing the amount of rail traffic.

In more general terms, the optimisation of the High Speed line catapults the area into the Mediterranean Core Corridor, reinforcing the route from East to West, recognising and incentivising industry in the whole region. Boosting the railway connection is also a driving force in promoting new production activity which can ensure a lasting bond between these two cities in Lombardy.

"The high speed network," explains **Maurizio Gentile**, Chief Executive Officer and General Director of Rete Ferroviaria Italiana, *"provides a very wide area, around 25 million people, with the possibility of using green public transport. Demand in this sector grew by 81% between 2009 and 2013, and is continuing to grow year on year. The construction of new railway infrastructure has changed the travelling habits of the Italian population, reducing car use from 57.3% to 45.5%*

and aeroplane use from 10.5% to 7.2% in the areas affected by the new lines. The freight sector also benefits from the separation of traffic flows. In fact, by quadrupling the existing lines, freight companies improve their levels of regularity and punctuality thanks to the separation of traffic flows, using the numerous interconnections between high speed and conventional lines. This new vision contributes to the goal of transferring a share of goods traffic from road to rail, as indicated in the recent European and Italian strategies for sustainable development.

Yet the completion of infrastructure is so much more; it is undeniable and in fact proven by economic research that this type of investment has anti-depression effects in a period of crisis, and is in fact considered to be a factor for local development. This is precisely what has happened for the Treviglio - Brescia line, which was built between 2011 and 2016, exactly when the country was dealing with the toughest knock-on effects of the crisis which began between 2008 and 2009 and which struck world economies.

The completion of the Turin - Milan - Brescia HS/HC line also contributes to improving European railway transport for passengers and goods. *"In fact, the Mediterranean Core Corridor, the only one based in Italy, in Milan,"* stresses **Maurizio Gentile**, *"connects Spain, France, Italy, Slovenia and Hungary, and will soon also include Croatia. The Italian section from Turin to Trieste will form a connection with Eastern Europe, thereby developing strong partnerships and making the most of the development of the Suez Canal for expected new freight traffic flows from Mediterranean ports."*

It is clear that an area is increasingly competitive in relation to the infrastructure which it can put in place, because this is considered to be the real driving force or economic recovery. In fact there are many activities connected to the creation of infrastructure: *"Just think,"* comments **Corrado Bianchi**, *Director of Engineering and Construction for Cepav Due, "that each euro invested in the project generates five or six euros of wealth. The Treviglio - Brescia line is an attraction for suppliers and contractors, not only in the local area, with the considerable workforce as well as the related industries which are often overlooked. This is an economy which starts with the production of raw materials and goes as far as increasing business in bars, restaurants and hotel in the area."*

Take into consideration the workforce - an average of more than 5 thousand people - which was housed and fed during the project. Not to mention the myriad of companies which contributed to the various supplies and the many small-scale suppliers supported by working for Cepav Due. *"Of course, there are no precise figures for this,"* admits



Franco Lombardi President of Cepav Due, *"but overall the creation of the Treviglio - Brescia line has been a precious resource in one of the most difficult economic periods in history."*

In terms of employment, Cepav Due also provided an opportunity for professional growth for the many young people who came forward as students or interns and who are now employees with unique valuable experience which has enabled them to deal with the multiple production contexts in an important infrastructure project.

Train travel has always been seen as the means of public transport with the least environmental impact and contributes to developing a major project of sustainable mobility and logistics. *"A single piece of data sums up the importance of this choice,"* continues the Chief Executive Officer of Rete Ferroviaria Italiana, **Maurizio Gentile**, *"each rail passenger produces on average 70% less greenhouse gas compared to those who fly and 60% less than those who travel by car."*

And it is not just the strictly economic or infrastructure elements which represent the project's tangible legacy. Benefits for the local area include the resolution of a series of notable environmental issues. Polluted sites were

reclaimed and land fills were cleaned which otherwise would have been left in the open air. Cepav Due's building of the Treviglio - Brescia line has also meant the creation of something which otherwise would never have happened in the local area.

Small-scale and large-scale operations took place, from the removal of blast furnace waste which was unexpectedly discovered, to the creation of small bypasses to alleviate traffic and divert heavy goods vehicles from many settlements.

The Treviglio - Brescia represents all of this; Cepav Due and all the staff involved in the completion of the project are aware of having left a considerable legacy for the country in terms of public health, economic and infrastructure progress for the whole eastern area of Lombardy, in terms of travel and production, as well as in terms of environmental impact and pollution reduction thanks to the use of rail.



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In the creation of the HS/HC Treviglio - Brescia line, the Cepav Due Consortium has benefited from the collaboration and professionalism of numerous companies. Some of them have participated in this publication:



HS/HC **TREVIGLIO - BRESCIA** five extraordinary years

The new Treviglio - Brescia High Speed/High Capacity railway line: the story of an Italian infrastructure project, completed by Cepav Due and forming an integral part of the Mediterranean Core Corridor. The launch of a new section through the provinces of Milan, Bergamo and Brescia, completed within the time schedule and budget, with high levels of complex management requiring constant, ongoing discussions with numerous parties.

