

DIGITALIZATION AND INNOVATION

# Infraverse, Ferrovial's metaverse for infrastructures

The metaverse has come into our lives. Ferrovial wanted to take a step forward in the industry with the creation of its Infraverse, dedicated to infrastructures. Infraverse is developed in an open ecosystem to maximize the number of advanced technologies with immersive and interactive environments. This allows Ferrovial to drive a new generation of sustainable and efficient transport infrastructures, achieving advanced operational capabilities throughout the asset lifecycle.

## REAL-WORLD SIMULATIONS

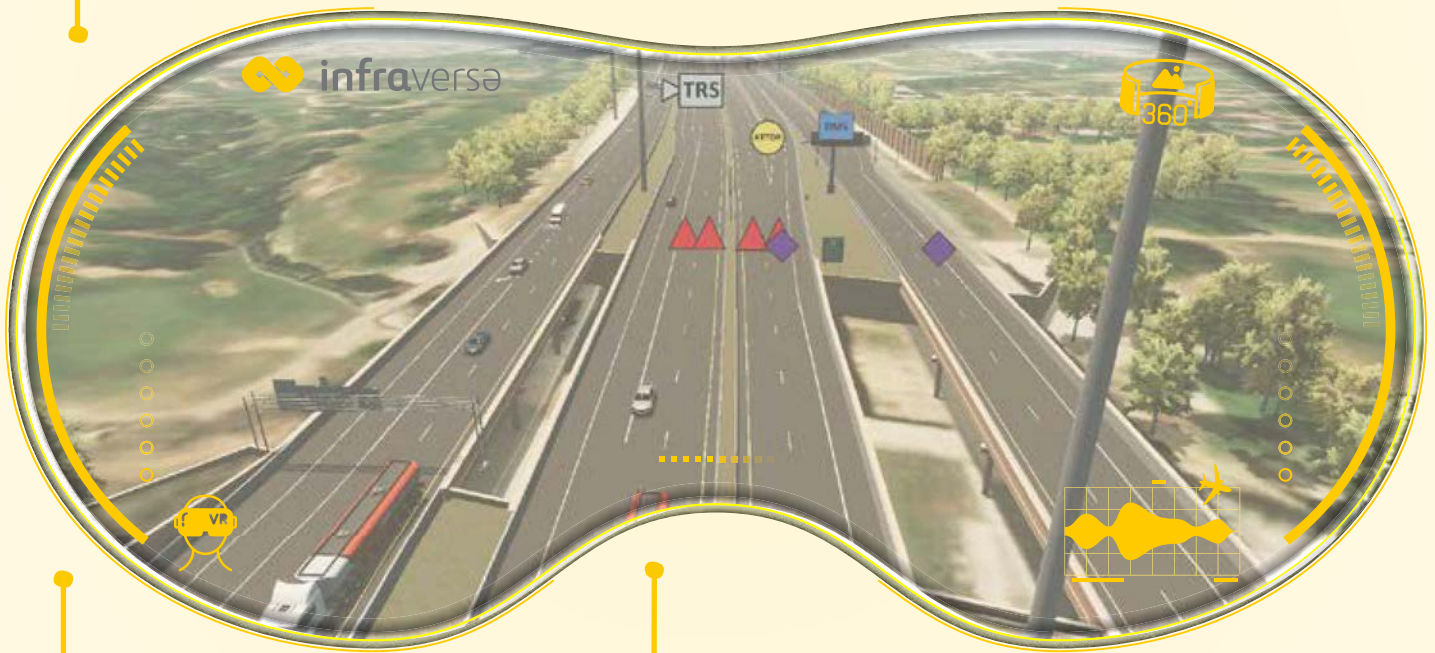
The use of Digital Twins allows to simulate, predict and reproduce digital representations of real-world infrastructures like traffic or weather. It provides digital representation throughout the construction, operation and maintenance phases.

## BUSINESS APPLICATIONS

Infraverse provides operational improvements in design reviews and on-site decision making. It also improves services and user experience, as well as employee health and safety.

## LABS NETWORK

Infraverse has a network of labs, physical spaces where hardware and software are available, key to experiencing immersive infrastructure. There are currently Labs in Madrid and London and there are plans to expand in the near future.



## METAVEVERSE TECHNOLOGIES, OPEN ECOSYSTEM

### TECHNOLOGIES

- AR and VR
- Digital Twins
- Internet of Things
- 5G
- Artificial Intelligence
- Blockchain

### FEATURES

- Cloud technologies to create virtual environments
- Multiple technologies to ensure interoperability
- Sensation of presence
- Interaction through seamless interfaces
- Lab spaces to provide "a window" on the Infraverse

## VALUE USES CASES IMPLEMENTED

### EFFICIENT OPERATIONS

- Teleoperations
- HUB for remote operations
- Reduce risk on complex or isolated areas
- Validating designs based on O&M impact
- 3D model design review

### HUMAN IN THE LOOP

- Communities immersive experience of infrastructure
- Simulate traffic conditions
- Behavioural science

### SUSTAINABILITY

- Bringing together global teams
- Reducing travel time and cost
- Remote collaboration and connectivity
- Remote assistance

### SAFETY

- VR training for Health & Safety
- Reducing hazard exposure

### DIGITAL TWINS

- Infrastructure simulation, Airports
- Advance simulation, connectivity networks

DIGITALIZATION AND INNOVATION

# Transforming the company

Ferrovial develops innovative digital solutions that connect and transform the company, generating value and enabling new business opportunities. In order to meet these challenges, Ferrovial invests significantly in technology.



In 2022, the implementation of Digital Horizon 24 plan was accelerated, designed to strengthen the company's innovation and digitalization, and which play a fundamental role in its transformation process. Among the main challenges of the plan is to determine how to respond to Ferrovial's transformation needs and orient innovative activity to meet them.



With the aim of strengthening the business through digitalization, and supporting transformation and future growth, the company focuses on automation, efficiency, competitiveness, agility, capture and effective use of data, while fostering an entrepreneurial and digital culture.



In this sense, enhancing transversal capabilities, such as the contextualized use of data, cybersecurity, the use of platforms, business alliances or the review of processes is key in the company's digitalization process.



As part of the Journey to Cloud global program that will channel all initiatives in the transformation of Ferrovial's digital ecosystem, work is being done to modernize native platforms to improve their interface, automate processes, mitigate risks and eliminate obsolescence or reduce time-to-market.



## IMPACT-ORIENTED DIGITAL TRANSFORMATION

Digital transformation is materialized in a results-oriented management, measured through a new digital portfolio management tool that unifies all technology and innovation initiatives. Transformation impacts are quantified through value levers, the result of all crosscutting or specific initiatives carried out in each business:

- Digital Construction, supported by the Abacus program and centered on the digitalization of site management and administration processes.
- Digital Concession, with a focus on the end user as a lever for differentiation and value creation and also diversification into new businesses such as energy, water or mobility.
- Digital Corporation, to digitalize processes such as finance and control and human resources.

## INNOVATION STRATEGY

Ferrovial's innovative activity develops competitive advantages and guarantees a sustainable impact by transforming the business and generating new products and services through exploration and experimentation with new technologies. It is a process that begins with the definition of the priorities of the business units, with the main objective of obtaining competitive advantages.

To ensure a sustainable impact aligned with Digital Horizon 24, Ferrovial has established a new Innovation Strategy 2022-24 focused on generating impact on the following areas:

### Competitive Advantages

By means of operational efficiency and risk management, the innovative activity drives and develops the implementation of new products and processes that generate a greater quality service to its customers.

In 2022, INFRAVERSE, an initiative for the efficient use of the technologies that make up the metaverse, was launched. The aim is to improve construction and operation processes, providing a better response to customer needs.

On the other hand, the deployment of digital capabilities and tools has enabled the optimization of design and management processes for new infrastructures. These are solutions that analyze demand by simulating variables that allow us to identify each business opportunity, considering value and risk variables. Additionally, new generative and parametric design techniques have been explored and implemented, allowing to obtain a better approximation of the design of the transportation and/or energy infrastructure in a more efficient approach.

Likewise, the implementation and use of digital tools in the operation, such as the transversal asset management tool, enables a better overall understanding of the performance and functionality of the assets. By complementing this tool with simulation capabilities in digital twin environments, cloud and data platforms, Ferrovial is able to optimize performance throughout the entire infrastructure lifecycle.

DIGITALIZATION AND INNOVATION

# Innovation: leading transformation and emissions reduction

Innovation is an essential component not only of the Horizon 24 strategic plan, but also of Ferrovial's mission and values. This year several projects all along the value chain have been scaled: efficient asset management and improved digital and user-centered solutions focusing on competitiveness, health and safety and emission reductions.

## COMPETITIVENESS

### Carbon Management Solution

Digital platform for quantifying carbon emissions in the different stages of infrastructure projects, enabling the control and reduction of emissions.

### Low Carbon Concrete

Ferrovial Construction is leading this project to analyze and test innovative concrete solutions. The project -which consist of the optimization, cement replacement, zero emissions and circular economy phases- are carried out on Ferrovial Construction sites.

## RISK MANAGEMENT

### VR Training Simulator

This simulator incorporates virtual reality technology for health and safety training. It allows an exposure to risk situations that can be arise in the workplace.

## EFFICIENCY

### Asset Management Platform

Asset management platform (roads, railroads, energy infrastructure, water treatment plants). The solution is integrated with BIM modeling tools, allowing data management throughout the lifecycle of a project.

## DIVERSIFICATION

### Vertiports Design Challenge

Ferrovial and AECOM have developed a platform to design new ideas and concepts for vertiports. Different teams compete in the search for the best solutions.

### Smartformwork

Intelligent formwork system that enables real-time control of pressure and temperature, facilitating the optimization of work cycles and achieving greater safety in the concreting process. This is a further step in the commitment to the digitization of construction sites.

### NextPass by NextMove

Nextpass is the first digital mobility product from Nextmove, the new digital hub of Cintra US. Launched on the opening day of Ferrovial's I66-Outside the Beltway in Virginia, Nextpass is the mobile app for iPhone and Android that allows payment on any toll road, bridge, tunnel or express lane in the state of Virginia, without the need for a transponder or toll tag (more info at [www.nextpass.io](http://www.nextpass.io)).

## TRANSFORMATION

### Demand Analysis

A set of projects aimed at incorporating different data sources (mobility, demographics, noise, pollution) in the analysis and characterization of demand models during the early stages of an infrastructure project.

### Infraverse

Virtual reality tool that tests real driver reactions, without interrupting traffic, modeling the psychological impact that slight changes in infrastructure can have on their decision making. It will provide valuable data before executing any changes in toll roads operations.

Finally, sustainability, considered as one of its main pillars for the creation of higher quality and resilient infrastructures, has led to the implementation of a work program with low carbon footprint materials that aims to identify and standardize the use of more sustainable materials.

### Transformation

In an increasingly changing world, Ferrovial relies on transformation as a key lever to adapt to the constantly evolving demands of the market and its customers. In innovation, business transformation is managed in the centers of excellence, knowledge centers in three critical areas: mobility, asset management and energy and sustainability.

During 2022, the Energy and Sustainability Center of Excellence was launched to directly support the recently created energy business unit. Projects such as Ikongreen and the carbon footprint measurement tool have been developed within this center.

In parallel, Ferrovial promotes the industrialization of the entire construction process by synchronizing the production and assembly of components with the supply chain and logistics planning. To this end, it works on projects that provide modular construction capabilities, automation, robotization, teleoperation and 5G connectivity. Thanks to projects such as AIVIA, it drives the adaptation of its infrastructures to contexts such as those of connected and autonomous mobility.

Continuing to transform Ferrovial's business is a transversal task that is approached from a global and comprehensive perspective at all stages of the infrastructure lifecycle.

### Diversification and growth

By launching new adjacent businesses, and taking advantage of Ferrovial's internal capabilities and knowledge, the company's businesses are diversified. For this reason, in 2022 the venture-building process was created to develop and launch business ideas.

The creation of new products and services will continue to increase the value generated for the client, providing new digital channels and additional sources of income. In this context, Ferrovial has launched NextPass, a payment application for Managed Lanes, a new personalized tolling method.

### **OPEN INNOVATION ECOSYSTEM**

Ferrovial has been promoting and increasing its open innovation ecosystem and network of alliances for years. This ecosystem is made up of five agents that nurture, strengthen and complement Ferrovial's knowledge, capabilities and talent.

The first of these agents is the relationship with **universities and research centers**. It is worth noting the research collaboration with the Massachusetts Institute of Technology (MIT) through the energy initiative (MITEI), renewed in 2021 for a third five-year period, and through the MIT Mobility Initiative (MMI), which Ferrovial has joined in 2022 as a founding member. The aim of the latter agreement is to contribute to the design of a mobility system that is sustainable, safe, clean and inclusive.

**Startups and Venture Capital funds** are the second and third key players. During 2022, the successful relationship with the brightest entrepreneurs in the major global innovation hubs in the United States, Europe and Israel has continued to connect them with the organization and accelerate the innovation process. In this regard, the company is always open to test the most disruptive technologies and business models in its infrastructures and prove their validity in a real environment.

In relation to Venture Capital funds, Ferrovial has expanded its investment strategy by acquiring stakes in specialized venture capital funds whose investment strategy focuses on construction, energy and mobility. This is the case of Atómico, a benchmark venture capital fund in Europe, in which Ferrovial continues to be one of the participating corporate partners.

The fourth agent is the **Public Innovation Agencies**, which are responsible for establishing industrial policy, mainly by facilitating access to public funding. These programs, of different types, are supported both by the Spanish Recovery and Resilience Plan (NextGenEU) and European initiatives linked to the EU Community Framework (2021–2027), with instruments such as Horizon Europe, LIFE or specific thematic vehicles such as the Climate KIC, EIT Digital, EIT Urban Mobility or InnoEnergy, in addition to their counterparts in the United States. Ferrovial has a portfolio of initiatives aimed at deploying smart and resilient infrastructures to improve the energy efficiency and sustainability of the territory.

Collaboration with **large corporations** is the fifth agent. The aim is to seek synergies, complementing knowledge capabilities and sharing best practices in innovation management. In this area, Ferrovial's **internal talent** stands out, enabling it to leverage its own intellectual capital to devise and market projects in the most efficient way, favoring collaboration among employees.

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## ATLAS, the unified digital portfolio tool

Ferrovial has developed ATLAS, the new digital tool that centralizes IT and innovation initiatives, from their conceptualization to the capture of their final impact on the business. In this regard, ATLAS unifies this management under the same standard and process, facilitating its alignment with the strategic plans of the different business lines and maximizing the impact they can generate.

Digitalizing and unifying management provides considerable benefits such as the homogeneity of the same process, having a single source of information, transparent collaboration between teams, as well as integration with other digital tools deployed in the company.

ATLAS has also enabled the implementation of a governance model that ensures constant communication and exchange of information between the portfolio department and the business units, facilitating the monitoring of initiatives and strategic, operational and budgetary decision-making related to Ferrovial's investment in IT and innovation.