

PROJECT SCOPE

- 20,000 workers
- 113 affected towns
- 302 km of track
- 38 km of connections to existing track
- 285 bridges
- 117 cities, 6 departments, 3 regions
- 400 major civil engineering structures
- 14 "Natura 2000" protected sites
- 220+ protected species
- 50-year operations and maintenance requirement

THE CHALLENGES

- Efficiently manage a highly-complex, distributed project
- Effectively address local residents' concerns to garner public support
- Mitigate environmental effects along a sensitive 340 km corridor

THE SOLUTION

Use SkylineGlobe's 3D geospatial visualization software suite to coordinate, integrate, and display disparate data sources in a single, interactive 3D environment that brings to life the project's ultimate plan and vision, increases public support, and minimizes environmental impact.

THE RESULTS

The \$10.06 billion project was completed ahead of schedule, on budget and with public approval in early 2017.



[Image by Komenvoir](#)



SKYLINEGLOBE FOR RAILWAYS

High-speed rail between Tours and Bordeaux: Managing the world's biggest rail concession contract

ABOUT IGO

IGO has been a Skyline partner since 1998. The company is a leading provider in France of 3D services & software design:

- Skyline 3D software reseller and associated services
- Solutions development: Web geoportals and 3D GIS
- Hosting and web service provider (SaaS-Cloud) for 2D/3D GIS solutions
- Virtual & augmented reality solutions



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BACKGROUND

In June 2011, following a competitive bidding process, Réseau Ferré de France (RFF) awarded the world's largest ever rail concession contract to LISEA (Ligne Sea Tours – Bordeaux), a consortium company led by VINCI Concessions. They were tasked with managing the financing, design, construction, operation and maintenance of a 340 km high-speed line connecting the French cities, Tours and Bordeaux. This high-speed rail would bypass the cities of Libourne, Poitiers and Angoulême, slashing travel time between Paris and Bordeaux from 3 hours 15 minutes to 2 hours and 5 minutes.

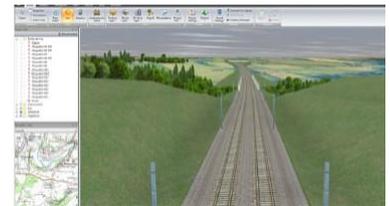
The project would involve construction of over 400 major civil engineering structures, including 302 km of high-speed rail line, 38 km of connecting rail line, 19 viaducts, 5 underpasses (one almost two kilometers long), 285 bridges, 15 grade-separated junctions and seven cut-and-cover tunnels, spanning three regions.

ABOUT COSEA

COSEA is a consortium of companies led by Vinci Construction, including Eurovia, VinciEnergies, BEC, NGE, TSO, Ineo, Inexia, Arcadis and EgisRail.

Challenge 1: Sheer Size of the Project

With only six years to complete the entire project, the 340 kilometers of track were divided into 16 work packages grouped in seven geographical sections, to be worked on simultaneously. Within each geographical section, each discipline created an independent model, based upon the architect's original model.



To manage this complex project efficiently, a single interface was needed that would integrate and display disparate data sources from across these various disciplines in a single intuitive 3D visualization. This common operational picture could be used to plan collaboratively and to visually expose potential design conflicts that would force late design changes, which would cause delays, result in increased materials costs and force budget overruns.

After an in-depth search for a 3D comprehensive visualization solution and a call of tender, COSEA (the design-build construction joint venture, which was awarded the project's design and civil engineering works) selected Skyline's SkylineGlobe software for web-enabled 3D information mapping and analysis. Using Skyline's software, the global project and the different construction options were displayed in 3D, providing all interested parties with rapid access to extensive data from multiple agencies and sources in its geographic setting. Employing user-friendly interfaces, operators performed on-the-fly dynamic analysis that did not require offline pre-processing by specialized analysts using complex desktop applications.

IGO, a Skyline software partner since 1998, guided COSEA in the adaption of the



Skyline software to their specific needs. Using Skyline's TerraBuilder to work with their own proprietary geospatial data, COSEA merged aerial photos, satellite images, and digital elevation models from different sources and in different formats into a photo-realistic, geographically accurate terrain database. This terrain model was then fused in Skyline's TerraExplorer software with detailed feature and information layers, including models of existing and proposed roads, bridges, and infrastructure, to create a high-resolution, 3D visualization environment that provided an integrated, accessible view of the entire project. The use of Skyline tools and processes fostered communication, coordination, and collaboration among all project stakeholders, greatly increasing the level of confidence in the design, the schedule, and the overall execution of the program.

During the construction process, this same interface was used to visually present crucial operational information in conjunction with related geographic data, facilitating efficient infrastructure and asset management.

Challenge 2: Public Opposition from 113 Impacted Towns

With the scheduled completion of the project, trains traveling at up to 320 km/h would reduce the journey between Paris and Bordeaux from three hours to just over two, but residents of the affected towns were uncertain that it was worth the cost. Would the noise barriers, designed to be constructed up to six meters high ruin the views of the historic center? Would there be a negative effect on existing green spaces and water conservation areas? Did the height, form and design of the building fit in with surrounding architecture? "The local population was very afraid of the impact we might have," Xavier Neuschwander, Chairman of VINCI construction and a civil engineer, acknowledges.



To counter environmental and local concerns, more than a hundred meetings were held to inform and consult with the thousands of people living close to the project. A crucial component of these meetings involved viewing, navigating, and analyzing accurate 3D representations and animations of the plans created with Skyline's TerraExplorer. These rich visualizations brought to life the ultimate plan and vision for the completed project, as well as provided critical topographical/ geographical information that increased public understanding and acceptance of various regional blueprint principles.

Concerned parties could interactively navigate through the photo-realistic 3D model of the planned rail, independently answering their questions, before construction began, and without the misconceptions that invariably result from picturing a 3D form based on 2D drawings. With intuitive imagery and snapshot comparison tools, people could easily compare before and after views of the affected area and evaluate alternative proposals, as well as see the plans for the different stages of the construction process. With TerraExplorer's wide array of line of sight and shadow analysis tools, users could understand and debate issues such as structure height and placement.

"It's the cohesion between all the participants, whether VINCI or partner companies [that matters]. Just like in an [international] rugby tournament, everyone has to forget what club he belongs to and push together in the scrum to win possession of the ball!"

Xavier Neuschwander, Chairman of VINCI Construction

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Challenge 3: Environmental Preservation

Passing through no fewer than 14 Natura 2000 sites, the Tours-Bordeaux line threatened the habitat of 220 endangered species of flora and fauna. "It is a complex ecosystem that we are disrupting," acknowledged Lorène Dumeaux (Project Manager - Biodiversity



Foundation), who worked with local conservation organizations to minimize impacts to the environment and preserve greenspace and biodiversity in the Paris-Bordeaux corridor.

In an effort to understand preexisting conditions, and integrate all possible measures into the design plan that would avoid, reduce, and compensate for any adverse environmental impact, much preparatory environmental analysis was performed in 2011 and 2012 (e.g. slope stability, erosion control, air emissions) and sensors were installed for pollution monitoring and soil analysis.



Engineers and architects used Skyline TerraExplorer's advanced analysis tools including slope/contour maps and measurement tools. These analysis tools complemented the realistic 3D visualization also in planning restoration aspects of the project: Where should infill and redevelopment occur?

What areas were off limits? What was the proper slope for clear-span bridges and open-bottom culverts construction to reestablish natural water flow?

Results

In the words of Philippe Bour, the project integrator:

"Skyline's software has played a critical role in the efficient management of this rather massive project, but even more importantly, it has enabled us to share plans with the public in such a way that they could accurately envision what would be built six years later. We were able to allay many concerns in this way, as well as receive valuable feedback that led to adjustments of the final design. With the construction phase complete, the comprehensive 3D visualization that we created will continue to be invaluable for operational management, maintenance, and customer service."

