

INNOVATION

Digital transformation and competitive advantages

Innovation at Ferrovial is a process of exploration and learning aimed at driving the company to improve its ongoing processes, transform its services and products, and develop new opportunities for the transport, mobility and energy infrastructure business.

R&D INVESTMENT

59.9

MILLION EUROS

PROJECTS DEVELOPED IN 2021

128

PROJECTS WITH STARTUPS

35

NEW APPLIED TECHNOLOGIES

18

Innovation is, has been and will continue to be fundamental to improving existing business models and exploring new ways of adding value to Ferrovial, committed to continuing to increase its digital and innovation ratios and supporting the transformation of its business units and physical infrastructures through its Digital Horizon 2024 plan.

HORIZON 24 DIGITAL PLAN

Digital Horizon 24 is the mirror program of the Horizon 24 Strategic Plan and tackles digitization and innovation in Ferrovial. It is a fundamental approach of transforming the core of the company, acting on different value levers related to business objectives: effective risk management, efficiency, customer-focused competitiveness, differentiation in the core business and diversification, to grow in new areas.

In order to make it a reality, Ferrovial requires a series of capabilities that will provide them with each of the six key digital enablers, with innovation as the main accelerator: the contextualized use of data throughout the organization, supported by its PANGEA platform; cybersecurity, to control and secure its activity; technology platforms, for flexibility and agility; partners, to complement its capabilities; reengineering and automation of processes; and digital culture, transforming all employee experience processes supported by Workday. It is a relevant requirement to exploit these transversal capabilities with a clear vision of adding value to the business.

Therefore, Digital Horizon 24 is completed with specific itineraries for each of the businesses, with more precise objectives:

- Digital Construction supported by the Abacus program and based on the digitization of construction management and administration processes.
- Digital Concession, with a user-centric approach as a lever for differentiation and value creation, as well as diversification into new businesses such as energy, water and mobility.
- Digital Corporation, to digitize processes such as finance and control and human resources.

A REFERENCE IN THE INFRASTRUCTURES OF THE FUTURE

In a technological and interconnected world, smart transportation and energy infrastructures are evolving and undergoing an extraordinary transformation. In this context, fostering innovation has enabled Ferrovial to position itself as a global leader in the management of connected and orchestrated infrastructures.

In this line, one of its most relevant projects stands out: AIVIA Orchestrated Connected Corridors, a key project for the development of 5G smart roads to improve the experience and safety of users on toll roads and the workers who maintain them, in mixed traffic scenarios, i.e. where connected and autonomous vehicles coexist with conventional vehicles.

Another significant event was the launch of the Ferrovial Vertiports division. One of its first initiatives will be the development of a network of more than 35 vertiports for electric vertical take-off and landing aircraft, known as eVTOLs. This infrastructure, necessary for safe, high-speed, zero-carbon air mobility, will be launched in Florida and the United Kingdom, in partnership with startups such as Lilium and Vertical Aerospace.

INTELLIGENT HORIZON-BASED MANAGEMENT

Having a well-managed innovation portfolio that allows a balanced investment in different trends, technologies and use cases to generate a broad portfolio of strategic options is essential to take advantage of the opportunities that arise. A diversified portfolio in terms of geographies, businesses and horizons allows to capture value and take advantage of opportunities in a changing and accelerating market.

Ferrovial works with an approach based on three growth time horizons as a means of categorizing its portfolio of projects in an organized, systematic and intelligent manner. Different project portfolios are thus formed to achieve and improve the profitability, sustainability and efficiency of its operations.

In the **short term**, the first of the horizons aims to achieve impacts on its more traditional businesses through proofs of concept and pilots, which are then scaled up when the expected results are achieved. These pilots are leveraged in disciplines including automation, digitization, data processing and analytics or artificial intelligence, led from the Digital Hub.

In the **medium term**, Ferrovial applies innovation in a transversal and transformational way to increase the value of its assets through integrated management of the global infrastructure lifecycle. To this end, it relies on the Center of Excellence for Mobility and Digital Infrastructure and the Center of Excellence for Asset Management.

This horizon also includes the exploration and implementation of innovative technologies that have not yet reached their full potential, such as 5G. In this regard, Ferrovial has deployed one of the first private 5G SA (Standalone or complete) communications networks in one of its flagship infrastructure projects in London, at the Silvertown Tunnel project.

In the **long term**, Ferrovial also explores future opportunities with a high degree of uncertainty through the What If? program, which focuses on trends such as Digital Twins or new forms of transportation that can transform lifestyles and cities. In this area, studies have been carried out on Urban Air Mobility, Urban Logistics and, most recently, Connected and Autonomous Vehicles (CAV), the most relevant results of which have been published on the digital portal Foresight.

SHARING KNOWLEDGE

The need to share knowledge, collaborate and maintain a global vision of innovation among employees and business units has taken on a fundamental role in recent years. This demand has been transformed into an internal and collaborative platform for shared knowledge, Nexus, which acts as a cloud of resources fed by the entire community and which contains highly relevant content such as the trends that Ferrovial monitors, the most important innovation projects and periodic trend reports: Infobits and White Papers, interviews with startups, and much more.

OPEN INNOVATION AND TALENT CULTURE

One of the great innovation levers for the joint development of high-potential opportunities are partnerships. For years, Ferrovial has been responsible for continuing to cultivate and increase its open innovation and partnership ecosystem. The company's innovation ecosystem is strengthened by a dense network of alliances and collaborations in major global innovation hubs such as Israel, the USA, Germany and Asia.

Some collaborations are being carried out in a coordinated manner. For example, Ferrovial has joined INDESIA as the only industrial partner in

the sector to promote the adoption of AI at the industry level, bringing great potential for internationalization of the initiative. This consortium is a catalyst for the adoption of this type of disruptive technologies.

Ferrovial also draws on agents that enhance its capabilities, such as universities and research centers. It should be noted the research collaboration with the Massachusetts Institute of Technology (MIT), renewed in 2021 for a third cycle, and the new MIT Mobility Initiative (MMI) which Ferrovial joins by signing a five-year collaboration agreement with an initial two-year term as a Founding Explorer Member, along with Ford and Hyundai, among others, to address challenges in connectivity, audiovisual policy, electrification and data mobility. It is also worth mentioning the Public Innovation Agencies, which facilitate access to funding for innovation projects such as Climate KIC, EIT Digital or Urban Mobility KIC. In parallel, in the context of the EU's Next Generation plans to improve the energy efficiency and sustainability of cities, Ferrovial has deployed a portfolio of initiatives to develop this potential in the field of energy rehabilitation of housing.

The other two agents are startups and Venture Capital funds. In this regard, 35 projects have been carried out with startups in 2021 and it has invested in Lilium, a German vertical take-off and landing electric aircraft company, and Neutron, a NaaS (Networks as a Service) platform to massify private LTE and 5G networks for industry, smart cities and rural areas. In addition, Ferrovial is one of the partners participating in Atómico, a European venture capital fund that invests in technology startups, boosting their growth on a global scale and thus multiplying their business opportunities.

Finally, at the center of this ecosystem is Ferrovial and its internal talent. It is key to develop an internal culture of innovation capable of dealing with the different agents in the ecosystem and maximizing its potential. Ferrovial has the Zuritanken program for internal participation of all employees to solve the company's own challenges in a creative and innovative way.

During 2021, it has incubated the Objective Zero project, applying sustainable innovation in works. It has also carried out the Shuttle program, the first intrapreneurship program implemented in Ferrovial Construction, which seeks to respond to the two major challenges facing the company: the optimization of collaboration with the supply chain and the automation of processes through the collection of information.

XR-Lab

In 2021, the Asset Management and Process Digitization team has enabled a hybrid Extended Reality (XR) space to allow the company to experiment with different technologies, including virtual reality, augmented reality, IoT and driving simulation, which are intended to support real use cases and can potentially be scalable to different businesses or spaces. Within these technologies, a human-sized immersive space has been placed in a room that has not only been built in Madrid, but also in Ferrovial's London offices for collaboration between the two spaces.

Innovation: Always on the way

Innovation represents one of the key priorities for Horizon 24, the Ferrovial Strategic Plan 2022-2024. The company applies innovation criteria to offer customers and users products and services that guarantee a unique experience. These are some examples of Ferrovial's state of the art categorized under 7 innovation dimensions. Let's go.

1.

DATA DRIVEN MANAGEMENT

Plans to improve the value of data and gain a complete view of customers, performance, efficiencies, etc.

Real-time Propensity Factor (Rtpf)

Machine Learning techniques to understand real drivers preferences and adjust managed lines tolls

Cost Projections

Web tool that incorporates AI in the calculation of the cost variation in the construction bidding processes



2.

MOBILITY

New technologies for adaptation and anticipation to the new complex mobility landscape

Ground Mobility for Air Services (GMAS)

Solution to facilitate spatial analysis, by blending and integrating geospatial data sources to support business processes

3.

SAFETY

Plans and technologies to improve the safety conditions of workers and users

IM-SAFE

New standard in monitoring of trends, challenges, best practices, and technology, for safety of transport infrastructures



4.

AUTOMATION

Application of robotics and new digital devices to promote a safer environment, improving productivity and efficiency

Parametric Tower Design

Module for the optimization of the design of electrical towers. It is based on the optimum geometry in the dimensioning of the metallic structure and the tower foundations

5.

DIGITALIZATION

To find out efficiencies in information transfer, delivery methodologies and digital solutions

Smartformwork

Development of a multi-sensor intelligent system (temperature and pressure) for formwork trolley which operates in tunnels



6.

SUSTAINABILITY

Technologies that contribute to capture opportunities related to climate change and the circular economy

Objective ZERO

To provide sustainable electric energy to civil works from photovoltaic solar panels. The potential saving reaches a 90% of the electric cost

7.

ENGINEERING

Identify new construction procedures and discover new materials

Apolodoro

Development of a sensor-based auscultation methodology to determine the stress effects in prestressed reinforced concrete bridges

