THEMATIC AGENDA
2026-2028

CEDEX



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Cover photograph ***"Progress"***
Railway viaducts over the River Ulla, viewed from the Gundián lookout point in Ponte Ulla, Vedra, A Coruña
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1st CEDEX Photography Competition (2022)

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FOREWORD TO THE THEMATIC AGENDA

We are at a pivotal moment in addressing some of the major challenges that will shape our society's future. Adapting to climate change, managing water sustainably, strengthening infrastructure resilience, transforming mobility, advancing the ecological and energy transition, and responding to demographic change all demand robust answers grounded in knowledge, innovation and the ability to anticipate what lies ahead.

In this context, the contribution of scientific and technical bodies in support of public administrations is becoming ever more important. As a leading organisation in civil engineering, water, transport and the environment, CEDEX has a responsibility to generate knowledge, provide technical evidence and support public decision-making, helping to achieve safer, more sustainable and more resilient development.

The CEDEX Thematic Agenda 2026-2028 is driven by that same commitment to public service. Its aim is to identify—working closely with the directorates we support—the areas of action and research where CEDEX can make an especially meaningful contribution to meeting today's and tomorrow's challenges. It is a tool for setting our priorities, strengthening our capacity to respond, and ensuring our efforts are focused where they can deliver the greatest benefit to society.



Áurea Perucho Martínez

Director of CEDEX

Ministry of Transport and Sustainable Mobility

This Agenda builds on the CEDEX Strategic Agenda 2023–2025 and is grounded in an analysis of the evolving national and international context, technological change, new demands from public administrations, and emerging needs across our areas of work. This exercise has enabled us to review our lines of work, strengthen those of strategic importance, and identify fresh opportunities towards fulfilling our mission.

Likewise, the reflection undertaken ahead of its preparation has highlighted the need to continue strengthening our scientific and technical capabilities, our infrastructure and equipment, as well as the talent and specialist expertise of our staff. It has also helped to identify the potential of new technologies to enhance our research activity, improve the efficiency of our processes, and broaden the scope of the services we provide.

The priorities set out in this Agenda are mirrored in the CEDEX Strategic Plan 2026–2028, developed in parallel. While the Thematic Agenda defines the main challenges, areas of activity and research lines that should guide CEDEX's scientific and technical work over the next three-year period, the Strategic Plan sets out the objectives, capabilities and actions required to deliver it. The two documents are complementary and together provide a coherent framework to steer the Organisation's activity and progress towards fulfilling its mission.

Through this Agenda, we reaffirm our commitment to public service, technical excellence and the creation of knowledge that is genuinely useful to society. Together with the new Strategic Plan, it sets the framework that will guide CEDEX's work in the years ahead, enabling us to continue contributing—alongside public administrations and all stakeholders—to addressing the major challenges of our time and moving towards a more sustainable, safe and resilient future.

> The Thematic Agenda is a tool for setting our priorities, strengthening our ability to respond, and ensuring our efforts are focused on those areas where they can deliver the greatest benefit to society

AREAS OF ACTIVITY

WATER | COASTS | MOBILITY AND TRANSPORT | ENVIRONMENT | BIODIVERSITY | INFRASTRUCTURE | HERITAGE

CROSS-CUTTING CHALLENGES/OPPORTUNITIES

SECURITY AND RESILIENCE | SUSTAINABILITY | DIGITALISATION | CLIMATE CHANGE | AI

THEMATIC AGENDA

WHAT DO WE WORK ON?

NEW CHALLENGES AHEAD

SCIENTIFIC AND TECHNICAL PRIORITIES

LINES OF ACTIVITY AND RESEARCH

ALIGNMENT

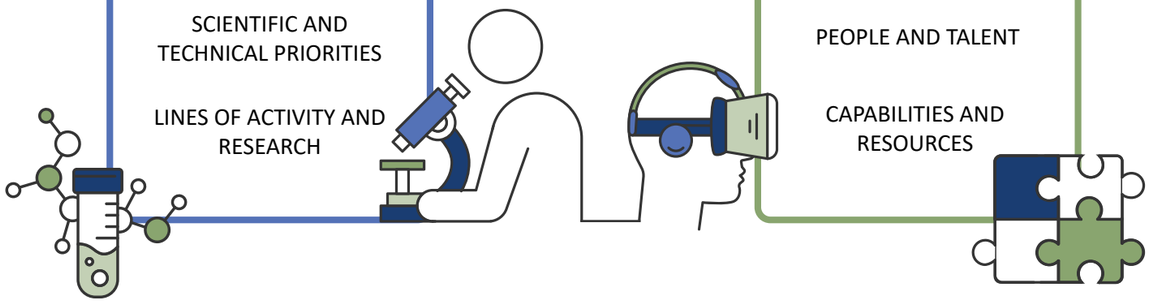
STRATEGIC PLAN

HOW DO WE WORK?

STRATEGIC OBJECTIVES

PEOPLE AND TALENT

CAPABILITIES AND RESOURCES

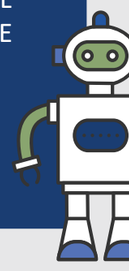


IMPACT ON SOCIETY

+ KNOWLEDGE + INNOVATION + STRONGER TECHNICAL SUPPORT + BETTER PUBLIC POLICIES

THE THEMATIC AGENDA SETS OUT CEDEX'S SCIENTIFIC AND TECHNICAL PRIORITIES FOR 2026–2028, WHILST THE STRATEGIC PLAN DEFINES THE OBJECTIVES AND CAPABILITIES NEEDED TO DELIVER THEM. BOTH DOCUMENTS ARE COMPLEMENTARY AND PROVIDE A SHARED FRAMEWORK FOR THE ORGANISATION'S WORK





> The Thematic Agenda and the Strategic Plan are complementary documents, providing a shared framework for the organisation's work



EXECUTIVE SUMMARY

> Through seven strategic challenges, CEDEX channels its research, testing and technical support capabilities to enhance the safety, sustainability, digitalisation, heritage and resilience of infrastructure and the natural environment



CHALLENGE 1

SAFETY AND RESILIENCE IN MOBILITY

1. Adapting the transport system to climate change
2. Improving safety across the transport system
3. Transport system design and operations



CHALLENGE 2

SUSTAINABLE MOBILITY

1. Circular economy
2. Support for transport planning. Intermodality
3. Upkeep and maintenance of the transport system
4. Noise reduction measures
5. Environmental impact: protecting biodiversity and ecosystems
6. Environmental impact: air quality and atmospheric emissions
7. Energy efficiency and decarbonisation



CHALLENGE 3

DIGITALISATION IN MOBILITY

1. Adapting roads for autonomous and connected mobility
2. Creating digital models of transport infrastructure with support from drones and BIM
3. Digital Twins
4. Development of geographic and cartographic information systems (GIS). Web GIS viewers
5. Real-time monitoring
6. Advanced numerical modelling



CHALLENGE 4

SAFETY AND RESILIENCE IN THE NATURAL ENVIRONMENT

1. Climate change adaptation
2. Enhanced safety of water infrastructure
3. Structural and functional integrity of the environment
4. Extreme events: floods and droughts
5. Environmental restoration and biodiversity protection
6. Built heritage: landscape and territory



CHALLENGE 5

SUSTAINABILITY IN THE NATURAL ENVIRONMENT

1. Support for river-basin and water-sector planning
2. Support for coastal and marine planning
3. Treatment, sanitation, efficiency, savings and reuse (DSEAR)
4. Environmental conservation, monitoring and management
5. Energy efficiency and decarbonisation



CHALLENGE 6

DIGITALISATION IN THE NATURAL ENVIRONMENT

1. Development of geographic and cartographic information systems (GIS). Viewers web
2. Environmental monitoring and instrumentation
3. Advanced numerical modelling
4. Big data
5. Open data



CHALLENGE 7

HERITAGE

1. Public works and urban planning

CEDEX is a leading public body working in public works, mobility, inland and marine waters, the environment and climate change, and serving as an implementing agent for the SECTI

1

THE CENTRE FOR STUDIES AND EXPERIMENTATION OF PUBLIC WORKS (CEDEX)

The **Centre for Studies and Experimentation of Public Works,** O.A. and M.P. (CEDEX) is an **Autonomous Body and an in-house entity of the General State Administration,** as provided for in Article 98 of Law 40/2015 of 1 October on the Legal Regime of the Public Sector, **administratively attached to the Ministry of Transport and Sustainable Mobility** (MITMS), through the Secretariat of State for Transport and Sustainable Mobility, and with **functionally dependent on the MITMS and the Ministry for the Ecological Transition and the Demographic Challenge** (MITECO), within the scope of their respective competences. In addition, it has the status of an implementing agent of the Spanish System of Science, Technology and Innovation (SECTI)[1].

[1] Law 17/2022 of 5 September, amending Law 14/2011 of 1 June on Science, Technology and Innovation.

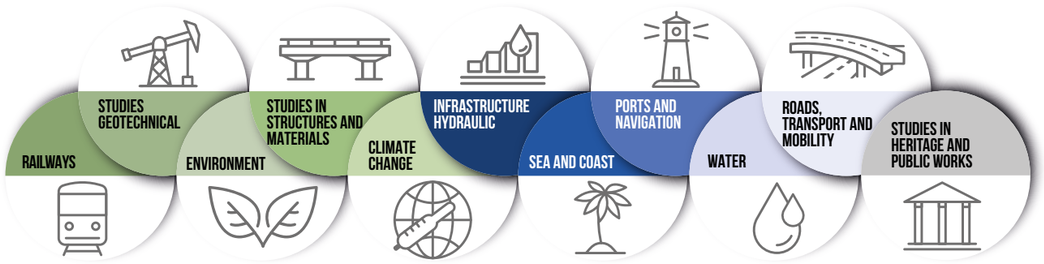


1.1 AREAS OF ACTIVITY, FUNCTIONS AND STRENGTHS

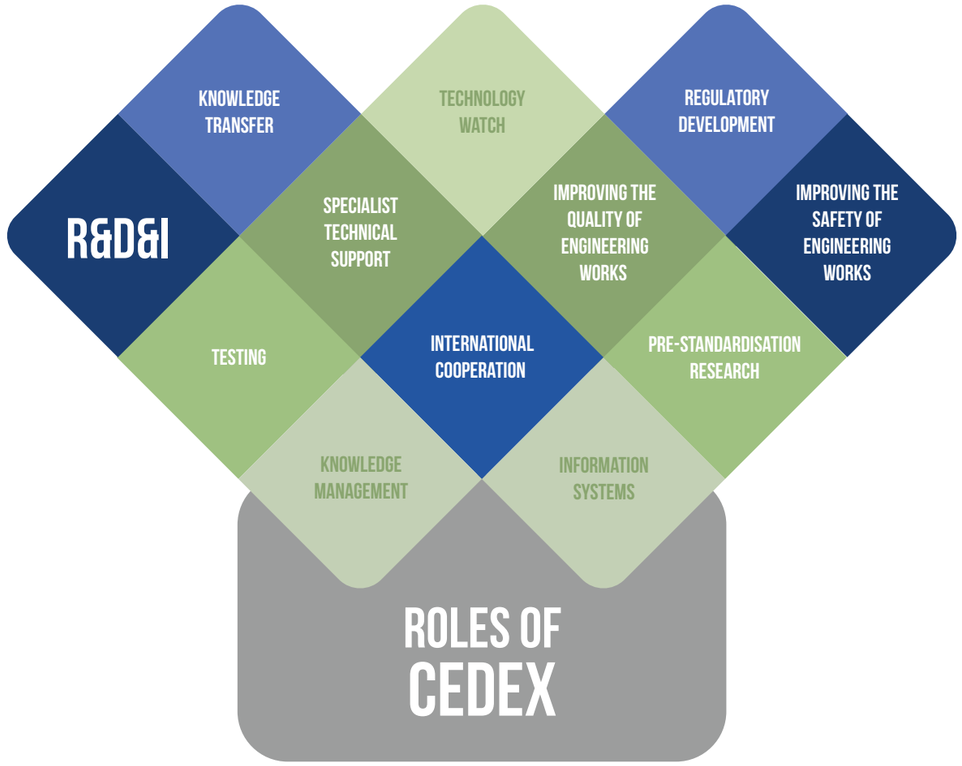


The **work** we carry out at CEDEX spans a wide range of topics, supporting institutions and management bodies with executive responsibilities: mobility; road, rail and maritime transport and its infrastructure; inland and marine waters and their infrastructure, dams, ports and coasts; structures and construction materials;

geotechnics; understanding and protecting the environment, and developing measures to reduce the impacts of delivering and managing infrastructure, as well as climate-change mitigation and adaptation; and the study of public-works heritage, focused on its conservation, restoration and enhancement.



> **CEDEX** is made up of eight specialised technical units known as Centres and Laboratories



To achieve this, **CEDEX** is made up of eight specialised technical units known as Centres and Laboratories. Through these units, we provide **high-level technical support,** carry out **applied research and technological development** in the fields of civil engineering and the environment, and also **share knowledge,** through courses, seminars, technical sessions, master's programmes, publications and exhibitions.

Alongside these eight technical units are the Secretariat— the organisation's administrative engine and management hub— and the Directorate, supported by an External and Commercial Relations Office, an R&D&I Unit and the Management Committee, which sets the organisation's strategic direction in line with the guidance of the Council, chaired by the Secretary of State for Sustainable Mobility (Chair) and the Secretary of State for the Environment (Vice-Chair).

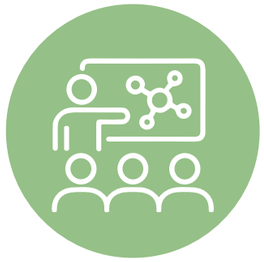
Our activities



Sharing and transferring knowledge

We promote the **sharing and transfer of Spanish knowledge and technology** both at national and international level, through publications, workshops, technical workshops, seminars, symposia, master's programmes, courses and exhibitions, as well as by creating and maintaining themed information portals. We take part in working groups and national and international networks, and we work with other public bodies and institutions, placing strong emphasis on international co-operation.

> Full details of the functions carried out by CEDEX can be found in our Statute



Advancing applied knowledge

We help to advance applied knowledge by delivering work and projects in **research, technological development and innovation,** as well as supporting the development of standards and regulations.



Specialist technical support

We provide specialist technical support to both the public and private sectors. To do so, we carry out a wide range of activities, including data collection and management, testing and experimentation, instrumentation, and the study, improvement and certification of materials, techniques, methods and construction solutions, as well as developing the standards that underpin them.

Serving society



- As the **in-house service provider of the General State Administration (AGE),** we support ministries through sectoral work programmes, mainly linked to specialised technical assistance and support in the fields of technology and innovation, in most cases aimed at directorates within MITMA and MITECO and their associated bodies.
- We serve **society** not only by supporting ministries and other public-sector administrations and entities, but also by working with private companies to develop and roll out innovation tailored to the sector's needs. We also promote the transfer and dissemination of knowledge through training activities, the publication of research notebooks and monographs, the organisation of conferences and seminars, and via our own library network; and by promoting standardisation through active participation in national and international committees.

This service to society also extends to some Ibero-American countries through the specialised technical assistance that has been provided for many years to the Cooperation Fund for Water and Sanitation of the Ministry of Foreign Affairs, European Union and Cooperation.



*Ultimately, CEDEX works to improve society's wellbeing and support economic growth by upgrading and maintaining infrastructure**,** enhancing the value of our **public works heritage,** driving **safe, sustainable mobility,** promoting the best use of essential and scarce resources such as **water,** and protecting and caring for our **environment,** our **coasts** and our **biodiversity. We apply innovation for addressing new challenges by developing practical solutions.***

Key strengths

At CEDEX, we have three major strengths: our **highly qualified staff, the independence and reliability** that underpin our work, and our **extensive technical resources and distinctive scientific and technical facilities.**

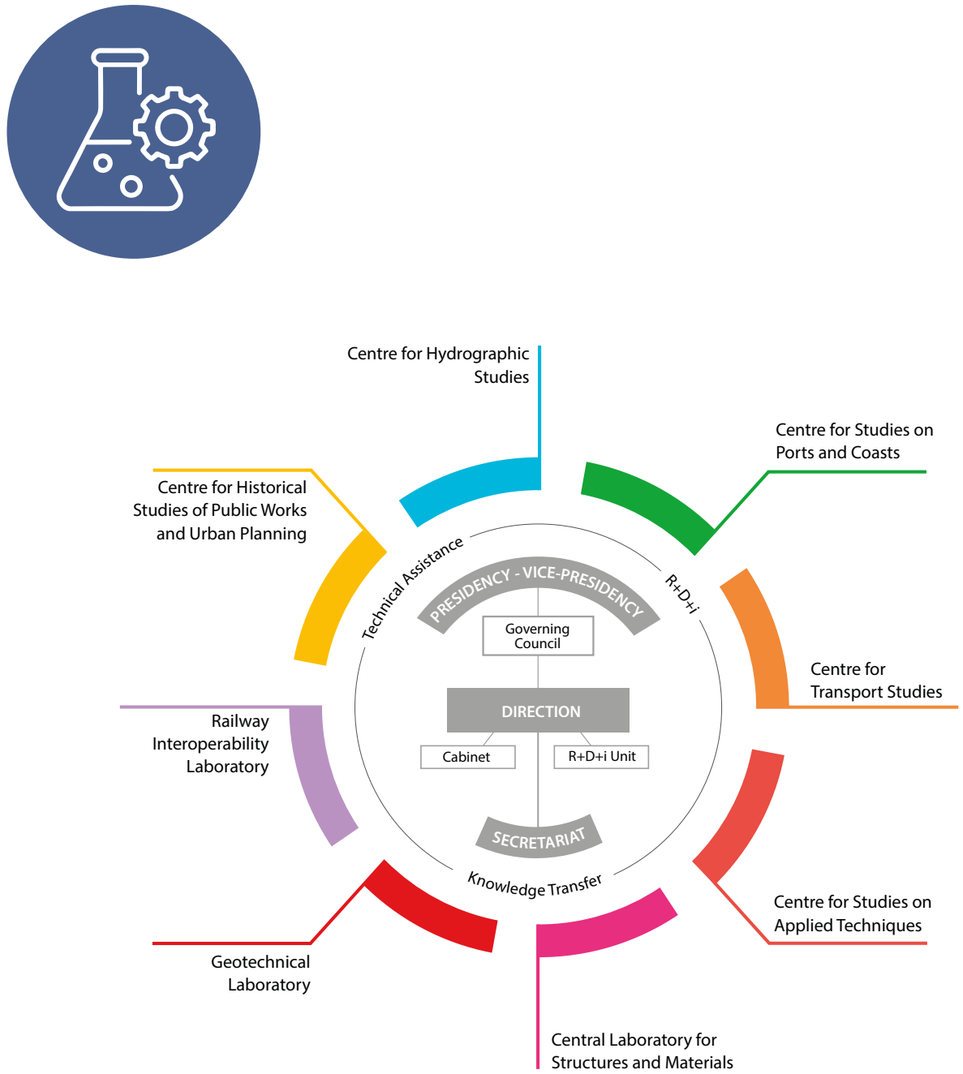
Our staff stand out for their **high level of training and specialist expertise,** complemented by a strong professional commitment that supports the ongoing development of our different **areas of work,** with a focus on continually strengthening our capabilities; alongside the flexibility and versatility needed to respond to the emerging needs of 21st-century society.

Another key feature is the **multidisciplinary integration** within our teams, bringing together professionals from varied backgrounds: engineering and other technical disciplines, earth sciences, basic sciences and social sciences. This mix provides complementary perspectives when tackling increasingly complex issues linked to planning, development and management across our fields of work.

In addition, embedding the **environmental dimension** into decision-making processes in civil engineering is essential to **contributing to the Sustainable Development Goals** and to meeting the requirements that arise from their implementation in Spain.

> Our staff stand out for their high level of training and specialist expertise

1.2. CENTRES AND LABORATORIES



CENTRES AND LABORATORIES

CEDEX is made up of a set of specialised technical units known as Centres and Laboratories, staffed by highly qualified professionals and supported by distinctive equipment and facilities. Together, they deliver high-level technical support, applied research and technological development within the fields of civil engineering and the environment.

CENTRE FOR PORTS AND COASTAL STUDIES (CEPYC)

CEPYC is a specialist centre for **ports, coasts and navigation, and for assessing the environmental aspects of maritime activities.** Our work draws on field measurements, data bases and information systems, alongside experimental work using scaled physical models, numerical models and simulation systems, to **support the port system,** by **improving the design of its infrastructure** and operational performance, **enhancing navigational safety and helping to protect the coast and marine ecosystems.**

Our flagship facility is an **8,000 m2 Maritime Experimental Laboratory** for building reduced-scale physical models of a wide range of maritime infrastructure, including port works and coastal protection. The laboratory houses key facilities such as the **Multidirectional Wave Basin** and the **Large-Scale Wave and Wind Flume,** as well as the **Ship Manoeuvring Simulation Unit.**

GEOTECHNICS LABORATORY (LG)

At the **LG** we focus our work on areas relating to **soil and rock mechanics** and on **geological and geotechnical engineering applied** to transport infrastructure, buildings, hydraulic works, port works and environmental projects. We have extensive geotechnical testing facilities, both laboratory-based and in situ, as well as geophysical equipment. We host the secretariats of the Spanish Societies for Soil Mechanics and Geotechnical Engineering, and for Rock Mechanics. We run the renowned **International Master's in Soil Mechanics and Geotechnical Engineering.**

Our flagship facility is a **large-scale railway test box** that enables full-scale trials of how different track configurations and components behave, including the introduction of new materials, under the passage of various trains at different speeds. These studies are complemented by specialist in situ test and instrumentation equipment, as well as laboratory systems for dynamic testing of coarse materials.

TRANSPORT STUDIES CENTRE (CET)

The **CET** is a specialist centre for **roads and transport more broadly.** Our core work focuses on pavement research, using recycled and new materials alongside emerging techniques, with an emphasis on improving the durability and sustainability of our roads to support transport decarbonisation and adaptation to climate change. We assess **Life Cycle Assessment (LCA) methodologies and criteria and Green Public Procurement (GPP),** as well as **Innovation Public Procurement (IPP),** tailored specifically to the road sector. We also carry out studies on traffic, road safety and mobility to improve network management and, ultimately, to **move towards mobility that is safer, more sustainable and better connected.**

Our most notable facility is a **Full-Scale Accelerated Pavement Testing Track** for carrying out accelerated, controlled trials on road pavements, where we test new materials, additives, technologies and construction techniques.

HISTORICAL CENTRE FOR PUBLIC WORKS AND URBAN PLANNING STUDIES (CEHOPU)

At **CEHOPU** our formally established aim is to **highlight and enhance the historical heritage of public works and urban planning** through research, study and the dissemination of how engineering and science have evolved, together with the most influential figures throughout this field's history, with the ultimate goal of safeguarding, restoring and enriching that heritage.

Our principal facilities include a **documentation centre that safeguards historical archives;** a range of collections of scale models, 3D models, GIS maps and drawings; and an outreach space made up of exhibitions and publications—both physical and virtual—which we make available to the public openly and free of charge.

RAIL INTEROPERABILITY LABORATORY (LIF)

The **LIF** is the newest of the laboratories within CEDEX and the **the first laboratory in the world to be accredited to test components and lines fitted with ERTMS** (European Rail Traffic Management System), the unified railway signalling system that is to be rolled out progressively across the European Union, to achieve full interoperability in train protection systems and move towards safer European rail networks. Our work on the functional validation of trackside and onboard ERTMS interaction has supported the commissioning of new lines and helped place Spain among the countries with the largest ERTMS-equipped rail networks of countries with the greatest number of ERTMS-equipped kilometres on their railways.

Key facilities include the **Rail Traffic Simulation Laboratory,** the first European laboratory to carry out tests on real ERTMS N1 and N2 lines in a laboratory setting. We also have the **Eurocab Laboratory,** the first European laboratory to run certification tests for ERTMS onboard equipment (EVC), as well as the **Eurobalise Laboratory,** for the certification of Eurobalises and Antennas/BTM, currently accredited by the National Accreditation Body in accordance with UNE-EN ISO/IEC 17025.

CENTRAL LABORATORY FOR STRUCTURES AND MATERIALS (LCEYM)

The **LCEYM** is a specialist centre for **research and testing in civil engineering and building structures, as well as the materials and products used in construction.** We study the properties of these materials and their durability, covering traditional materials such as concrete and steel, alongside less conventional ones such as materials used for lining and waterproofing ponds and reservoirs, recycled materials, and innovative longer-life solutions such as glass-fibre-reinforced polymer reinforcement. In structures, we investigate defects and deterioration in buildings, bridges and dams, as well as bridge dynamics, and the monitoring and instrumentation of structures.

Among our most notable facilities, we have a **six-degree-of-freedom seismic simulator**, unique in Spain, and a highly specialised **photometry laboratory** for signalling.

The laboratory is accredited by the National Accreditation Body, in accordance with the UNE-EN ISO/IEC 17025 standard.

HYDROGRAPHIC STUDIES CENTRE (CEH)

At the **CEH**, our work focuses on **inland waters,** with particular emphasis on water resources, high flows and flooding, hydrological planning, the safety of hydraulic works, river hydraulics, water status and water technologies.

Our work supports a **better understanding of Spain's hydrology,** through the publication of annual flow-gauging reports and the compilation of the water resources inventory. We also develop regulations, standards and technical specifications, and take part in international cooperation projects on water and sanitation.

Among our most notable facilities is our distinctive **Hydraulics Laboratory,** which has two halls totalling nearly 8,000 m2, enabling reduced-scale physical model testing of hydraulic structures and river engineering works for inland waters. Hydraulic experimentation—both physical and numerical—helps us tackle river-related challenges and improve the design of hydraulic works.

The **Water Quality Laboratory** is accredited by the National Accreditation Body, in accordance with UNE-EN ISO/IEC 9001.

CENTRE FOR STUDIES IN APPLIED TECHNIQUES (CETA)

At **CETA** we focus our work primarily on the **study and characterisation of environmental impacts and natural and human-induced risks,** particularly those linked to **public works.** We work to understand and conserve ecosystems and their biological diversity, support adaptation to and mitigation of climate change, reduce pollution, promote efficient use of natural resources, and restore the natural environment through nature-based solutions.

Among our most notable facilities is an **Isotope Hydrology Laboratory,** whose work centres on characterising the hydrological cycle by using tracers and isotopes to carry out studies and research in hydrology and applied hydrogeology, as well as on the isotopic composition of precipitation water (REVIP Network). We also conduct radiological monitoring of surface water bodies (inland and marine) for the Nuclear Safety Council. The laboratory is accredited by the National Accreditation Body, in accordance with UNE-EN ISO/IEC 17025.

CETA is also home to our **Training and Documentation Unit**, from which we provide cross-cutting knowledge-transfer services through workshops and courses, supported by an extensive library network.

Key cross-cutting support units

> For the eight aforementioned technical units to carry out their assistance and research work and all their activities, the work performed by the **CEDEX Secretariat**—the administrative and management engine—is essential, as is that of the R&D&i Support Unit and the External Relations and Commercial Activities Office; these serve as vital pillars for the collaborative development of innovative and international projects.

1.3. SPECIALISED FACILITIES

At **CEDEX** we have a range of distinctive **scientific and technical facilities,** many of them unique in Spain, and some recognised as national — and even international — benchmarks: the rail interoperability and ERTMS laboratory; the large-scale cell for full-scale testing of railway sections; the full-scale accelerated pavement testing track; the maritime experimentation laboratory and its ship-handling simulation unit; the hydraulics laboratory; the isotopic applications laboratory; and the six-degrees-of-freedom seismic simulator.



IS. CAJÓN Railway caisson: a large-scale test cell for full-section railway trials.



IS. TRACK
Full-scale accelerated pavement testing track.



IS. SISMIC
Six-degrees-of-freedom seismic simulator.



IS. HYDRO
Hydraulics laboratory.



IS. LIF
Rail interoperability and ERTMS laboratory: Eurobalise, Eurocab and Traffic Simulator.



IS. ISOTOPIC
Isotopic applications laboratory.



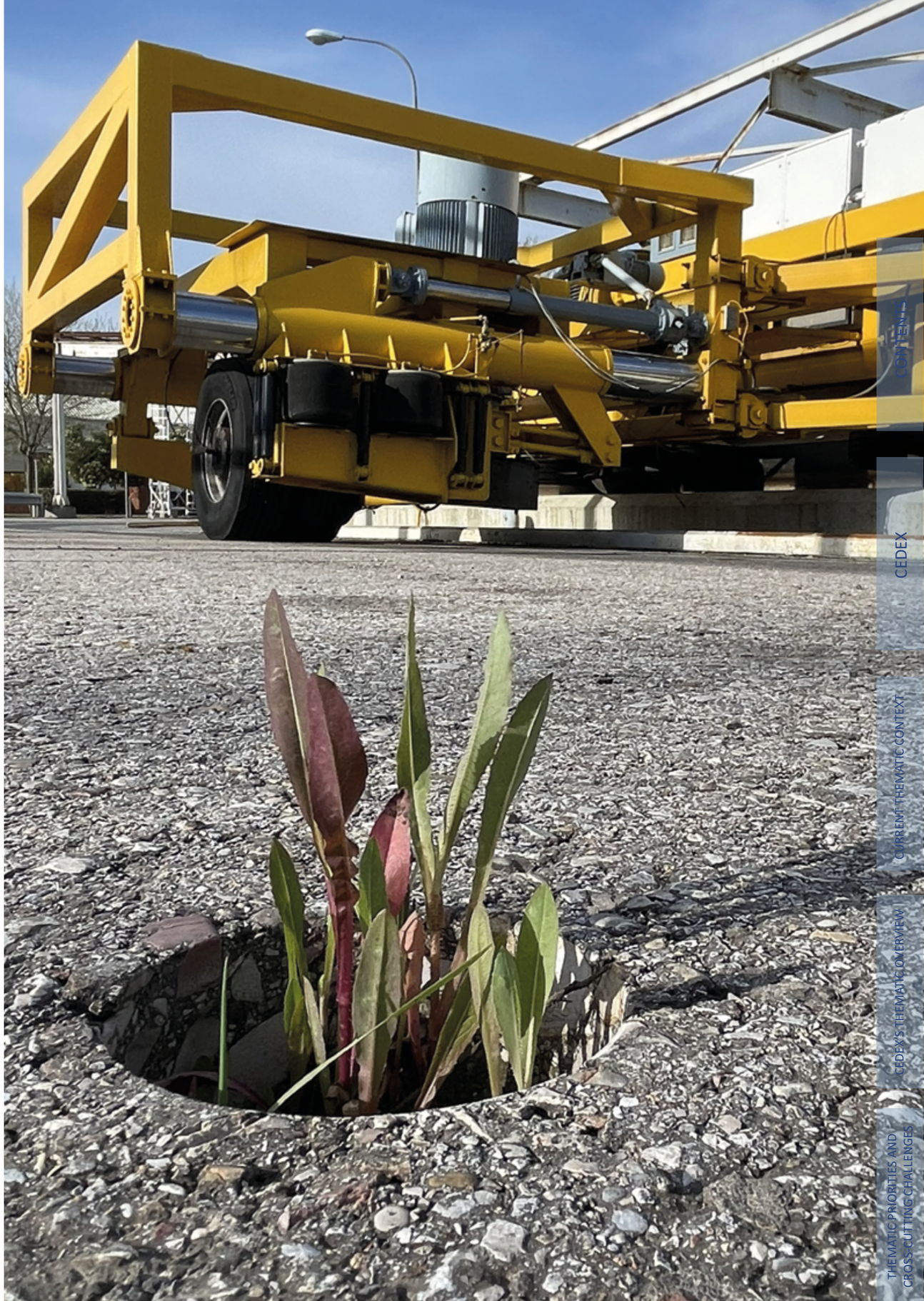
IS. MARIT
Maritime testing laboratory and ship-handling manoeuvring simulator.

Contribution to Public Policies and the SDGs

At CEDEX, we are fully **committed** to the **2030 Agenda for Sustainable Development** adopted by the United Nations in 2015 and, as a result, our work helps to deliver the **Sustainable Development Goals** (SDGs) set out within it.



Our **work** has a cross-cutting impact on most of the 17 SDGs and serves as a catalyst for the wider 2030 Agenda. The **key SDGs** addressed by this Thematic Agenda are: SDG 3 “Good Health and Well-being”; SDG 4 “Quality Education”, SDG 6 “Clean Water and Sanitation”, SDG 7 “Affordable and Clean Energy”, SDG 9 “Industry, Innovation and Infrastructure”, SDG 10 “Reduced Inequalities”, SDG 11 “Sustainable Cities and Communities”, SDG 12 “Responsible Production and Consumption” SDG 13 “Climate Action”, SDG 14 “Life Below Water” and SDG 15 “Life on Land”. This work also strengthens our Environmental Management System, in place since 2009 across CEDEX activities, in line with the certification requirements of ISO 14001:2015.



Europe has sharpened its focus on security, resilience and strategic autonomy, against a backdrop of conflicts and trade tensions

2

CURRENT THEMATIC CONTEXT

The **environmental, social, economic, technological and political context** in which CEDEX carries out its work is crucial in shaping its lines of action in support of transport and the environment.

Over the 2023–2025 period, the international landscape has been shaped by growing uncertainty linked to geopolitical, economic, energy and technological shifts. As a result, **Europe has sharpened its focus on security, resilience and strategic autonomy,** against a backdrop of conflicts and trade tensions.

The **energy transition, climate-change adaptation and digitalisation** are now at the heart of public policy, as key drivers of future economic and social development. The **rapid expansion of artificial intelligence (AI) and other digital technologies (BIM, digital twins) is transforming infrastructure management and services,** creating both opportunities and challenges related to governance, security, and the ethical, responsible use of technology.

Infrastructure plays a strategic role, with investment rising across Europe in transport, energy, water and digital networks—both to support the green transition and to **strengthen security and resilience against natural, climate related, technological and geopolitical risks.**

This chapter reviews the period's key trends across environmental, social, economic, technological and public policy dimensions, providing a reference framework for defining the priorities and lines of action of the 2026–2028 Thematic Agenda.



2.1. ENVIRONMENT

The environmental context for the 2026–2028 period is shaped by global challenges and their European and national implications. **Climate change, pressure on natural resources and the degradation of ecosystems are increasingly influencing** public policy, particularly the planning and management of natural and built infrastructure.

The impacts of extreme events, disruption to the hydrological cycle, pressure on the coastline and the marine environment, and biodiversity loss all provide clear evidence of the need to adapt, build resilience and restore and to restore the environment. Of particular **importance are water management and conservation, safeguarding coasts and their associated ecosystems, and embracing nature-based solutions to support their restoration.**

Accordingly, policies linked to the European Green Deal, the energy transition, the circular economy, biodiversity, and marine and hydrological planning are guiding **regulation and public investment, which requires specialised technical support and evaluation grounded in scientific and technical evidence.**

In this context, **CEDEX's capabilities are particurly relevant to supporting public administrations** both in the definition – through pre-regulatory research – and in the development – pre-regulatory research – and in the development of environmental policies related to water engineering, the coast and the marine environment, environmental quality, climate change, infrastructure resilience, and advanced modelling and monitoring.

Accordingly, the following aspects are particularly noteworthy:

- **Safety, resilience and climate change** as shared cross-cutting priorities
- **Water, coasts and the marine environment** as priority strategic areas
- Biodiversity conservation and **nature-based solutions for environmental restoration**
- **Digitalisation, monitoring and advanced modelling** to support decision-making



2.2. SOCIETY



Spain has more than **49 million inhabitants, with an ageing population that is unevenly distributed** between major urban centres and large rural areas undergoing depopulation. This shapes **mobility needs, infrastructure provision and access to public services,** and calls for solutions tailored to different territorial and social realities.

Urban **concentration brings challenges linked to congestion, environmental quality and how public space is organised,** whereas **less populated areas need mobility solutions that strengthen connectivity and territorial cohesion.** In this context, public and shared transport, inclusive mobility, the digitalisation of services and the efficiency of different transport modes are particularly important.

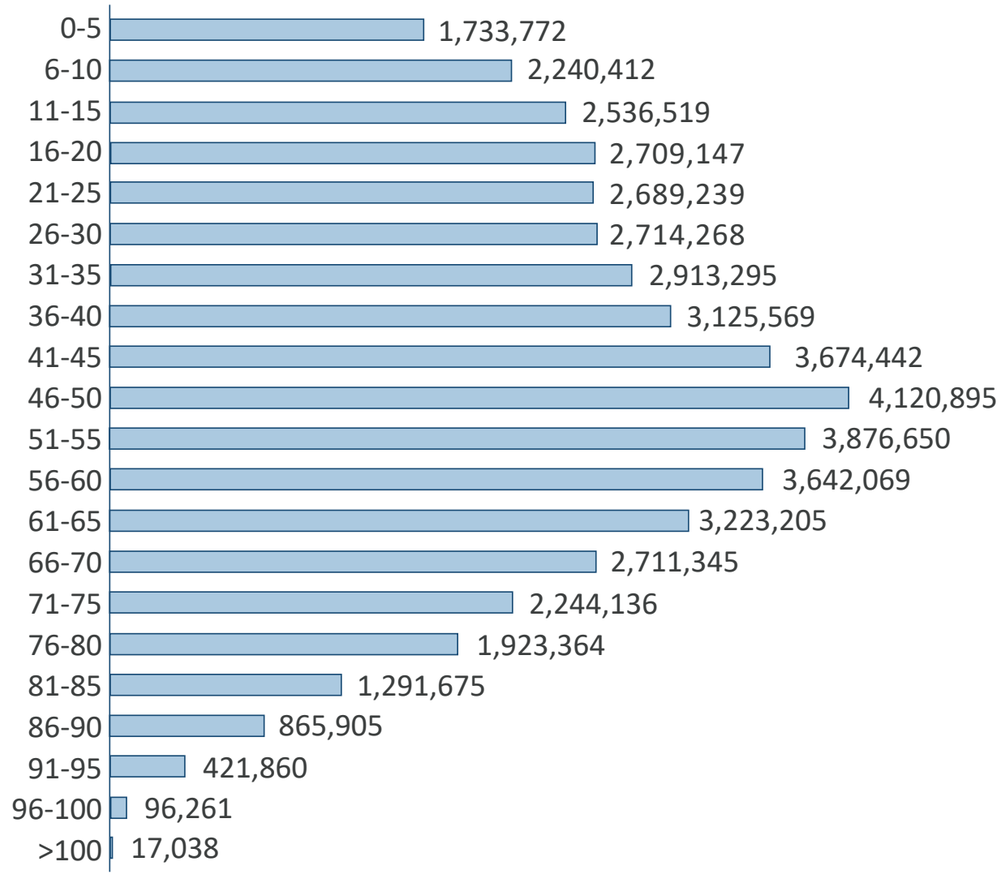
At the same time, it is necessary **to cut transport emissions,** which account for a significant share of greenhouse gases, by moving towards more sustainable and resilient mobility models.

Ensuring **safety in the face of natural and technological risks is now a social imperative,** there is also a growing demand greater transparency and access to technical information. In line with the Sustainable Development Goals and in continuity with the 2023–2025 Agenda, progress must be made in integrating the social and territorial dimension into technical actions.

The main areas for action are:

- **Safety and resilience in the face of** environmental, climatic and technological risks
- **Sustainable,** accessible and inclusive mobility
- Sharing **accessible technical information and know-how**
- **Embedding social and environmental criteria** in technical actions

AGE GROUPS



2.3. ECONOMY



As noted in the introduction, the economic landscape for 2026–2028 is characterised by high **uncertainty, driven by the energy and technological transitions, international crises and shifts in trade relationships.** It is therefore crucial to use resources efficiently and to focus on the quality and timeliness of public investment.

The push towards sustainable, resilient and decarbonised economic models has a **direct impact on infrastructure, mobility, water, energy and the management of natural resources,** increasing the need for specialist technical support for risk assessment, investment optimisation and better decision-making.

The Spanish economy **relies heavily on sectors that are intensive in natural and built infrastructure:** water, the coastline, transport, construction and tourism. This gives strategic importance to planning, conserving and adapting the existing public asset base.

It is now widely recognised that **digitalisation, the use of data and advanced modelling are key drivers of greater efficiency,** and by their very nature they support the **development of evidence-based economic decision-making, strengthening the role of technical rigour** in underpinning public investment and recovery, resilience and sustainability policies.

The following aspects are therefore highlighted:

- **Efficiency and quality** of public investment
- **Transition to a low-carbon** and circular economy
- Integration of **risk analysis and resilience**
- Use of **digitalisation and advanced modelling** to support decision-making
- Strengthening **CEDEX's role as a strategic source of technical support** for public administrations

2.4. NEW TECHNOLOGIES AND ARTIFICIAL INTELLIGENCE



Since November 2022, the 2023–2025 period has been characterised by a very rapid expansion of advanced digital technologies and, in particular, generative AI, with a growing impact on infrastructure management, the environment and public services. **These technologies are reshaping analysis, modelling, monitoring and decision-support processes.**

General-purpose technologies, and especially those linked to digitalisation such as the development of **sensors, remote sensing, the Internet of Things (IoT), digital twins and data management platforms, are powerful enablers of innovation** across a range of fields. Integrating and leveraging large volumes of information makes it possible to improve monitoring, anticipate risks and optimise infrastructure management.

AI and advanced data analytics open up new possibilities for **predictive modelling, supervised automation and the assessment of complex scenarios in water management, natural hazards, infrastructure maintenance or environmental management.** At the same time, greater emphasis is placed on data quality—a key foundation for AI—as well as on transparency, security and governance of these technologies, with **digital sovereignty.**

For CEDEX, this context offers an opportunity to strengthen analytical and forward-looking capability, but **requires significant organisational adaptation,** ongoing training and interoperable integration of systems and data. The main areas of focus are:

- **Digitalisation and advanced monitoring** of infrastructure and the natural environment
- **Advanced modelling,** data analytics, digital twins and applied AI
- **Rigorous assessment of** emerging technologies
- **Data and systems integration and interoperability** to support evidence-based decision-making



2.5. PUBLIC POLICIES



The 2023–2025 period has been shaped by the **strengthening of the European Green Deal and the roll-out of the Recovery and Resilience Facility and Spain's Recovery, Transformation and Resilience Plan (PRTR).** These instruments have steered public policy and investment towards the green transition, digitalisation, resilience, and territorial and social cohesion.

At European level, there is a clear move to embed climate, environmental and sustainability criteria into sectoral policies through initiatives such as the **Fit for 55** legislative package, strategies on climate change adaptation, biodiversity and green infrastructure, and new regulatory frameworks linked to energy, resilience, ecological restoration, digitalisation and **artificial intelligence.** In Spain, the recent period has been marked by the development of rules and strategies on sustainable mobility, climate change adaptation, the circular economy, water planning, coastal protection and digitalisation, with particular emphasis on **Law 9/2025 on Sustainable Mobility.**

A defining feature of the period, as noted in the introduction, is **the shift in policy towards resilience and proactive preparedness** in the face of nature and climate- related, energy, technological and geopolitical risks. Digitalisation, data use, modelling and evaluation techniques are therefore becoming increasingly important to improve effectiveness, transparency and the monitoring of public action.

Building on the 2023–2025 Strategic Agenda, **this context strengthens CEDEX's role as an independent technical and scientific support body** for shaping, assessing and tracking complex public policies, especially in infrastructure, mobility, water, the natural environment and climate change adaptation.

Key areas of action include:

- Embedding **sustainability, resilience and climate adaptation across sectoral policies**
  - **Technical and scientific support for** the planning, evaluation and monitoring of public policies
  - Strengthening **transparency, traceability and the technical basis of public** decision-making

At international level, key reference frameworks include the **United Nations 2030 Agenda** and its Sustainable Development Goals, as well as the **Paris Agreement,** under the UNFCCC, which serve as global benchmarks for sustainability, climate action and resilience.

Key European reference frameworks include:

- The European Green Deal and the **"Fit for 55"** legislative package
- European Regulation on **Artificial Intelligence** (AI Act)
- European Regulation on **Nature Restoration and the EU Biodiversity Strategy for 2030**
- European Strategy for **Sustainable and Smart Mobility and the development of the Trans-European Transport Network** (TEN-T)
- Framework **Programme for Research and Innovation: Horizon Europe**
- Connecting **Europe Facility (CEF)**
- Recovery and Resilience Facility and the **REPowerEU** initiative

The following national policies are particularly relevant in this context:

- Law 7/2021, of 20 May, on **Climate Change and the Energy Transition**
- Law 9/2025, of 3 December, on **Sustainable Mobility**
- Update of the **National Integrated Energy and Climate Plan** (PNIEC) 2021–2030
- National Plan for **Adaptation to Climate Change** (PNACC) 2021–2030 and its **work programme 2026 - 2030**
- Law 7/2022, of 8 April, on **waste and contaminated soils** for a circular economy
- Spanish Circular Economy Strategy, **Spain Circular 2030,** and its action plans
- Spanish Strategy for **Science, Technology and Innovation** 2021–2027, to be renewed for 2028- 2034
- National Strategy for **Artificial Intelligence** (ENIA), focused on the development and responsible use of AI in Spain
- Maritime Spatial **Planning** (POEM) and the Marine Strategies
- National Strategy for **Green Infrastructure, Ecological Connectivity and Restoration**
- National Strategy for **River Restoration** 2023-2030
- Strategy to **Reconnect Fragmented Habitats** Affected by Linear Transport Infrastructure
- River basin plans and **flood risk management**
- **plans,** alongside policies on reuse, efficiency and water resilience
- Strategies and plans linked to **resilience, security and the protection of critical infrastructure**

This programme is implemented through its areas of work, in accordance with the aims and functions set out in its Statute as an autonomous state body

3

CEDEX'S THEMATIC OVERVIEW

CEDEX's 2026–2028 Thematic Agenda is based on the context analysed in previous chapters and on its role as a leading public body in the fields of **study, experimentation, applied research and technical assistance** in the areas of infrastructure, water, transport, the natural environment and civil engineering.

This Agenda builds on the **2023–2025 Agenda** and is aligned with the 2026–2028 Strategic Plan. It is implemented through its lines of work, within the objectives and functions set out in its Statute as an autonomous State body.

The Thematic Agenda is **drawn up in constant consultation and dialogue with the departments and management units** of the ministries to which it is attached: the Ministry of Transport and Sustainable Mobility and the Ministry of Ecological Transition and Demographic Challenge. The aim is for the Agenda to reflect the shared priorities within these lines of activity, so as to continue providing the highest standard of technical and scientific support and assistance for the development of public sector policies and their associated plans and projects.

> The Thematic Agenda is drawn up in close consultation and ongoing dialogue with the departments and directorates of the relevant ministries



3.1. CEDEX'S ROLE WITHIN THE TECHNICAL - SCIENTIFIC SYSTEM



CEDEX serves as a public point of reference in the fields of public works, civil engineering, building construction and the related environment, playing a distinctive role within the technical-scientific system. In line with the aims and functions set out in its Statute, its role can be described as providing:

- **Technical and scientific support:** Provides data, studies and models to help validate and enhance the safety, resilience, sustainability and efficiency of infrastructure and services.
- **A bridge between science and public administration:** Helps turn knowledge into technical criteria, recommendations and practical tools applied to decision-making.
- **Knowledge hub:** Works with universities, research centres and international networks, seeking complementarity while maintaining the capabilities needed to act as an independent point of reference.

A distinctive feature is the **integrated approach enabled by its institutional structure,** examining issues **by bringing together multiple disciplinary perspectives and factoring in the interplay between infrastructure, the natural environment, resources and risks.**



3.2. THEMATIC PRIORITISATION PRINCIPLES

The set of workstreams included in the 2026-2028 Thematic Agenda has been chosen in line with the following criteria:

1. Alignment with the **CEDEX's aims and functions:** All strands must sit within the organisation's statutory aims and functions.
2. Relevance to **public policy:** Priority is given to topics for which there is demand for technical support from public authorities, departments and directorates—first and foremost, the parent ministries.
3. **Cross-cutting scope:** Preference is given to themes that affect several areas (infrastructure, climate, mobility, territory).
4. Risk **management:** The aim is to help address complex problems and/or those with high uncertainty, where independent assessment is essential.
5. **Continuity** of knowledge: Established strands are strengthened, avoiding fragmentation, while adapting them to new challenges.
6. **Strategic alignment:** With European and national objectives on infrastructure, the green transition, digitalisation and resilience.
7. **Practical applicability:** The knowledge generated should be geared towards tools that are genuinely useful for management and decision-making.

> "CEDEX's aims and functions, public policy, cross-cutting scope, risks, continuity, strategic alignment, practical applicability

3.3. CEDEX'S CONTRIBUTION



CEDEX's contribution takes place in a setting involving a wide range of technical and scientific stakeholders. CEDEX's contribution is characterised **by its public, independent nature and its focus on the public interest.** The organisation's remit ensures neutrality and lends credibility to its **analyses, underpinned by its in-house capabilities** in applied research, experimentation, modelling and the assessment of techniques, materials and systems **while remaining actively committed to collaboration and open to proposals from other institutions and organisations** and openness to proposals from other institutions and organisations.

The **integrated focus on transport and the environment** enables CEDEX to tackle complex challenges in a coherent way, such as **water management, coastal protection, and sustainable mobility, along with how these areas interact.** This is complemented by the management of knowledge, databases, models and experimental capabilities, which provide essential support for innovation and continuous improvement.

The **mission of CEDEX is to provide ongoing support to the public administration,** supporting not only specific projects, but also the processes of planning, monitoring and evaluating policies. This role as a technical point of reference is **particularly important in complex situations,** urgent matters or issues subject to controversy, where rigour, independence and technical robustness are essential.

The 2026–2028 Thematic Agenda reaffirms CEDEX's commitment to being the **leading public body for technical support in decision-making on infrastructure, water, transport and the natural environment,** bringing rigour, independence and a long-term perspective. The Agenda **builds on** the one established for 2023–2025 and is developed **in line with the 2026–2028 Strategic Plan,** prioritising issues with high cross-cutting impact, risk and uncertainty, and strengthening the accumulation and transfer of applied knowledge. The **contribution of CEDEX stands out for its ability to carry out applied, integrated research,** grounded in knowledge, **supporting the public administration over the long term** throughout the public policy process, with a clear focus on the public interest.

> CEDEX's mission is to provide ongoing support to the Administration

The 2026–2028 Thematic Agenda reaffirms CEDEX as the leading public reference body, focused on supporting decision-making in infrastructure, water, transport and the natural environment, bringing rigour, independence and a long-term perspective. The Agenda continues the 2023–2025 phase and aligns with the 2026–2028 Strategic Plan, prioritising issues with high cross-cutting impact, risk and uncertainty, while strengthening the build-up and transfer of applied knowledge. CEDEX's contribution stands out for its ability to deliver applied, integrated, knowledge-based research, providing long-term support to the Administration throughout the public policy process, guided by the public interest.

CEDEX's thematic challenges are geared towards achieving the major objectives set out in the areas of mobility, the natural environment and environmental quality

4

THEMATIC PRIORITIES AND CROSS-CUTTING CHALLENGES: INNOVATION IN MOBILITY AND INNOVATION IN THE NATURAL ENVIRONMENT

In such a fast-changing world, it is vital to **drive innovation so we are always striving for continuous improvement** in response to changing circumstances and the ongoing technological advances.

CEDEX's thematic challenges are geared towards achieving the major goals set out in the fields of mobility, the natural environment and environmental quality—each of them linked to resilience, sustainability and digitalisation—just as in the CEDEX Strategic Agenda 2023–2025.

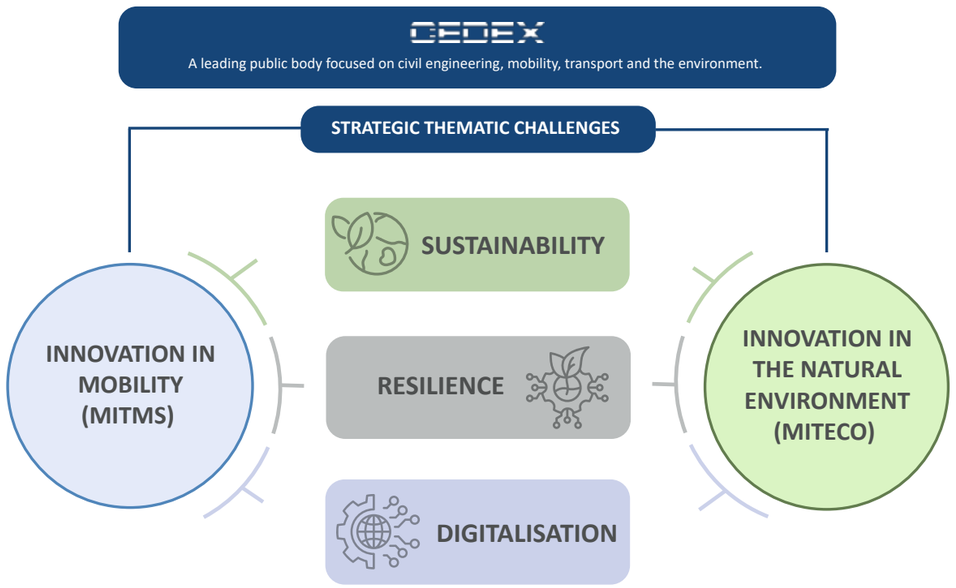
Innovation should be understood as a commitment to **continuous improvement,** refining processes and seeking **new solutions** to existing challenges. It is a process of **ongoing learning and progress** that is absolutely essential for all organisations, and driving it forward is a priority for CEDEX



Accordingly, CEDEX's thematic priorities continue to focus on the following two major strategic thematic areas, from which three thematic domains in turn emerge, making a total of **six strategic thematic challenges:**

- **Innovation in mobility,** focused on strengthening resilience, sustainability and digitalisation, and
- **innovation in the natural environment,** also aimed at strengthening resilience, sustainability and digitalisation, while contributing to biodiversity protection, more efficient management of natural resources and improved environmental quality

> We are moving towards two major strategic thematic areas: innovation in mobility and innovation in the natural environment



For each of the strategic challenges set out, we have defined its scope and reviewed its strategic context, identifying the CEDEX themes and lines of activity that will make a significant contribution to achieving these challenges.

Identifying the main lines of activity for the 2023–2025 period is the result of a series of working sessions with technical staff from CEDEX centres and laboratories, shared with the Directorates-General of the MITMS and MITECO ministries, to ensure CEDEX's operating framework is aligned with their needs. At the end of that period, it was updated to incorporate new requests from the directorates and the thematic areas in which CEDEX is involved through the delivery of European and national projects.

The **themes and lines of activity** identified by CEDEX within the six **strategic thematic challenges** focus on contributing to **safety and resilience, sustainability and digitalisation** across both **mobility** and the **natural environment**



Innovation in Mobility



Since the mid-1990s, Spain's approach in this sector has focused chiefly on investing in infrastructure development, placing Spain among the countries with the best infrastructure in Europe and worldwide.

Today, transport and mobility policies are evolving. For these reasons, the public administration recognised the need to shift its infrastructure policy: MITMS has moved from being an organisation mainly focused on delivering infrastructure to leading transport and mobility policy as a whole, bringing sustainability (economic, social and environmental) and innovation into its planning.

The MITMS is driving a delivery strategy built around three pillars: safety and resilience, sustainability, and digitalisation. In this context, it is essential that CEDEX works alongside the Ministry on its initiatives, strengthening our support in this area through the threefold approach outlined above, which means taking on the following challenges:

- **Thematic challenge 1.** Safety and resilience in mobility
- **Thematic challenge 2.** Sustainable mobility
- **Thematic challenge 3.** Digitalisation in mobility

CEDEX is one of the implementing bodies for the National Climate Change Plan, so our commitment to delivering **resilient** mobility is clear and unequivocal, and we direct a significant part of our work towards this goal. Likewise, CEDEX has numerous workstreams focused on increasing **safety** and improving the **operation** of infrastructure—each of them a decisive factor in a resilient transport system.

CEDEX is delivering ADIF's commission (2022–2026) on "Provision of advisory services, research and technological development across the different techniques of the rail and building system (AGE 026/22)", comprising 11 research and technological development actions relating to rail infrastructure projects, interoperability and sustainability.
Within the field of **rail transport,** as a key mode of transport in supporting the **sustainability of the system,** CEDEX joined in 2021 as a founding member of the joint undertaking **ERJU** (Europe's Rail Joint Undertaking), as part of a joint application with the other rail entities within MITMS (Adif, Renfe and Ineco). This joint undertaking **is setting the direction for European rail R&D&I** over the 2021–2031 decade, so CEDEX's firm commitment reflects both its European outlook and its determination to **remain at the forefront of rail R&D&I.** At present, in early 2026, CEDEX is participating in the **following projects:**

- **ERJU-FP1 MOTIONAL:** aims to develop a future European Traffic Management System (TMS) that is interoperable and resilient, able to adapt capacity and integrate all the services involved, including last-mile operations provided by other transport modes.
- **ERJU-FP2 R2DATO:** seeks to meet the growing demand for passenger and freight transport. FP2-R2DATO will harness the benefits of digitalisation and automation to develop next-generation ATC and deliver scalable capabilities for digital and automated train operations (up to and including autonomous) (DATO), in order to increase the capacity of existing rail networks.
- **ERJU-FP6FUTURE Project:** Regional lines with lower usage, or the secondary network, play a vital role not only in serving Europe's regions but also in feeding passenger and freight traffic into the core/main network. These rail lines need to be revitalised or even renewed.
- **ERJU-FP3IAM4RAIL Project:** aims to strengthen the next generation of Smart, Integrated Railway Asset Management by providing and demonstrating innovative solutions covering both fixed assets and rolling stock, minimising whole-life costs and extending asset service life, while meeting safety requirements and improving the reliability, availability and maintenance of the rail system.



CEDEX also takes part in other projects linked to safety and resilience in mobility, such as VICE4RAIL, which aims to speed up the uptake of EGNSS in order to roll out efficient, robust and competitive ERTMS solutions, and which focuses on the **development of a certification and standardisation process for the use of EGNSS,** closing the **current gaps in safety-critical rail applications and moving towards a pan-European EGNSS-based solution for ERTMS** and its global deployment. In addition, CEDEX is involved in the SCALE project, which seeks to broaden the rollout of mature C-ITS services (cooperative intelligent transport systems and services) and to support technical development and large-scale impact assessments of new C-ITS use cases in 10 representative countries. CEDEX also participates in the SMarAI project, together with Sasemar, Puertos del Estado and AEMET—an innovative initiative aimed at **enhancing maritime safety response capabilities in the event of a disaster at sea,** through the development of an **Artificial Intelligence (AI)-based operational platform** to **allocate operational resources in a more effective way,** helping the decision-making process for mass-rescue emergencies and incidents of marine pollution. The SMarAI technical framework will comprise three key elements:

1) Data integration and analysis for training, testing and validating AI algorithms for estimating disaster risk

2) Risk analysis, including hazards, exposure and vulnerabilities, and defining the most suitable AI algorithms

3) An operational AI platform for end users, integrated into a viewer where AI models are applied to selected data to deliver real-time risk forecasting and mapping

Construction activity can have a significant environmental impact, so it is crucial to assess, across every stage of a structure's life cycle, its potential contribution to sustainability. CEDEX takes part in the European LIAISON project, which aims to develop a methodology, support tools and near-to-market technological solutions to help make EU transport infrastructure a more sustainable and lower-carbon. In particular, work is under way in the **field of green public procurement**, developing actions that make it easier to engage the market by supporting procurement processes, legislation and standardisation. CEDEX is also involved in the GFRPort project, whose overall objective is to demonstrate that using glass-fibre-reinforced polymer (GFRP) bars embedded in reinforced-concrete maritime structures is the route to achieving a **maritime infrastructure system with greater durability, a longer service life and lower maintenance requirements.** The project aims to promote the use of GFRP bars to replace steel as reinforcement in situations where durability is a key concern.

Digitalisation as a means of improving **transport efficiency** requires the development of applications and tools that enhance both the collection and the **management** of information. CEDEX is a recognised benchmark in monitoring and numerical modelling, with particular emphasis on the digitalisation effort delivered through the various in-house commissions carried out by CEDEX, including, among others, the use of satellite interferometry, laser scanning, terrestrial photogrammetry, and the automation of instrumentation systems.

> Digitalisation as a means of improving transport efficiency requires the development of applications and tools that enhance both the collection and the management of information

Innovation in the Natural Environment





Protecting the natural environment and safeguarding its **environmental values** have become firmly established as one of the main concerns in advanced societies.

As an Autonomous Body functionally attached to MITECO, and as a national benchmark organisation in the environmental field, CEDEX must play a meaningful role in addressing the challenges arising in the context of the **protection and restoration of the natural environment** and in improving environmental quality, supporting the Ministry across the following areas of activity: Water; Coasts and the Marine Environment; Environmental Quality and Assessment; Climate Change; Biodiversity and Forests; Demographic Challenge; Energy; Environmental Education; and Just Transition.

At CEDEX, we approach this support for MITMS's responsibilities and functions by contributing to the three thematic challenges set out in this Thematic Agenda, under the strategic thematic objective of Innovation in the natural environment:

- **Thematic challenge 4. Resilience in the natural environment**
- **Thematic challenge 5.** Sustainability in the natural environment
- **Thematic challenge 6.** Digitalisation in the natural environment

As already noted, CEDEX helps implement a range of measures linked to **water and coastal management** within the framework of the **National Climate Change Plan,** working alongside **resilience policies.** It is worth highlighting CEDEX's strategic contribution to **water-resources planning and management** through the **assessment of the impact of climate change** on maximum rainfall in Spain, a key issue. One example is the inventory of water resources prepared by CEDEX, together with updated projections of how these resources may evolve under different scenarios set out by the Intergovernmental Panel on Climate Change (IPCC). In the area of resilience in the natural environment, CEDEX's involvement in the MERIDIAN Project can also be highlighted, alongside other universities and research bodies, to examine the significance of environmental disturbances and the effects of climate change on the diversity of soil microbiota in several lake basins in Antarctica. The Manzanares project is also noted, aimed at restoring ecological river continuity along the riverbanks of the final stretch of the Manzanares River, prior to its confluence with the Jarama River, reducing flood risk and improving the condition of aquatic and terrestrial ecosystems. Participation in the Guadaltwin Project should also be added, focused on creating a digital twin of the Guadalquivir River. In addition, CEDEX has taken part in the Manzanares- Gavia – Bulera river ecosystem restoration project, the green and blue infrastructure of Madrid's Metropolitan Forest, and has carried out scientific and technical support work for an experimental study to develop a methodology based on environmental isotope analysis to determine how nutrient pollution evolves in water bodies, as well as measurement tasks undertaken within the radiological monitoring networks for Spanish marine and coastal waters.

Within the sphere of **sustainability,** CEDEX is a key player in hydrological and sectoral water planning, as well as in coastal and marine planning.

In this regard, CEDEX has taken part in the **MSP-OR** and **ReMAP** projects, which developed strategies to help drive forward the rollout of **maritime spatial planning directives in Europe.** Not to mention CEDEX's work across a wide range of areas linked to **environmental monitoring and management.**

In the field of **digitalisation,** it is once again worth highlighting the potential of new technologies to support better **management of natural resources and protection of ecosystems.** In this respect, CEDEX's contribution can be seen, for example, in the rollout of marine information portals **(InfoMAR and the Environmental Viewer of Puertos del Estado),** natural-environment resources (Interactive visual guide to Spanish riparian vegetation) or environmental information tools (Basic Information System on Noise Pollution (SICA); data networks **(gauging yearbook, Isotope Monitoring Network in Precipitation (REVIR) managed with AEMET; Spanish Environmental Radiological Monitoring Network (REVIRA), managed by the CSN or hydrological models (CAUMAX, CHAC, CAMREC and collaboration with the IBER model).**

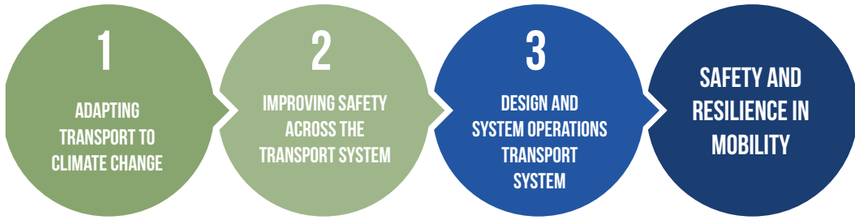
CHALLENGE 1

Safety and Resilience in Mobility

> ...we understand safety and resilience in mobility as the ability to protect people and ensure transport systems can keep running in the face of risks, change and emergencies....

Strategic Priority

The transport system is facing ever-growing challenges driven by climate change, operating conditions and the need to maintain high levels of safety and reliability. In this context, CEDEX has identified three priority areas for action: adapting the transport system to climate change, improving safety on roads, railways and in ports, and enhancing the design and day-to-day operation of the transport system. These three strands are delivered through 23 lines of activity aimed at generating knowledge, supporting decision-making, and strengthening the resilience, reliability and efficiency of mobility.





Challenge 1 (R1)	Strategic themes (T) and activity strands (L)	Unique facility (UF)
R1.T1.	**Adaptación del sistema de transportes al cambio climático**	
R1.T1.L1	Vulnerability and risk	
R1.T1.L2	Operational thresholds and indicators	
R1.T1.L3	Robust monitoring of climate agents	
R1.T1.L4	Adapting materials and structures to new climate actions	
R1.T1.L5	Studies of the evolution of the geotechnical behaviour of transport infrastructures	
R1.T2.	**Enhancing safety across the transport system**	
R1.T2.L1	Control of service indicators on roads	
R1.T2.L2	Road safety studies	
R1.T2.L3	Road pavement resistance studies	IS.PISTA [1]
R1.T2.L4	Studies of durability and resistance of structures	IS.SISMIC [2]
R1.T2.L5	Rail certification tests (ENAC accreditation)	IS.LIF [3]
R1.T2.L6	Low cost ERTMS deployment. Pilot tests	IS.LIF [3]
R1.T2.L7	Port operations risks, emergency protocols, special maritime operations	IS.MARIT [4]
R1.T2.L8	Maritime accident studies	
R1.T2.L9	Climate studies in port domains. Environmental conditions, nautical access limits, operations and supporting system	IS.MARIT [4]
R1.T2.L10	Geotechnical support. Resolution of pathologies and evaluation of new techniques of ground reinforcemen and improvemen	IS.CAJON [5]

[1] Full-scale accelerated pavement testing track.
[2] Seismic simulator with six degrees of freedom.
[3] Railway interoperability and ERTMS laboratory (Eurobalise, Eurocab and traffic simulator).
[4] Maritime experimentation laboratory and ship manoeuvring simulator.
[5] Large-scale cell for testing railway sections (Railway Caisson)

R1.T3.	Design and operation of the transport system	Unique facility (UF)
R1.T3.L1	Road pavement performance studies	IS.PISTA [1]
R1.T3.L2	Railway infrastructure and superstructure performance studies	IS.CAJON [5]
R1.T3.L3	Methodological and regulatory development of elements of the transport system	
R1.T3.L4	Studies of the behaviour of ships in maneuvering phases and docked at quays	IS.MARIT [4]
R1.T3.L5	Increase in the service life and adaptation to new uses of port infrastructures	
R1.T3.L6	Dimensioning of port infrastructures. Access areas, canals, docks, quays and sheltering works	
R1.T3.L7	Port and quay operations, port and maritime traffic simulations	IS.MARIT [4]
R1.T3.L8	Satellite train positioning and 5G technology application	

Contribution to the SDGs of the 2030 Agenda

Thematic areas			
	Climate change		Structures and materials studies
	Roads, transport and mobility		Ports and navigation
	Railways		Geotechnical studies

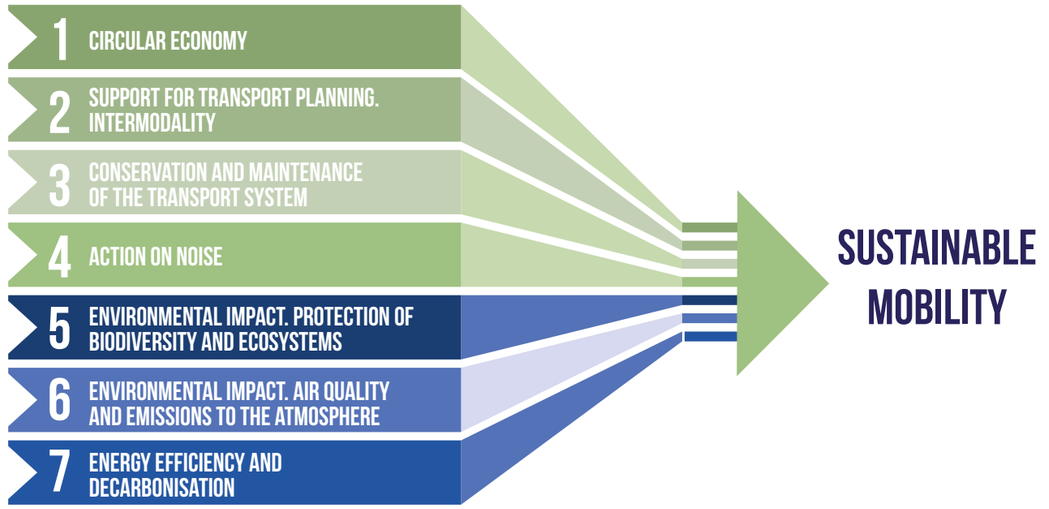
CHALLENGE 2

Sustainable Mobility

> ...we understand sustainable mobility to mean an efficient, decarbonised transport system that minimises its environmental impact, makes the best use of resources, and helps to protect our surroundings...

Strategic Priority

Sustainable mobility means cutting transport's environmental impact without sacrificing efficiency, functionality or service quality. As a leading reference body, CEDEX considers it has a role to play in developing solutions that drive the circular economy, support the conservation and sustainable upkeep of infrastructure, enable effective planning and reduce impacts on the environment. For this reason, we have identified 7 areas for action and 22 lines of activity focused on promoting decarbonisation, energy efficiency, biodiversity protection, improved air quality and noise reduction —helping to deliver a transport system that is more environmentally sustainable.





Challenge 2 (R2)	Strategic themes (T) and activity strands (L)	Thematic areas	Specialised facility (IS)
R2.T1.	**Circular economy**		
R2.T1.L1	Ecodesign in transport infrastructures: Life cycle assessment (LCA), durability, mechanical and environmental performance (RAP, scrap tyres, aggregates from slag, industrial by-products		IS.PISTA [1]
R2.T1.L2	Ecodesign in transport infrastructures: Durability, mechanical and environmental behaviour of concrete and structural steels (eco-efficient cements, polymers, CDW)		IS.SISMIC [2]
R2.T1.L3	Characterization and management solutions of dredged material		
R2.T2.	**Support for transport planning. Intermodality**		
R2.T2.L1	Analysis and preliminary study for the development of strategic transport planning		
R2.T2.L2	Passenger and freight transport models		
R2.T3.	**Asset management and maintenance of the transport system**		
R2.T3.L1	Monitoring of condition indicators. Concession contracts		
R2.T3.L2	Winter service. Impact of melting salts on pavements and infrastructures		
R2.T3.L3	Predictive maintenance of road pavements		IS.PISTA [1]
R2.T3.L4	Optimisation of railway track equipment		IS.LIF [3]
R2.T4.	**Noise mitigation**		
R2.T4.L1	Noise reduction pavements		IS.PISTA [1]

R2.T5.	Environmental impact. Protecting biodiversity and ecosystems								
R2.T5.L1	Ship strikes involving cetaceans								
R2.T5.L2	Watercourse restoration affected by linear infrastructure works								
R2.T5.L3	Protecting marine biodiversity. Management of ballast water, pollutants and particularly sensitive marine areas (ZMES)								
R2.T5.L4	Conservation of ecosystem services. Maintaining and restoring ecological connectivity (wildlife crossings, ecoducts...)								
R2.T6	**Environmental impact. Air quality and atmospheric emissions**								
R2.T6.L1	Inventories and models for assessing air quality								
R2.T6.L2	Estimating GHG emissions from maritime transport. Real time emissions and values integrated across space and time								
R2.T6.L3	Carbon footprint studies for transport modes and the transport system as a whole								
R2.T7.	**Energy efficiency and decarbonisation**								
R2.T7.L1	A.T.O. system and ERTMS Level 3 to support the system's energy efficiency								IS.LIF [3]
R2.T7.L2	Construction techniques for sustainable pavements: semi-warm, warm and cold mixes, ultra-thin mixes, and others								IS.PISTA [1]
R2.T7.L3	Studies to implement Low Emission Zones (LEZ)								
R2.T7.L4	Green public procurement for roads. Proposed environmental criteria								

Contribution to the SDGs of the 2030 Agenda



Thematic areas			
	Climate change		Structures and materials studies
	Roads, transport and mobility		Ports and navigation
	Railways		Environment

[1] Full-scale accelerated pavement testing track.
[2] Six-degrees-of-freedom seismic simulator.
[3] Rail interoperability and ERTMS laboratory (Eurobalise, Eurocab and traffic simulator).

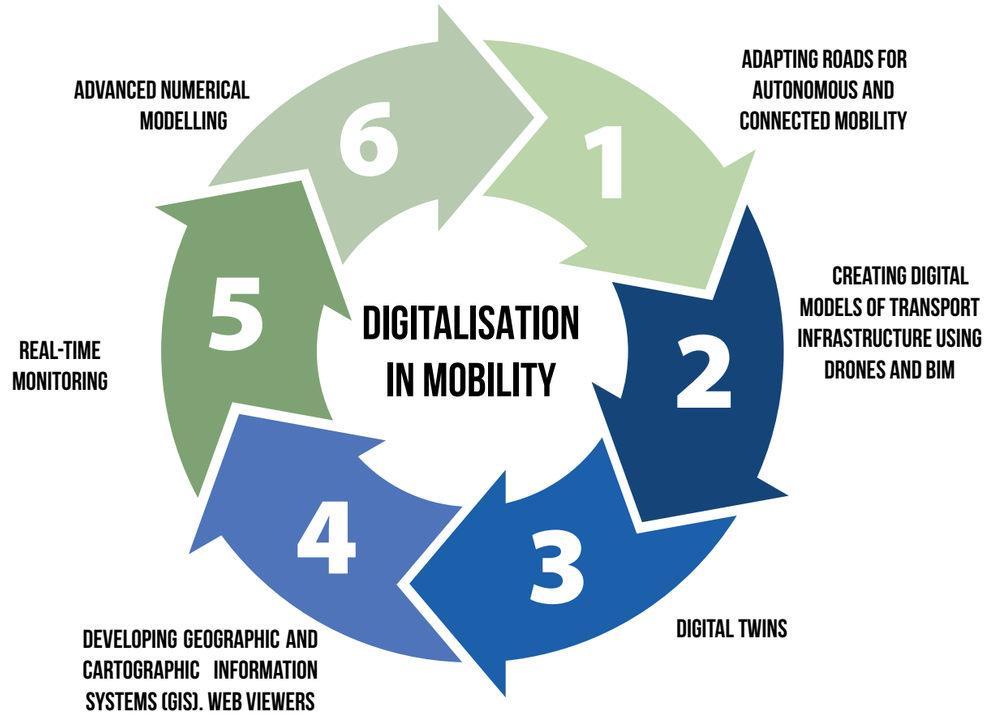
CHALLENGE 3

Digitalisation in Mobility

...by digitalisation in mobility we mean integrating digital technologies to enhance understanding, management, operation and the safety of transport infrastructure and systems...

Strategic Priority

Digitalisation is changing how transport infrastructure and systems are designed, managed and operated. In response to these needs, CEDEX considers it should contribute to the development and deployment of digital technologies that improve monitoring, analysis, decision-making and safety in mobility. Along these lines, CEDEX has identified 6 areas of action and 19 activity streams covering connected mobility, infrastructure digitalisation, digital twins, geographic information systems, real-time monitoring and artificial intelligence applied to transport.





Reto 3(R3)	Strategic themes (T) and activity lines (L)	Thematic areas							Unique facility (UF)
R3.T1.	**Adapting roads for autonomous and connected mobility**								
R3.T1.L1	Road equipment, vertical signs and road markings		●						
R3.T1.L2	Vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communication		●						
R3.T1.L3	Policy support		●						
R3.T1.L4	Cooperative Intelligent Transport Systems (C-ITS)		●						
R3.T2.	**Creating digital models of transport infrastructure using drones and BIM**								
R3.T2.L1	Inventory of geometric characteristics of road and rail elements, as a basis for the integration of monitoring and BIM implementation		●	●					
R3.T2.L2	Acquisition and development of tools and equipment that allow digitalization in BIM environment		●	●					
R3.T2.L3	BIM-based digitalisation for the study and sharing of public works and urban heritage		●						
R3.T3.	**Gemelo digital**								
R3.T3.L1	Laboratory simulation of the ERTMS system and new functionalities: design validation tests or commissioning trials			●					IS.LIF [1]
R3.T4.	**Development of geographic and cartographic information systems (GIS). Web viewers**								
R3.T4.L1	Acoustic monitoring of the impact of noise generated by transport into the population (SICAWEB + IDE SICAWEB		●	●					
R3.T4.L2	Decision-support for ports, maritime transport and emergency management at sea					●	●		
R3.T4.L3	New technologies for port geotechnical instrumentation and data processing (Port Geotechnical Information GIS)					●	●		
R3.T4.L4	Geolocation for the study and sharing of public works and urban heritage		●	●		●			

[1] Railway interoperability and ERTMS laboratory (Eurobalise, Eurocab and traffic simulator).
[2] Full-scale accelerated pavement testing track.
[3] Large-scale cell for testing railway track sections (Railway Box).

R3.T5.	Real-time monitoring								
R3.T5	Deployment of sensor-based monitoring systems: pavements; structures; tunnels; slope and embankment movements; innovative advances in geotechnical characterisation		●	●			●		IS.PISTA [2]
R3.T6	**Advanced numerical modelling**								
R3.T6.L1	Geotechnical study of pathologies and project solutions		●	●		●	●		IS.CAJON [3]
R3.T6.L2	Advanced computational fluid dynamics (CFD) applied to the interaction between waves and maritime structures					●			
R3.T6.L3	Historical database of AIS messages for studies of maritime traffic and its environmental effects					●			
R3.T6.L4	Data processing and machine learning for ground characterization and profiling		●	●			●		
R3.T6.L5	Development of AI tools for the digitalisation of infrastructure and the improvement of processes at CEDEX		●	●					
R3.T6.L6	Development of AI algorithms to predict maritime accidents					●			

Contribution to the SDGs of the 2030 Agenda



Thematic areas			
●	Ports and navigation	●	Railways
●	Roads, transport and mobility	●	Geotechnical studies

CHALLENGE 4

Safety and Resilience in the Natural Environment

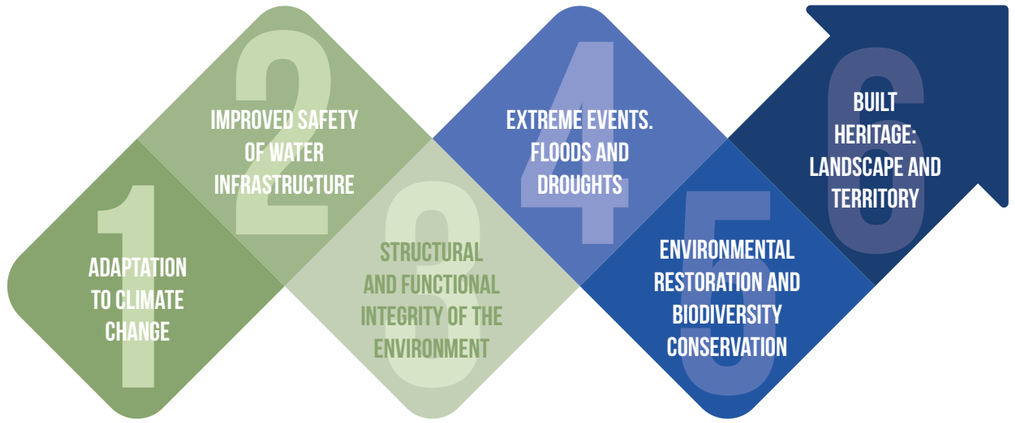
”

...by safety and resilience in the natural environment we mean developing solutions to reduce risks, protect ecosystems and help the land adapt to climate change...

Strategic Priority

Climate change, extreme events and the need to conserve ecosystems are creating new challenges for managing water, the coast and the wider territory. In response, CEDEX helps develop solutions that strengthen safety and resilience in the natural environment, enhance the safety of hydraulic infrastructure, and support the protection and restoration of natural systems. Work in this area is structured around 6 fields of action and 23 activity lines, focused on risk management, protecting the coast and ecosystems, environmental restoration, and conserving heritage and landscape.

SAFETY AND RESILIENCE IN THE NATURAL ENVIRONMENT





Reto 4(R4)	Strategic themes (T) and activity strands (L)	Thematic areas							Unique facility (IS)
R4.T1.	**Adaptación al cambio climático**								
R4.T1.L1	Characterization of the impact of climate change on the hydrological cycle and the water environment	●	●						
R4.T1.L2	Analysis of coastal and fluvial dynamics, and the prognosis of their evolution in climate change scenarios	●	●			●		●	IS.MARIT [1]
R4.T1.L3	Coastal strip management and development of climate change adaptation strategies	●				●			IS.MARIT [1]
R4.T2.	**Enhancing the safety of hydraulic infrastructure**								
R4.T2.L1	Studies to improve hydrological and hydraulic safety through physical, mathematical models and application of isotopic techniques		●	●					IS.HIDRO [2]
R4.T2.L2	Development of methodologies for conducting hydrological studies of dams. Support in policy development		●	●					IS.HIDRO [2]
R4.T2.L3	Studies of material pathologies. Concrete. Waterproofing systems			●	●				
R4.T2.L4	Geotechnical support in design and operation of dams and reservoirs. Pathologies			●			●		
R4.T3.	**Structural and functional integrity of the environment**								
R4.T3.L1	Stability studies for waste landfill sites and debris places						●	●	
R4.T3.L2	Stability of geological structures in the Network of Natural Parks						●	●	
R4.T3.L3	Stability of geological structures affecting the maritime-terrestrial public domain (cliffs). Environmental geotechnical issues					●	●	●	
R4.T3.L4	Environmental design of marine outfalls					●		●	IS.MARIT [1]
R4.T3.L5	Erosion protection coastal structures	●				●			IS.MARIT [1]

Contribution to the 2030 Agenda SDGs



[1] Maritime experimentation laboratory and ship-handling simulator. Hydraulic infrastructure Geotechnical studies
[2] Hydraulics laboratory.

R4.T4.	Extreme events: floods and droughts									
R4.T4.L1	Support for adaptive flood risk management through physical and numerical model studies		●	●		●				
R4.T4.L2	Basic, methodological and regulatory studies for the characterization of flood hazard and risk		●	●		●				
R4.T4.L3	Flood adaptation for urban and peri-urban areas		●			●				IS.MARIT [1] IS.HIDRO [2]
R4.T4.L4	Identification and hydrographic characterisation of droughts		●							
R4.T4.L5	Studies of river flood protection infrastructures		●	●						IS.HIDRO [2]
R4.T5.	**Environmental restoration and biodiversity protection**									
R4.T5.L1	Methodologies for the study and monitoring of good ecological status and conservation of aquatic ecosystems		●					●		
R4.T5.L2	Environmental restoration of the coast, the hydrographic network and the spaces adjacent to infrastructures					●		●		
R4.T5.L3	Nature-based solutions for environmental restoration, infrastructure integration and impact mitigation	●				●		●		
R4.T5.L4	Impacts from contaminated soils (pollutant containment barriers)							●		
R4.T6.	**Built heritage: landscape and territory**									
R4.T6.L1	Research into integrating public works and urban development with the landscape								●	
R4.T6.L2	Conservation and promotion of public works heritage in rural areas								●	

Thematic areas					
●	Climate change	●	Structures and materials studies	●	Environment
●	Water	●	Sea and coastlines	●	Landscape and rural areas
●	Hydraulic infrastructure	●	Geotechnical studies		

CHALLENGE 5

Sustainability in the Natural Environment

...by sustainability in the natural environment we mean creating knowledge and solutions for balanced management of water, coastal and marine resources, while protecting the environment...

Strategic Priority

Sustainable management of water, the coast and the marine environment calls for a better understanding of available resources, greater efficiency in how they are used, and stronger conservation in the face of today's environmental pressures. From this standpoint, CEDEX develops studies, methodologies and tools to support river-basin and marine planning, efficient water management, environmental monitoring and the energy transition. This challenge is organised into 5 areas of action and 20 activity lines, aimed at promoting sustainable management of natural resources, protecting water bodies and ecosystems, and driving solutions aligned with decarbonisation and efficient energy use.

SUSTAINABILITY IN THE NATURAL ENVIRONMENT





Reto 5(R5)	Strategic themes (T) and activity lines (L)	Thematic areas							Unique facility (IS)
R5.T1.	**Support for hydrological and sectoral water planning**								
R5.T1.L1	Inventory of water resources in natural regime		●					●	
R5.T1.L2	Baseline studies and methodological development							●	
R4.T1.L3	Water resource systems (availability and environmental flows)		●	●				●	
R5.T2.	**Support for coastal and marine planning**								
R5.T2.L1	Regulation of activities at sea. Technical instructions for dredging, beach restoration, artificial reefs and discharges at sea					●		●	
R5.T2.L2	Coastal and marine environment directives. Support for its implementation					●		●	
R4.T2.L3	Support for maritime spatial planning schemes					●		●	
R5.T3.	**Treatment, sanitation, efficiency, saving and reuse (DSEAR)**								
R5.T3.L1	Methodological development for risk management		●					●	
R5.T3.L2	Methodological and regulatory development for efficient management		●					●	
R5.T3.L3	Innovative technologies and monitoring		●					●	
R5.T4	**Environmental conservation, surveillance and management**								
R5.T4.L1	Characterising the hydrological cycle using tracers and environmental isotopes		●					●	IS.ISOTOPIC [1]
R5.T4.L2	Coastal protection structures against erosion	●	●	●		●			IS.ISOTOPIC [1]
R5.T4.L3	Studies of climate, atmosphere and sea using isotopic techniques		●			●		●	IS.ISOTOPIC [1]
R5.T4.L4	Achieving and maintaining good status of water bodies (study of specific issues, modelling of physical and biological processes, methodologies)		●			●		●	
R5.T4.L5	Characterisation and monitoring of environmental variables and pollutants in water bodies		●			●		●	
R5.T4.L6	Studies for sediment management in rivers and reservoirs		●			●		●	
R5.T4.L7	Characterisation and monitoring of marine litter, beach sand and microplastics		●			●		●	
R5.T4.L8	Protection against accidental contamination. Risk analysis and anti-pollution products		●			●		●	
R5.T4.L9	Radiological characterization of building materials and radon protection				●	●		●	IS.ISOTOPIC [1]
R5.T5.	**Energy efficiency and decarbonisation**								
R5.T5.L1	Performance studies of fixed and floating structures for marine renewable energy generation	●				●			IS.MARIT [2]
R5.T5.L2	Performance studies of foundations used for geothermal energy generation. Impact on load-bearing capacitye	●					●		

[1] Isotopic applications laboratory.
[2] Maritime experimentation laboratory and ship manoeuvring simulator..

Contribution to the 2030 Agenda SDGs



Thematic areas					
●	Climate change	●	Structural and materials studies	●	Environment
●	Water	●	Sea and coasts		
●	Hydraulic infrastructure	●	Geotechnical studies		

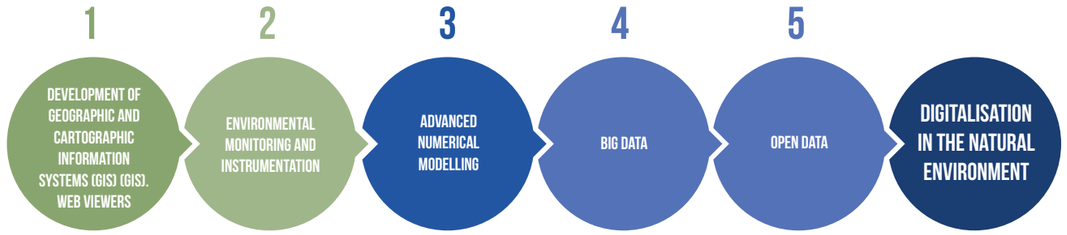
CHALLENGE 6

Digitalización en el medio natural

...by digitalisation in the natural environment we mean applying digital technologies to enhance understanding, monitoring and the sustainable management of natural resources, as well as freshwater, coastal and marine environments....

Strategic Priority

Digitalisation creates fresh opportunities to improve our understanding, tracking and management of the natural environment. From this standpoint, CEDEX promotes the development of digital tools that make it easier to access information, carry out environmental monitoring and deliver advanced modelling of natural processes. Work in this field is structured around 5 areas of action and 14 activity lines, focusing on geographic information systems, environmental instrumentation, numerical modelling, the management of large volumes of data, and promoting open access to information and reference models.





Reto 6(R6)	Strategic themes (T) and activity strands (L)	Thematic areas							Unique facility (IS)
R6.T1.	**Development of geographic and cartographic information systems (GIS). Web viewers**								
R6.T1.L1	Updating and developing hydrological databases		💧	📊					
R6.T1.L2	Isotopic databases on rainfall, surface water and groundwater		💧						
R6.T1.L3	Interactive visual guide		💧			🌴		🍃	
R6.T1.L4	Marine environment information portal (InfoMAR)					🌴			
R6.T1.L5	Real-time access to external data. Oceanographic and meteorological information					🌴			
R6.T1.L6	Generation, processing and analysis of geographic information data, and production of mapping for coastal and marine environments					🌴			
R6.T1.L7	Environmental viewer for state-owned ports		💧			🌴		🍃	
R6.T2.	**Environmental monitoring and instrumentation**								
R6.T2.L1	Monitoring the coastline using sensors on satellites and drones					🌴			
R6.T2.L2	Technologies for systematic monitoring of coastal and marine environments and related actions					🌴			
R6.T2.L3	Isotopic data network							🍃	
R6.T3.	**Advanced numerical modelling**								
R6.T3.L1	Development of 3D numerical models for studying hydraulic structures			📊					
R6.T3.L2	Advanced computational fluid dynamics (CFD)			📊					
R6.T4	**Big Data**								
R6.T4.L1	Hydrological data hub: acquisition, processing, review and use of information		💧	📊					
R6.T5	**Open data**								
R6.T5.L1	Hydrological data and models: capacity yearbook, CAUMAX, CHAC, CAMREC, IBER model collaboration		💧	📊					



Contribution to the 2030 Agenda SDGs



Thematic areas			
💧	Water	🌴	Sea and coasts
📊	Hydraulic Infrastructure	🍃	Environment

CHALLENGE 7

Heritage

> ...by heritage in public works and urban planning we mean preserving, studying and showcasing the historical, documentary and built legacy of our infrastructure and our land...

Strategic Priority

Public works and urban development represent a heritage of considerable historical, technical amd cultural value. Protecting it helps safeguard our shared memory and the development of engineering and the landscape. In this field, CEDEX carries out work focused on conserving, studying, researching and sharing this legacy, encouraging wider understanding and appreciation of it. This challenge is structured around one area of action and three strands of activity, centred on conserving documentary and built heritage, research and knowledge creation around heritage, and bringing it to the public through dissemination and recognition.

HERITAGE

PUBLIC WORKS AND URBAN PLANNING



Reto 7(R7)	Strategic themes (T) and activity strands (L)	Thematic areas						Unique facility (IS)
R7.T1.	Public works and urban planning							
R7.T1.L1	Preservation of documentary and built heritage		✓				✓	
R7.T1.L2	Research and knowledge creation around heritage		✓				✓	
R7.T1.L3	Sharing and showcasing documentary and built heritage		✓				✓	

Contribution to the 2030 Agenda SDGs



Thematic areas			
✓	Roads, transport and mobility	✓	Landscape and rural environment



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