



# **STRATEGIC AGENDA**

**CEDEX  
2023-2025**



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## **CEDEX 2023-2025**



CENTRO DE ESTUDIOS Y EXPERIMENTACIÓN DE OBRAS PÚBLICAS

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# FOREWORD



## Isabel Pardo de Vera Posada

Secretary of State for Transports, Mobility and Urban Agenda  
President of CEDEX. Ministry for Transports, Mobility and  
Urban Agenda (MITMA)

It is a pleasure for me to introduce this Strategic Agenda from CEDEX; an agenda that goes entirely hand in hand with the effort that the Ministry of Transport, Mobility and Urban Agenda (MITMA) is making to guide its activity towards the new needs of society.

As you know, the change of name of the Ministry, recovering in its designation the word transport and including mobility and the urban agenda, obeys the will to place the needs of the citizen at the centre of our activity. In doing so, our work as public servants turns towards the provision of services (planning, construction, operation and maintenance of infrastructures and transport regulation and management). These services produce econo-

mic growth, social cohesion and environmental well-being.

On the other hand, in recent years, we have suffered a pandemic that has significantly affected our way of life and our economies we are also enduring a situation of armed conflict in Europe, which is leading to a major energy and raw materials crisis.

The European Union is clear that the only way out of this crisis is through solidarity and a respectful approach to the environment, more resilient and digital. We are, therefore, at a truly strategic moment, in which, through the Next Generation instrument, the European Union is betting on innovation and modernisation in or-

der to transform our economies and place us at the forefront of the world. Thanks to the Recovery, Transformation and Resilience Plan (PRTR) we are given the opportunity to promote policies aligned with the change proposed from Europe and the MITMA is very clear that these funds are an opportunity to advance in green, sustainable, digital and resilient transport. For this purpose, we are committed to the "Urban and rural agenda, fight against depopulation and development of agriculture" and "Resilient infrastructures and ecosystems" as lever policies to advance in the proposed changes. Within these policies, the Secure, Sustainable and Connected Mobility Strategy 2030, the Indicative Railway Strategy and the future Sustainable Mobility Law are the elements on which the Ministry's activity will pivot in the coming years.

In this context, I believe that this Strategic Agenda is absolutely timely. It constitutes an invaluable exercise in which CEDEX exhaustively analyses the context that we are living in and identifies three key priorities for its future, prio-

rities that will be developed in the next CEDEX Strategic Plan:

- ▶ Maximum alignment with the needs of MITMA and MITERD.
- ▶ Consolidation of the national and international projection of CEDEX.
- ▶ Internal strengthening to improve efficiency.

Additionally, and from a technical level, CEDEX continues to bet on innovation and proposes a whole battery of strategic issues and lines of activity, from the point of view of resilience, sustainability and digitalization, to clearly support the two ministries on which it depends functionally in the arduous task of meeting the ambitious objectives we have set for the coming years.

I would like to highlight the enthusiasm and energy that emerges from this Strategic Agenda, supported by the good work and technical strength of CEDEX. This Agenda looks decisively to the future, reinforcing CEDEX vocation to be the technological arm of MITMA and MITERD.

# FOREWORD



## Hugo Morán Fernández

Secretary of State for Environment

Vice President of CEDEX. Ministry for Ecological Transition and the Demographic Challenge (MITERD)

**W**e are living in a particularly important moment. Mankind and the planet are going through a period of turbulence, to which Spain is no stranger.

In response to the widespread consensus of the scientific community, which demanded, and demands, urgent action to safeguard the environment, health and safety of citizens, we had already identified and declared the climate and environmental emergency. Additionally, it has been added a health crisis first, an economic crisis later, and a military conflict at the gates of the European Union, which has only aggravated the above.

The climate emergency, the degradation of ecosystems, the loss of biodiversity, the deterioration of soils and water quality, the impacts on the marine environment and the coast, as well as the modification of our living conditions, have triggered a shared concern that needs an adequate response.

Our country, due to its geographical location and its socio-economic characteristics, is especially exposed to the consequences of these challenges, something for which we have been preparing with the support of science.

That is why, in January 2020, the Council of Ministers declared a climate and environmental



emergency. And that is why, in our country, in recent years, we have deployed an unprecedented effort in terms of planning and programming, which has resulted in a series of instruments on energy and climate, jointly aimed at avoiding or reducing the worst effects of climate change and biodiversity loss.

Thus, the Law on Climate Change and Energy Transition is an essential tool to align the rest of the policies and guide the recovery process towards a model of lasting prosperity that respects the limits of the planet, in line with the climate strategy of the European Union and the Paris Agreement.

We have also made progress in the execution of the commitments acquired in the Spain Circular Economy Strategy, approved in June 2020, and we are overturning the legislation on waste, which will be key in the change of model.

In water policy, we have approved the Strategic Guidelines on Water and Climate Change, whose mission is to establish the principles and measures that should be contemplated in the planning and management of water in our country, and the hydrological plans of the third cycle 2022-2027, on which to address water management in Spain during the next six years. These Guidelines are in addition to the National Plan for Wastewater Treatment, Sanitation, Efficiency, Savings and Reuse (DSEAR) and the PERTE for Digitalization of the Water Cycle, among other initiatives.

We also work on the protection of biodiversity and natural heritage and, therefore, we approved the State Strategy for Green Infrastructure

and Ecological Connectivity and Restoration. We are strongly committed to adopting an ambitious and effective global framework to respond to the severe global biodiversity crisis.

Nor do we forget the adaptation of the coast to climate change because, in an eminently coastal country like ours, the rise in sea level represents, together with extreme events, one of the greatest threats. Hence, our work on the Strategy for Adaptation of the Coast to Climate Change and the National Strategic Plan for the Protection of the Coast, as well as on integrated coastal zone management and the implementation and consolidation of Marine Strategies and Maritime Spatial Management Plans.

For all these reasons, I especially appreciate that CEDEX, with which the Ministry has maintained a close collaboration for many years, has included in this Strategic Agenda 2023-2025 the issues that most concern us and in which we are working, proposing lines of activity that connect with the objectives expressed in the Recovery, Transformation and Resilience Plan. Without a doubt, they will be very useful.

The exercise of diagnosis, reflection and prospective that you have carried out, together with your technical background and your ability to promote innovation, will be a strong support for the Ministry in the present situation, under the imperative of carrying out significant changes that will drive us towards the desired goal of an ecological transition.

# PROLOGUE TO THE STRATEGIC AGENDA



## Áurea Perucho Martínez

Director of the Centre for Studies and Experimentation in Public Works (CEDEX)

Ministry for Transports, Mobility and Urban Agenda

**C**EDEX was created as such in 1957 and during its 65-year history it has established as a cutting-edge international institution, in charge of solving the many problems that arise in the areas of its specialization, especially in cases where it is necessary to combine engineering with environmental aspects, for the benefit of sustainable development.

For this reason, a year and a half ago when I was appointed director of CEDEX, I was aware that I was assuming a great responsibility and a great challenge: a great responsibility because it means being up to the level of previous direc-

tors with whom CEDEX has provided technical results of great importance, and a great challenge because I know that, in these difficult times we are living, CEDEX has to rethink some of its pillars in order to continue being at the level it is meant to be. For this reason, one of the initiatives that I have promoted is the elaboration of this Strategic Agenda, since I believe that it is essential to establish shared objectives with our ministries. The Agenda also highlights our commitment to contribute to an adequate implementation of the PRTR and to the best use of its funds to face the priority challenges in our areas of knowledge and experience. For achie-

ving this, we have set some priorities; some of them are of a general nature, in order to be able to provide the service that we want to give and that our ministries demand of us; we have also set some thematic priorities that have to guide our activity, aimed at identifying the fields in which CEDEX will focus decisively on the coming years.

Let me talk more about the thematic priorities. Along with the traditional capabilities of CEDEX in the field of technical support, experimentation and knowledge transfer we should not forget the innovative potential of CEDEX, embedded in its DNA; that is to say, 'to be attentive to new ways of doing things' that is 'thinking of better ways of solving problems'.

In the field of innovation, CEDEX plays an essential role for the ministries, sometimes as a promoter of an idea, but also as an observer, developer and regulator. CEDEX contributes with its transversal knowledge and its excellent technical capabilities, made up of highly qualified human resources and unique technological equipment, which allows us to provide reliable and independent technical opinions. All of this means that this Organization is an investment that brings multiple benefits to society, helping to boost the economic growth of our country by promoting the optimization and more efficient use of its resources.

For this reason, now more than ever, we are focused on promoting innovation in the areas of mobility and the natural environment, at the service of the Ministry of Transport, Mobility and the Urban Agenda, and the Ministry for the Ecological Transition and the Demographic Challenge.

In the following pages you will find the thrill, and also many hours of work, that have crystallized in the elaboration of this Agenda and in the proposal of a series of priorities and lines of activity that will help us to strengthen ourselves to be able to do what we like the most, that It is nothing more than providing technical solutions to the challenges that arise every day.

The Strategic Agenda does not end here. It is a living document that we will update and provide content through the new 2023-2025 Strategic Plan, with each new project, with each solution to a problem raised, with each course that we teach. I invite you to read this document and share with us your own concerns that will undoubtedly enrich our activity and help us to really be there where we are needed, effectively and efficiently fulfilling the mission for which this Organization was born, and which can be summed up as being the technological reference in our country in the wide spectrum of fields that encompasses civil engineering and building, transport and mobility, and the environment, placing itself at the service of governing bodies and society as a whole.

# 1

## **EXECUTIVE SUMMARY**

**W**e are currently experiencing a time of great **changes and new developments** in very different fields: both important technological innovations as well as great changes linked to knowledge management and communications. Therefore, it seems the right moment to stop and reflect on all the aspects that concern an institution like CEDEX.

Thus, in this agenda, we reflect on the **mission** of CEDEX, on the main social, environmental, economic and political **challenges** that will condition us in the coming years, to finally propose a **vision** of CEDEX, according to the nature of the Organism and our desire to **be as wuseful as possible** for society in general and for our ministries in particular. With that vision in mind, a set of **priorities** have been established that we will have to implement in order to achieve it.

On the one hand, from a general point of view, CEDEX is committed to seek a **maximum alignment with the needs of the MITMA and the MITERD**. CEDEX was created and exists to technically support and reinforce our ministries, in those issues that might require our participation, due to their difficulty or the need to have a specialized, impartial, objective and reliable adviser. Likewise, we are committed to the consolidation of the **national and international projection of CEDEX**, contributing to technically lead the forums and knowledge networks that concern us, promoting an objective and neutral position in order to ensure that Spanish interests are correctly represented. Finally, we are aware of the importance of **strengthening ourselves to improve the efficiency** of the services that

CEDEX provides, and we will dedicate all our efforts to this.

These general priorities are related to the implementation of the **thematic priorities**, since it is there where CEDEX provides added value through technical support, R&D&I and knowledge transfer. In this sense, we choose to support our ministries by reviewing and re-defining our lines of activity to offer them the best service. For this reason, we are committed to **innovation** in all aspects of **mobility** (transport infrastructures, mobility, materials and their adaptation to new circumstances and the mitigation of negative effects such as climate change) and **innovation** in all the elements that exist in the **natural environment** (biodiversity, water, ecosystems, environmental quality; and also, hydraulic and port infrastructures and their adaptation to climate change). Innovation is aimed to support the achievement of country challenges and the objectives of the PRTR. Therefore, we seek that all CEDEX activities contribute to a more **resilient, sustainable and digital** future.

CEDEX is an Organization qualified to contribute to face the current social, environmental, economic, technological and institutional challenges and to facilitate an adequate implementation and execution of the PRTR (Recovery, Transformation and Resilience Plan), helping that its investments are made where they generate more value, fostering public-private collaboration.



# 2

## **INTRODUCTION**

The **Strategic Agenda** is a document that has been created to identify the priorities that should guide the activity of CEDEX in the coming years. It has allowed us to reflect on the contributions that this Organization can make to face the current challenges and needs, with the aim of continuing to contribute to the welfare of society. This reflection must also help in the identification of needs (facilities, equipment, personnel and capabilities), which will be assessed in the next Strategic Plan 2023-2025, on which we are working.

**Why now** a Strategic Agenda for CEDEX? The Organization's activity has traditionally been highly conditioned by the activity of the ministries on which it functionally depends, MITMA and MITERD. In addition, CEDEX has had its own agenda through which it has provided itself with unique facilities and has opened new lines of research that, in the medium term, have allowed us to provide a better service to its management centres and to society. However, now we are living a **period of important**

**changes** and the emergence of a large number of innovations in all areas, not only technological innovations, but also all linked to knowledge management (big data, internet of things, artificial intelligence, blockchain) and communication (social networks, YouTube), among others, as well as the need to mitigate and adapt our infrastructures to climate change, so it seems appropriate to stop and reflect on all the aspects that concerns an institution like CEDEX.

To develop this Strategic Agenda, the involvement and collaboration of all CEDEX workers as well as input from the ministries has been considered, encouraging them to answer a survey focused on seeing what their opinion is about the mission and vision of CEDEX, as well as adding their own thoughts. This Strategic Agenda is the result of teamwork, since teamwork is what has always characterized our way of acting, and it is essential for CEDEX to be at the forefront of civil engineering and related environment.



# 3

## **THE MISSION OF CEDEX TODAY**

## WHO WE ARE?

The **Centre for Studies and Experimentation of Public Works**, A.O. and O.M. (CEDEX) is a **Public Agency** of those provided for in article 98 of Law 40/2015, of October 1, on the Legal Regime of the Public Sector, **organically attached to the Ministry of Transports, Mobility and Urban Agenda** (MITMA), through the Secretariat of State for Transports, Mobility and Urban Agenda, and **functionally dependent on MITMA and the Ministry for Ecological Transition and Demographic Challenge** (MITERD), within the framework of their respective competences. In addition, it holds the status of **execution agent of the Spanish System of Science, Technology and Innovation** (SECTI)<sup>1</sup>

CEDEX is a cutting-edge institution dedicated to activities related to public works, civil engineering, transportation and mobility, building, and the integration of climate and environmental implications.

CEDEX consists of **five Centres and three Laboratories** specialized in the different topics described and staffed with more than 400 highly specialized and qualified people. In addition, the staff is supported by a set of first-rate technological resources and scientific-technical facilities.

- ▶ Centre for Hydrographic Studies (CEH)
- ▶ Centre for Studies on Ports and Coasts (CEPYC)
- ▶ Centre for Transport Studies (CET)
- ▶ Centre for the Studies on Applied Techniques (CETA)
- ▶ Central Laboratory for Structures and Materials (LCEYM)
- ▶ Geotechnical Laboratory (LG)
- ▶ Railway Interoperability Laboratory (LIF)
- ▶ Centre for Historical Studies of Public Works and Urban Planning (CEHOPU)

## WHAT DO WE DO?

### Areas of work

The **activity** that we carry out at CEDEX covers a wide range of topics, at the service of institutions and management centres with executive powers: mobility, transport and its infrastructures, by road, rail or sea; continental and marine waters and their infrastructures, dams, ports and coasts; construction structures and materials; geotechnics; the knowledge and care of the environment and the development of measures to reduce the impacts of the execution and management of infrastructures and the mitigation and adaptation to climate change; as well as the study of the Heritage of public works, focused on its conservation, recovery and enrichment.

<sup>1</sup> Law 17/2022, of 5 september, that modifies Law 14/2011, of 1 June, on Science, Technology and Innovation.

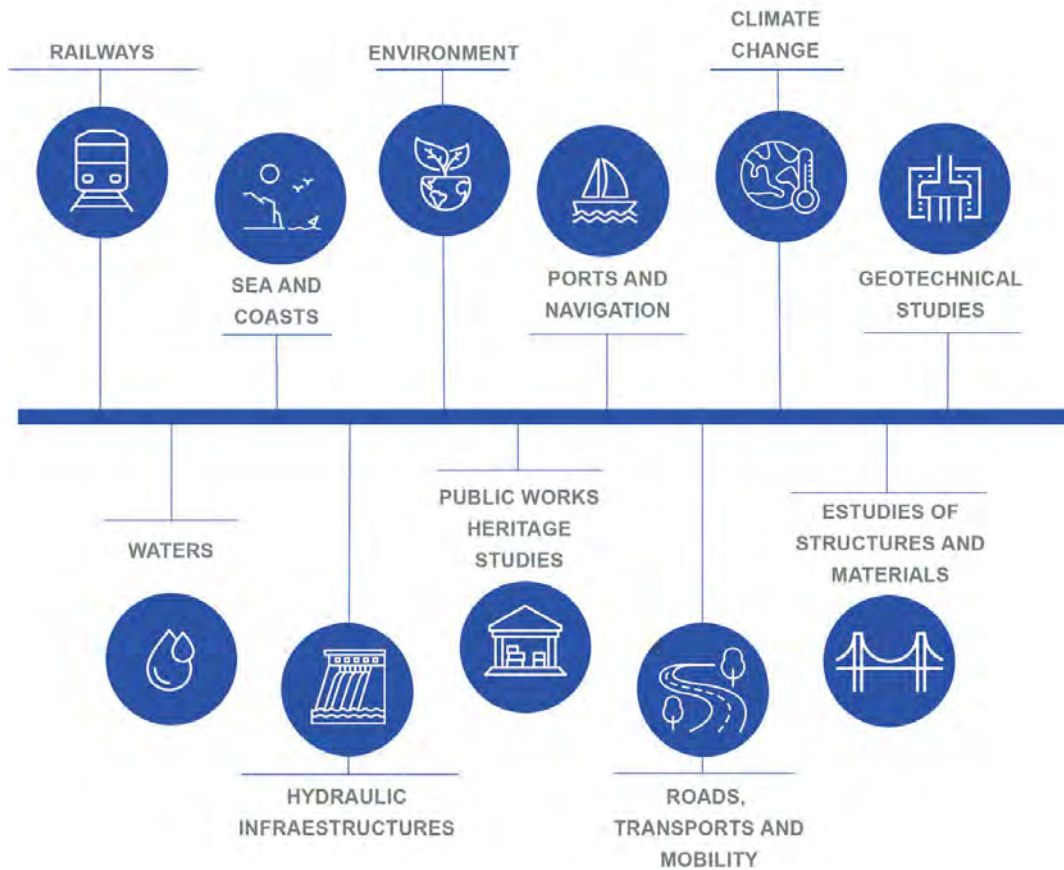


Figure 1. Areas of activity of CEDEX.

## Activities

- ▶ **We develop specialized technical assistance to the public and private sectors.** To do this, we carry out a wide variety of activities, such as obtaining and managing data, testing and experimentation, instrumentation, study, improvement and certification of materials, techniques, methods and construction solutions, as well as the development of its standardization.
- ▶ We contribute to the advancement of applied knowledge through the development of **research, technological development and innovation** works and projects.
- ▶ **We encourage dissemination and transfer of Spanish knowledge and technology** at the national and international levels, carrying out publications, workshops, conferences, seminars, symposiums, master's degrees, courses and exhibitions, as well as through the creation and maintenance of thematic portals of information. We participate in national and international working groups and networks and collaborate with other administrative bodies and institutions, giving great importance to international cooperation.

All the details of the functions carried out by the CEDEX can be consulted in its [Statute](#).



## Service to society

As an owned resource of the Spanish General State Administration (AGE), we provide service to the ministries, through sectoral work programs mainly linked to specialized technical assistance and support in the fields of technology and innovation, mainly oriented towards MITMA and MITERD management centres and entities linked to them.

We provide service to society, not only by supporting ministries or other administrations and entities of the public sector, but also by collaborating with private companies in the development and implementation of innovation

oriented to the needs of the sector, as well as promoting the transfer and dissemination of knowledge through training activities, the publication of research notebooks and monographs, and the organization of conferences and seminars; and likewise, promoting standardization, by actively participating in national and international committees.

This service to society is extended to some Latin American countries through the specialized technical assistance that has been provided for years to the Cooperation Fund for Water and Sanitation of the Ministry of Foreign Affairs, European Union and Cooperation.

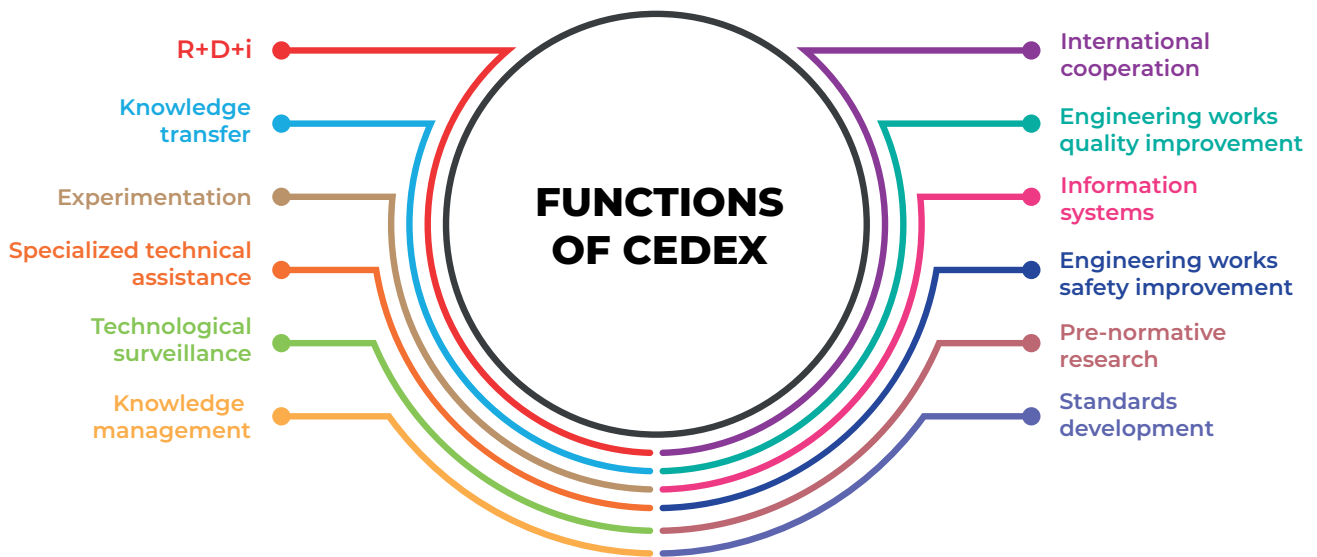


Figure 2. Main functions of CEDEX.

# MISSION

**CEDEX's mission** is to provide **service to society**, through its contribution to the resolution of traditional and emerging problems of society, in singular settings or works, related to public works, infrastructures and services of civil engineering, transport and mobility, building and the integration of climatic and environmental implications. To this end, CEDEX provides **highly qualified and specialized services**. This experience allows us to improve **safety** and **quality** in civil works and contribute to the advancement of applied knowledge through the development of research work, by participating in national and international working groups and networks, preparing technical regulations and by serving as a channel for the introduction and dissemination of **innovation** and early application of generic technologies in these fields of activity.

## WHAT MAKES US DIFFERENT?

In order to carry out these activities at CEDEX we have three **great strengths**: our highly qualified staff, the independence and reliability that characterizes our activity and our extensive technical equipment and unique scientific-technical facilities.

Our **staff** stands out for its **high level of preparation and specialization**, to which is added a vocational component that allows the continued development of the different lines of activity, , looking for a continuous improvement of our capabilities; that is joined with the flexibility and versatility required to answer the emerging needs of XXI Century society.

The **multidisciplinary integration of our team** of professionals with different backgrounds stands out: engineering and other technical qualifications, earth sciences, basic sciences and social sciences, that provide different com-

plementary visions in the study of increasingly complex issues linked to aspects of planning, development and management in our areas of work.

On the other hand, the integration of the **environmental variable** in the decision-making processes adopted in the field of Civil Engineering is essential for the contribution to the Sustainable Development Goals and the mandates that arise from their application in Spain.

With regard to the **facilities**, it should be noted that we have unique scientific-technical facilities, some of which constitute **a national and even international reference**: railway interoperability and ERTMS laboratory, the large dimension cell for tests of railway sections on a full scale, the real scale accelerated pavements test track, the maritime experimentation laboratory and its maneuvering simulation facilities, the hydraulics laboratory, the isotopic applications laboratory or the seismic simulator with six degrees of freedom.



The **high qualification** of our professionals, our valuable and unique **scientific-technical facilities and infrastructures**, the **breadth of topics** we address and the growing **cooperation** with similar foreign institutions, are some of the particularities that make **CEDEX** an **independent and multidisciplinary technical organization of reference, ideal for facing the current challenges** that arise in our areas of activity, for addressing the optimization and most efficient use of our resources, and for contributing to boosting the **economic growth** of our country and the **sustainable development**.





Figure 3. Singular CEDEX facilities

## HOW DO WE ORGANIZE?

At CEDEX we have a **Council** -whose **president** is the **Secretary of State for Transports, Mobility and the Urban Agenda** and whose **vice-president** is the **Secretary of State for the Environment**- who knows and guides our activities. We are structured into **eight Centres and Laboratories** of thematic specialization and a **Secretariat** for support, in which we work collaboratively within the areas indicated under the **direction of the Agency**, which is exercised by our **director**, supported by a **Management Committee** of which all the **directors of the Centres and Laboratories**, as well as the **Secretary** are members.

This **multidisciplinary integration** in a single Organization such as CEDEX allows us to optimize the service provided in our areas of activity.

### CEDEX'S ORGANIZATIONAL STRUCTURE





The **Centre for Hydrographic Studies** (CEH) develops its activity in the field of continental waters, highlighting its work on water resources, floods, hydrological planning, safety of hydraulic works, fluvial hydraulics, water quality and water technologies, for which it has facilities as unique as the Hydraulics Laboratory. Its work contributes to a better understanding of Spanish hydrology, through the publication of gauging yearbooks and the inventory of water resources. Hydraulic, physical and numerical experimentation allows solving fluvial problems and improving the design of hydraulic works. The most recent lines of work include studies of the possible hydrological impact of climate change and international cooperation in water and sanitation.

programs and management instruments including decision support systems, coastal protection strategies, the study of defense and restoration activities on the coast against erosion and flooding.

The **Centre for Studies on Ports and Coasts** (CEPYC) is the unit specialized in ports, coast, navigation and sea. Its activities are based on the use of measurements in nature, data banks and information systems, experiments using scaled physical models, numerical models and simulation systems. The issues covered include studies and research related to the design and operation of the maritime zone of ports, the stability and functionality of port, coastal and offshore marine structures, navigation safety, monitoring of the coast and the marine environment, the surveillance of projects and activities with environmental effects, plans,

The **Centre for Transport Studies** (CET) focuses its activities on the study of road infrastructures and transport in general. As priority areas of action, stand out those linked to the characterization of traditional materials as well as the incorporation of alternative and recycled materials, for the construction of pavements. Its specialization is also aimed at experimentation with new materials, additives and new construction techniques, in the accelerated pavements test track of on a real scale, the performance of monitoring studies of the behavior of the pavements by means of instrumentation in experimental sections, and the monitoring of their evolution through auscultation techniques. Other lines of research are the decarbonization of transport, its digitization (vehicle-infrastructure and vehicle-vehicle interaction; remote road surface monitoring), and the sustainability and resilience of infrastructures.

The **Centre for Studies of Applied Techniques** (CETA) works on the study and description of the natural environment, the impacts and natural risks or those induced by human activity and in particular by public works, on the environment. CETA analyzes specific impacts such as noise and air pollution, on surface and groundwater, the fragmentation of habitats and the effects of civil engineering actions both on riverside ecosystems and on the coastline, as well as in mitigation and adaptation to the effects of climate change. Proposals for measures are also prepared to minimize the impacts produced, from ecological restoration through nature-based solutions, to the proposal of measures to monitor their effectiveness and the state of the ecosystems, or the analysis of the radiological quality of the waters.

The **Training and Documentation Unit** attached to CETA -but a transversal body of CEDEX-, plays a key role in the transfer of knowledge to civil society by organizing Masters, Courses and Conferences. Similarly, through its editorial program, it carries out the publication of scientific-technical publications included in the extensive catalogue of CEDEX publications and coordinates the publication of the journal "*Ingeniería Civil*". It is worth highlighting the promotion of student participation processes in internships from both Institutes and Universities in the different CEDEX Centres and Laboratories.

The **Geotechnical Laboratory** (LG) is the centre specialized in civil engineering activities related to the ground. It carries out research and technical assistance functions in soil and rock mechanics applied to geological and geotechnical engineering in the field of building, transport infrastructure, hydraulic and port works, and environmental geotechnics. It contributes to the safety of the works in different phases: in the field of recognition and characterization of the terrain or geotechnical problem; in the analysis stage by means of analytical and numerical calculations, in situ or full-scale tests and geotechnical observation; and, based on the foregoing, in the definition of the best constructive or pathology repair solutions. For this, it is specialized in different high-level recognition techniques, linked to laboratory tests, in situ tests or geophysical techniques.

The **Railway Interoperability Laboratory** (LIF) is the first in the world accredited to test components and lines equipped with ERTMS, and to carry out the preliminary tests for the deployment of said European signalling system on real lines. It also participates in special studies related to ERTMS, such as the feasibility of the Eurobalise for three-lane tracks, and is involved in numerous European R&D projects to increase ERTMS performance, such as the use of the Galileo satellite system for a safe localization of the train with the consequent re-

duction in costs, the deployment of automatic train operation systems (ATO) on ERTMS or the use of new communication systems for levels 2, 3 and 3 hybrid of ERTMS. It also participates in advanced projects of new technologies applied to the railway, mainly those related to the digitization of the railway.

The **Central Laboratory of Structures and Materials** (LCEYM) carries out extensive activity in the field of civil engineering and building structures and construction materials. Its work stands out in the field of instrumentation and auscultation of structures, static and dynamic tests of structures, studies of construction pathologies, research into new, higher quality and more sustainable materials, as well as the control of materials used in construction, in road signs and waterproofing. The type of works in which work is very broad (bridges, buildings, ports, dams, roads, etc.) as they are studies not only of structural behavior but also of pathologies associated with the material. The results of some of these studies make it possible to introduce improvements in the applicable technical regulations. New technologies have recently been implemented for the development of these works, such as drones and BIM methodology.

The **Centre for Historical Studies of Public Works and Urbanism** (CEHOPU) focuses its activity on enhancing the historical heritage of public works. Its lines of work are grouped around three pillars: research and study aimed at generating knowledge about public works and its subsequent dissemination; the management and making available to the public of its own documentary collections or those of which CEHOPU is the depository through the corresponding collaboration agreements; and the recovery, conservation, functional transformation and enrichment of singular public works of a historical nature.

In terms of results, on the one hand, the activity oriented towards the dissemination and cultural appreciation of public works generates tangible results of social interest such as exhibitions, conferences and informative events, publications and graphic and documentary material. And, on the other, the activity aimed at the physical recovery of heritage offers the possibility of restoring, transforming, rehabilitating and providing current sustainable uses to public works of a historical nature.

## HOW DO WE CONTRIBUTE TO THE ACHIEVEMENT OF THE SDGs?

At CEDEX we are fully committed to the 2030 Agenda for Sustainable Development adopted by the United Nations Organization in 2015 and, therefore, our work contributes to the achievement of the Sustainable Development Goals (SDGs) defined therein.

Our activity has a transversal impact on most of the 17 SDGs and acts as a catalyst for the rest of the 2030 Agenda. The main SDGs affected by this Strategic Agenda are: SDG 3 “Health and well-being”; SDG 5 “Quality Education” SDG 6 “Clean water and sanitation”, SDG 9 “Water, industry, innovation and infrastructure”, SDG 11 “Sustainable cities and communities”, SDG 12 “Production and Responsible Consumption” SDG 13 “Climate Action”, SDG 14 “Life Underwater” and SDG 15 “Life on Terrestrial Ecosystems”. This activity internally reinforces the Environmental Management System, implemented since 2009 on the CEDEX activity in accordance with the certification requirements of the ISO 14,001:2015 standard.

SUSTAINABLE DEVELOPMENT GOALS					
	<b>NO POVERTY</b>		<b>ZERO HUNGER</b>		<b>GOOD HEALTH AND WELL-BEING</b>
	<b>QUALITY EDUCATION</b>		<b>GENDER EQUALITY</b>		<b>CLEAN WATER AND SANITATION</b>
	<b>AFFORDABLE AND CLEAN ENERGY</b>		<b>DECENT WORK AND ECONOMY GROWTH</b>		<b>INDUSTRY, INNOVATION AND INFRASTRUCTURE</b>
	<b>REDUCED INEQUALITIES</b>		<b>SUSTAINABLE CITIES AND COMMUNITIES</b>		<b>RESPONSIBLE CONSUMPTION AND PRODUCTION</b>
	<b>CLIMATE ACTION</b>		<b>LIFE BELOW WATER</b>		<b>LIFE ON LAND</b>
	<b>PEACE, JUSTICE AND STRONG INSTITUTIONS</b>		<b>PARTNERSHIPS FOR THE GOALS</b>		

# 4

## **CONTEXT AND NEW CURRENT CHALLENGES**

In order to focus the direction of the Strategic Agenda of CEDEX, it is essential to know the **current context**, in which **new challenges** are presented to us both in the **transport and mobility** sector and in all aspects related to the conservation and improvement of the **natural environment** and the improvement of **environmental quality**.

This context is currently marked by **new environmental, social, economic and technological challenges**, both at an international, European and national level, which entail a change in the

focus of public policies, management objectives and investment **priorities**, which is highly conditioned by: major global issues such as the climate emergency and the need to evolve to more **sustainable** production models, the issue of the demographic challenge and its associated need to seek **new mobility models**, the explosion of new technological developments that drive us towards **digitization** which may mean a leap forward in our efficiency and optimization of resources, the outbreak of the covid-19 **pandemic** in early 2020, or the most recent **crisis scenarios worldwide** that we are currently experiencing.



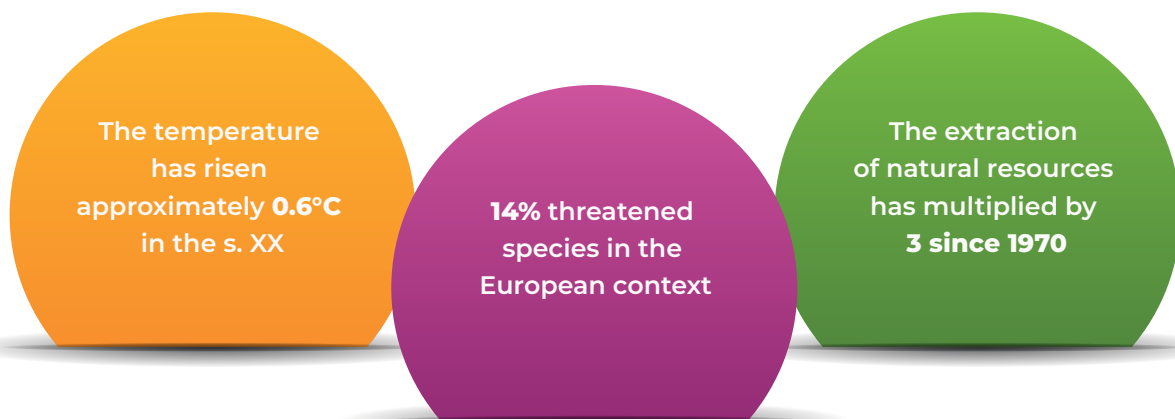


## ENVIRONMENT

At the present time we are facing a major environmental challenge, characterized by a series of environmental problems that we must face and for which solutions must be sought and applied urgently. The “**climate emergency**”, with potentially catastrophic consequences for the planet, as well as the problems linked to other environmental aspects that damage our environment, **the overexploitation of natural resources, the loss of biodiversity, pollution of air, soils and continental and marine water bodies or the increase of residues.**

The most recent estimates made by the Intergovernmental Panel on Climate Change (IPCC 2021) conclude that, unless greenhouse gas (GHG) emissions are rapidly reduced, the target

agreed by G20 to limit warming to 1.5°C by 2030 relative to pre-industrial levels (probably not even 2°C) can't be achieved. The consequences of **climate change** are not only global warming, but also the alteration of the hydrological cycle - with a reduction in water resources, an increase in the frequency of droughts and an increase in maximum and torrential rainfall -, the increase in sea levels -contributing to the increase in coastal erosion and coastal flooding-, the acidification of marine waters, the melting of permafrost and glaciers, as well as the greater frequency and intensity of other extreme events (heat waves, storms...), with the consequent impacts on the existing flora and fauna. The **loss of biodiversity** is another great challenge, since globally we are suffering the greatest mass extinction of species known, which is being produced by the loss of natural habitats, their isolation



**Source:** Miteco; [Fundación Global Nature](#); WWF; UN Environment's [Global Resources Outlook 2019](#).

and fragmentation, as well as by the increasing rise on invasive and exotic species, being further reinforced by climate change, and leading to a loss of natural capital and the ecosystem services it provides (quality air and water, fertile soils, among others).

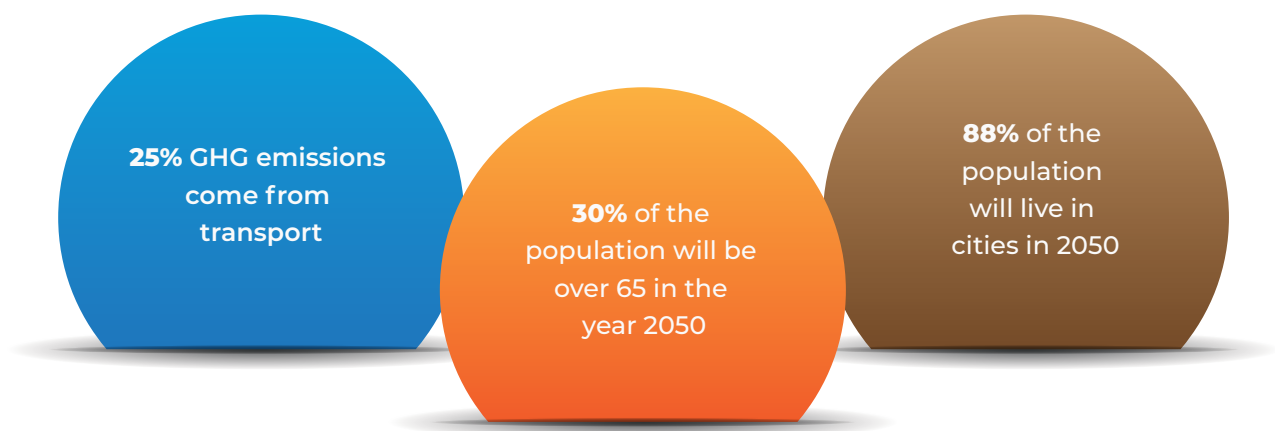
Therefore, we are currently in an environmental context that drives us towards the energy transition, in search of a **cleaner, more efficient and sustainable organizational model, supported by the use of renewable sources and circular economy models**. This energy transition and the fight against climate change entail technological transformations and changes in the industry, in search of effective solutions, to mitigate the effects of climate change and to increase the capacity to adapt to its adverse effects and promote resilience.

## SOCIETY

Spain currently has 47 million inhabitants unevenly distributed by age range, the most numerous group corresponds to the 45 to 49 age range. The widespread **aging of the population** implies that infrastructure and mobility policies must consider the new needs that arise for the older population.

On the other hand, the greater **concentration of population** in large cities and peri-urban areas entails important management challenges, related to aspects such as traffic congestion, the distribution of public space, the harmful effects on health due to low air quality or excessive noise caused by traffic. In addition to that challenge, many rural areas and medium-sized cities face the opposite problem, **depopulation**, which requires seeking new specific mobility solutions to try to tackle this issue.

In this context of demographic challenge, the **sustainability of daily mobility** in today's society demands special attention to issues related to passenger and freight transport, efficiency in



Source: OTLE; [El envejecimiento de la población \(fgcsic.es\)](https://fgcsic.es/); [200521-Estrategia\\_Espana\\_2050\\_6.pdf \(lamoncloa.gob.es\)](https://lamoncloa.gob.es/200521-Estrategia_Espana_2050_6.pdf)



the use of different modes of transport, public transport and collective transport, digitization of services and inclusive mobility.

It is estimated that transport is the cause of approximately one third of greenhouse gas

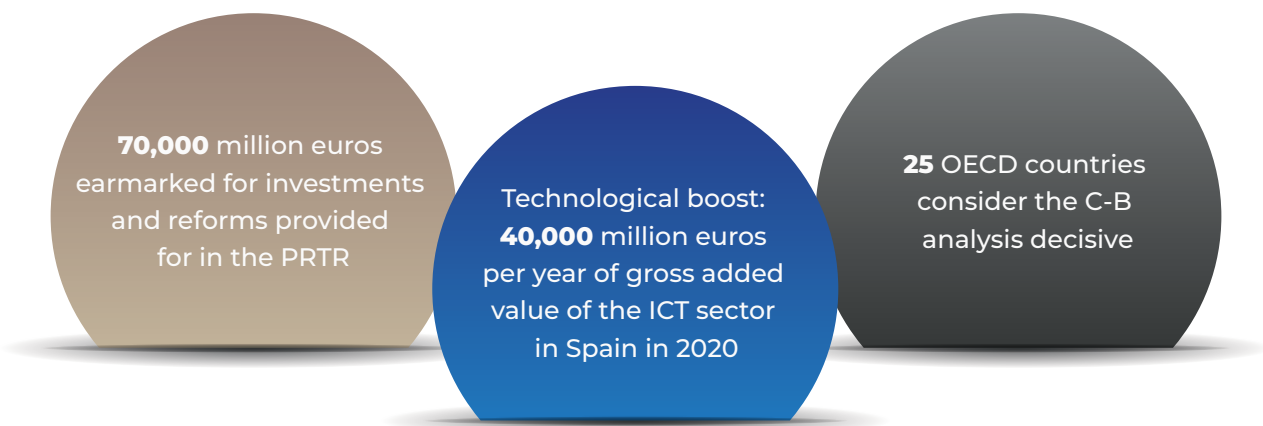
(GHG) emissions, so it is essential to work to drastically reduce polluting emissions from this sector in the coming decades, in order to achieve the decarbonization objectives of 2030 and 2050, set out in the Long-Term Decarbonization Strategy 2050.



## ECONOMY

Investments with public funds must be aimed at providing solutions to the needs that society demands, prioritizing those actions that, with maximum efficiency, generate the **greatest social benefit**. In this regard, the report on “Transport Infrastructures” by the Independent Authority for Fiscal Responsibility (AIReF) confirms the investment effort that Spain has made in recent decades, and the strong increase in demand derived from this effort. AIReF proposes changing the investment model, **prioritizing actions based on planning tools**, to ensure that investments result in socioeconomic benefits and achieve an efficient provision of infrastructure capable of meeting the needs of society and the economic system, with rational and efficient spending of resources.

The Covid-19 pandemic has dealt a severe blow to the transport and mobility sector due to the severe restrictions to which it has been subjected. With the aim of accelerating economic recovery, the European Union has assigned Spain within the framework of its **European Recovery Plan** (Next Generation EU), and under the principles of European policies, in particular the **European Green Deal**, the digital revolution and resilience, a total of **69,528 million euros** in direct transfers. This amount will be allocated to the investments and reforms that the Government of Spain has defined in the **Recovery, Transformation and Resilience Plan (PRTR)**, which is developed around four main axes: the ecological transition, digital transformation, social cohesion and territory, and gender equality. It includes among its priorities components aimed, among other aspects, at promoting the



**Sources:** [Plan de Recuperación, Transformación y Resiliencia](#), Informe Anual del sector de las TIC, los medios y los servicios audiovisuales 2020 del Observatorio Nacional de las Telecomunicaciones y de la Sociedad de la Información (ONTSI), Hacia Infraestructuras Exitosas. Diez retos clave para la gobernanza y opciones de política (OCDE 2016), encuesta gráfico 5.

conservation and restoration of ecosystems and their biodiversity, the preservation of the coastal space and water resources and sustainable, safe and connected mobility.

On the other hand, we must be aware of the explosion in the development of **new information technologies, digitization and data collection and analysis**, which offer us a magnificent opportunity to greatly improve our management and efficiency in many aspects of our areas of work. In this sense, the massive incorporation of recent technologies and digitization in **mobility** has led to the emergence of new forms and mobility services, as well as new business models such as electronic commerce, which represent an excellent opportunity to improve the efficiency of system, by facilitating a better adjustment of supply to demand. Digitization also represents an opportunity regarding the **management of our natural environment**. Thus, the incorporation of new technological tools represents a challenge to significantly improve knowledge and efficiency in the management of natural resources, and the development of more sustainable production processes based on a circular economy.

We are, therefore, facing a great **economic challenge** and a great **opportunity** to transform and make the mobility sector more resilient and to advance in the protection of ecosystems and biodiversity, as well as water resources. However, new challenges are added to the existing ones: the rise in energy prices, the scarcity of raw materials, the supply crisis... all of this aggravated by the current situation of conflict between Russia and Ukraine.

## PUBLIC POLICY

At the **international level**, the **UN 2030 Agenda on Sustainable Development** (2015) stands out. It is an ambitious action plan that sets out 17 SDGs and 169 goals to achieve a sustainable world in the year 2030. Also noteworthy is the **Agreement on Paris (2015)**, focused on not increasing the average global temperature by more than 2°C.

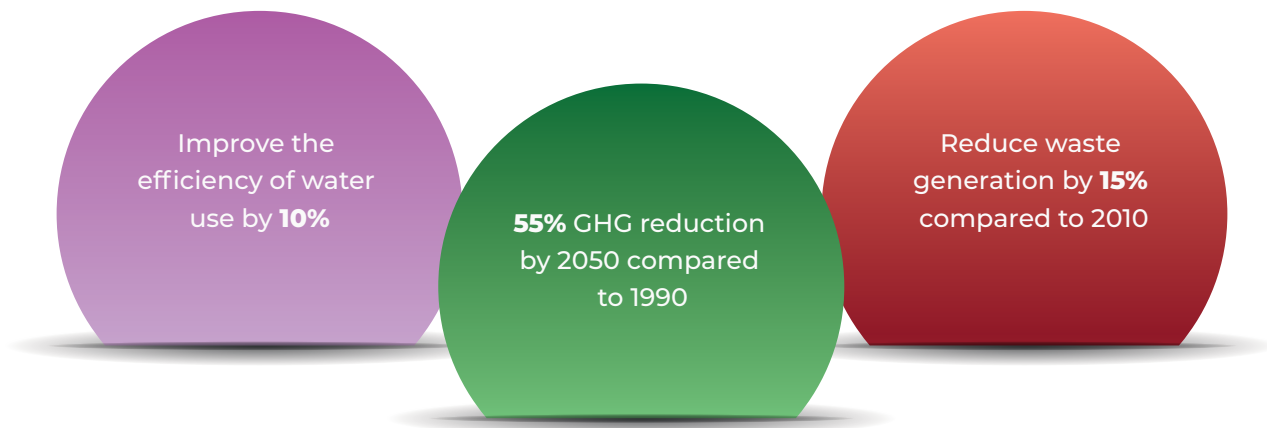
At the **European level**, the EU is positioned at the forefront of the sustainable economy through the **European Green Deal**, which includes actions against climate change, sustainability laws and pollution control measures, GHG reduction, energy efficiency and green and circular economy. It should be noted, among others:

- ▶ **The European Strategy for Sustainable and Intelligent Mobility**
- ▶ The “**Fit for 55**” legislative package, aimed at meeting the **targets for reducing GHG emissions by 2030 (55% compared to 1990)** and becoming the first climate-neutral continent by 2050.
- ▶ The **Horizon Europe** research framework program, highlighting the lines of work linked to resilience and the green and digital transition.
- ▶ The **Connecting Europe Facility**, which supports investment in European networks of digital, transport and energy infrastructures.
- ▶ The **2030 Biodiversity Strategy**, focused on the protection of nature, increasing the area of the Natura 2000 Network, connecting protected areas through a green infrastructure and reversing situations of ecosystem degradation.



At the national level, the political challenge is linked to European and international challenges, but we can also highlight some initiatives, such as:

- ▶ **Law 7/2021, on Climate Change and Energy Transition.**
- ▶ The **National Integrated Energy and Climate Plan 2021-2030**, which sets the goal of reducing GHG emissions by at least 23% in 2030 compared to 1990, as a milestone to achieve climate neutrality in 2050.
- ▶ The **National Plan for Adaptation to Climate Change.**
- ▶ The **2030 Safe, Sustainable and Connected Mobility Strategy**, which is the roadmap for transport and mobility for the next ten years.
- ▶ Law 7/2022, of April 8, on **waste and contaminated soil** for a **circular economy**.
- ▶ The **Spanish Circular Economy Strategy, Circular Spain 2030** and its First Action Plan.
- ▶ The **Spanish Strategy for Science, Technology and Innovation 2021-2027**, which defines six strategic lines of R&D&I, one of them being “Climate, energy and mobility”.
- ▶ The second cycle of **Marine Strategies (2018-2024)** and **Marine Spatial Plans** (POEM).
- ▶ The **National Strategy for Green Infrastructure and Ecological Connectivity and Restoration.**
- ▶ The **National Plan for Wastewater Treatment, Sanitation, Efficiency, Savings and Reuse** (DSEAR)



Sources: [Estrategia Española de Economía Circular y Planes de Acción, Fit for 55,](#)

# 5

## **CEDEX VISION: 2023-2025**

In order to develop the **vision** of CEDEX, from now to 2025, we have asked ourselves: How can CEDEX contribute to these new challenges? How do we see ourselves?

These questions were formulated in a questionnaire addressed to CEDEX workers prior to the preparation of this Strategic Agenda in order to share the vision and involvement of all. From the responses received, we confirm the common vision that the reason of existence of our organization is the positioning of the institution as a **reference for our ministries**, valuing our **unique facilities and R+D+i**, highlighting **the great human capital** that resides at CEDEX, **our impartiality and our vocational dedication**.

Guided by these reflections and analysing the **new priorities and needs, the context and the current challenges**, we can see that **CEDEX** continues to be called upon to exercise the function of a **reference for innovation** and **provider of solutions** based on science and technology, in all our thematic areas. To do this, we must **anticipate emerging needs**, maintaining **technological surveillance** and promoting intense and fluid **communication** with the **relevant sectoral agents**.

Since its creation, CEDEX has **evolved** parallel to the changes that our country has experienced. Thus, in the **1950s, 1960s and 1970s**, when a **development** period was **beginning** in Spain, CEDEX contributed to laying the **foundations for this expansion**. Subsequently, in the **1980s**



and 1990s, large infrastructures were developed in a spectacular way in Spain and, in parallel, CEDEX grew remarkably, giving support to the successive ministries of public works throughout the **planning and construction** process of the main infrastructures in our country. During **those years and the first decade of this 21st century**, CEDEX continued to equip itself with valuable and unique **scientific-technical facilities**, which have allowed us to remain positioned as the **main reference in the different fields of Civil Engineering and the Environment** in our country. During this **21st century**, with the proliferation of new research centres in universities, companies and technology centres and after the years of deep economic crisis experienced since 2008 both in our country and worldwide, and within the environmental, social, technolo-

gical, economic and institutional situation described, the need to face **the new challenges** and adapt to this new reality is detected. It means that **new and more collaborative ways of working** have to be promoted, **rationalizing the use of global resources** and optimizing efficiency and **economic growth**.

For all these reasons, aware of the importance of Spain having a top-level public body **-rigorous, neutral and independent-** dedicated to research, development, innovation and its dissemination, as well as specialized technical assistance, we propose this **Strategic Agenda** of CEDEX, valuing the full potential of our centres and laboratories and making the institution visible as an asset both for the ministries and for society in general.



**For it:**

- ▶ The work of CEDEX must be aimed at carrying out **work** that, due to its **complexity, novelty, cost, difficulty, interdisciplinarity, singularity or confidentiality**, cannot be assumed by the private sector.
- ▶ CEDEX, due to its privileged position as a **highly specialized and qualified autonomous body**, endowed with outstanding **technological capabilities**, can guarantee the **objectivity, reliability, impartiality and quality** of its work, highly valued values when tackling tasks such as **planning, validation, certification, standardization** or advice on **new techniques** or technologies.
- ▶ CEDEX must continue to be the **natural interlocutor with the Administrations**, particularly with MITMA and MITERD to provide technical assistance in engineering, public works and their environmental aspects.
- ▶ CEDEX can and should **collaborate, never compete**, with private companies and other research centres and universities.
- ▶ CEDEX can and should be a **meeting point** for **debate, dissemination, reflection** or the search for common positions on new trends and innovations in different sectors.
- ▶ CEDEX can and should contribute to **facing and solving the current social, environmental, economic, technological and institutional challenges**, facilitating the **implementation and execution of the Recovery, Transformation and Resilience Plan** and encouraging its **investments** to be made where they **generate more value** and contribute more to the **economic drive of the country**.

CEDEX's **vision** is to provide **technical and innovative support** to the Administration, being its **technological arm** in the main areas related to transport and mobility, the urban agenda, the demographic challenge and the ecological transition, to contribute to **economic development** and to the achievement of a **more sustainable, resilient, cohesive and egalitarian society**. In this sense, CEDEX must continue to be a national reference and the Spanish representative in the main forums worldwide in its fields of work; and support private companies, especially in internationalization processes, providing **rigor and confidence**.



# 6

## **CEDEX'S RESPONSE: ITS STRATEGIC AGENDA**

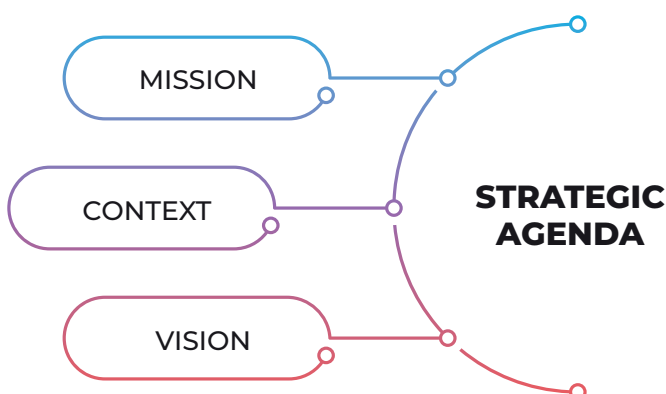
«The future depends on what we do in the present».

Mahatma Gandhi

As already told, we live a moment of important transformations on several spheres. The **objective** of this Strategic Agenda is to **guide the steps of CEDEX for the coming years**, constituting a **strategic framework** on which to rely in order to respond to the **great current challenges** posed within our fields of work. It is about **seeking the best possible alignment** with the **challenges** at the country level, seeking effectiveness with **maximum efficiency** and contributing to the **economic development of Spain**.

This Agenda will serve as the **basis** for drawing up the **new 2023-2025 Strategic Plan**, which will specify the way to carry out the general and thematic priorities set forth herein and the timing to establish our **roadmap for the next three-year period**.

- ▶ The **general priorities** refer to aspects of management that are **transversal to the entire Organization**, and have been defined as:
  - Maximum **alignment** with the needs of **MITMA and MITERD**.
  - Consolidation of **national and international projection**.
  - Internal **strengthening to improve efficiency**.
- ▶ The **thematic priorities** refer to the approach of the main lines of activity of CEDEX that will allow it to respond to the challenges at the country level and are identified with the **promotion of innovation**:
  - Innovation in **mobility**.
  - Innovation in the **natural environment**.



#### GENERAL PRIORITIES

MITMA and MITERD alignment.  
Consolidation of national and international projection.  
Strengthening to improve efficiency.

#### THEMATIC PRIORITIES

Innovation in mobility.  
Innovation in the natural environment.

## GENERAL PRIORITIES

### Working aligned with the needs of MITMA and MITERD

As indicated, CEDEX is an Agency with **functional dependency of MITMA and MITERD**, which are the ministries that bring together the competencies related to civil engineering, transport and mobility, the urban agenda, and the environment, the demographic challenge and the ecological transition; areas in which most of our activity is focused.

Therefore, it is a priority for CEDEX to collaborate closely with the management centres and entities of both ministries to formalize **sectoral programs** in the thematic areas of shared interest, where CEDEX will be able to contribute its knowledge and apply it to the resolution of problems that concern our ministries in particular, but also companies, promoting the path of public-private collaboration.

This has motivated that the thematic priorities and the lines of activity defined below have been drawn up in close collaboration with both ministries, with the idea of being of the greatest use to them in their mission of serving the needs of society.

This fluid and dynamic collaboration is expected to contribute to the **strengthening of CEDEX's institutional relations** at the national level.

Likewise, CEDEX, due to its technological capabilities, can anticipate new challenges by opening innovative lines of work on topics of interest to both ministries. To this end, the **technological observatory** function will be strengthened, intensifying **technological surveillance**, capturing information from abroad, and reinforcing **internal knowledge management**, to allow us to make decisions based on the greatest amount of information possible, which will make it easier for us to anticipate changes by detecting them at an early stage and reducing risks and strategic errors.

CEDEX's priority is to **focus** our work to the **direct needs** raised by **MITMA and MITERD**, including support for planning, policy implementation, the development of methodologies or the resolution of singular technical problems that are the responsibility of our ministries in particular; but also to companies, promoting public-private collaboration. It is also a priority to be aware of possible future needs, in order to be able to anticipate situations in which the ministries may require the support of CEDEX.

## Consolidation of national and international projection

The in-depth knowledge of our technological environment together with our capacities must allow us to **consolidate the national and international projection of CEDEX**.

In this process, it is essential to strengthen our capacity in the field of **experimentation**, optimizing the use of our research facilities and the research results obtained, with the aim of starting a gradual process of integration on the map of Singular Scientific Technical Facilities (ICTS).

It is also key to work on the **transfer of knowledge and results**, for which effective communication and the recovery and promotion of new courses and master's degrees are necessary, favouring the participation of technical personnel from the administration and companies, from Spain and from other countries.

And of course, we must be aware that research, technological development or innovation is no longer carried out in isolated groups. Collaboration and cooperation actions must be explored and maximized, both with companies and research centres, promoting participation in **R&D&I** activities and projects at national and European level and promoting the **internationalization** activities of CEDEX.

- ▶ CEDEX maintains a close relationship with other European institutes and laboratories

and participates in numerous working groups and committees. However, it is planned to go one step further to reinforce our existing ties and establish new ones with similar institutions in our European environment, fostering stays and temporary exchanges of personnel, as well as the development of joint studies and research and participation in new groups of work.

- ▶ On the other hand, historically this Agency has been a benchmark in terms of specialized training in the fields of civil works and the environment. Numerous senior management positions in public administration, both Spanish and Latin American, have been trained in the CEDEX Masters and Training Courses, so continuing to promote the participation of national and foreign professionals in them is a fundamental part of our functions, contributing to the **dissemination of knowledge** and the training of technicians.

In a connected world, reinforcing the **role of CEDEX at a national and international level** is a strategic tool as it allows us to better understand the new developments, research and good practices that are taking place. Likewise, it generates learning and networking opportunities, and is a source of opportunities for participation in joint projects with companies and institutions from all over the world.

## Internal strengthening to improve efficiency

In order to continue **fulfilling our mission** with the best effectiveness and efficiency, we are working to **strengthen ourselves internally**, walking in two directions: on the one hand, **reinforcing our capacities** and, on the other, **promoting the transversality** of our centres, since the challenges of the present require each more frequently a transversal approach that simultaneously covers various thematic fields developed in several of our centres.

In the first place, to **reinforce our capacities** we must protect and strengthen what we have referred to as the two great assets of CEDEX: our highly qualified personnel and our unique scientific-technical equipment and facilities.

In order to **strengthen our qualified personnel**, we must establish a clear roadmap that will lead us to the earliest incorporation of new human resources, allowing us to address the thematic challenges that are posed in this Agenda. It is necessary not to lose the high qualification and experience of our technicians, which requires the adequate transmission of knowledge through joint work for a sufficient number of years, of the most expert technicians with the youngest. Given the high average age of the technical personnel, the immediate incorporation of human capital is absolutely necessary, with continuity in the coming years, for which the corresponding support of the Human Resources bodies will be necessary.

On the other hand, in order to **strengthen our valuable technical equipment and facilities**,

CEDEX is a **valuable asset** with a **purely technical** profile, at the service of both MITMA and MITERD. In order to continue fulfilling its **mission** in the best way and with the greatest **efficiency**, it is necessary to protect it, reinforcing what are its **great strengths**: its **highly qualified personnel** and its **unique scientific-technical facilities**, drawing up specific roadmaps. Likewise, it is necessary to **foster synergies** by enhancing the internal **transversality** of our centres.

within the sectoral programs established with the management centres, each singular facility will establish its own roadmap, defining its lines of activity, clients, and estimation of needs in a short time horizon and in a medium term.

Secondly, to **promote transversality** we will work in search of the greatest synergy between our centres and multidisciplinary work teams. To do this, we will intensify internal communication mechanisms in order to share and increase knowledge of our work and studies, as well as the advances that occur in the environment of our research.

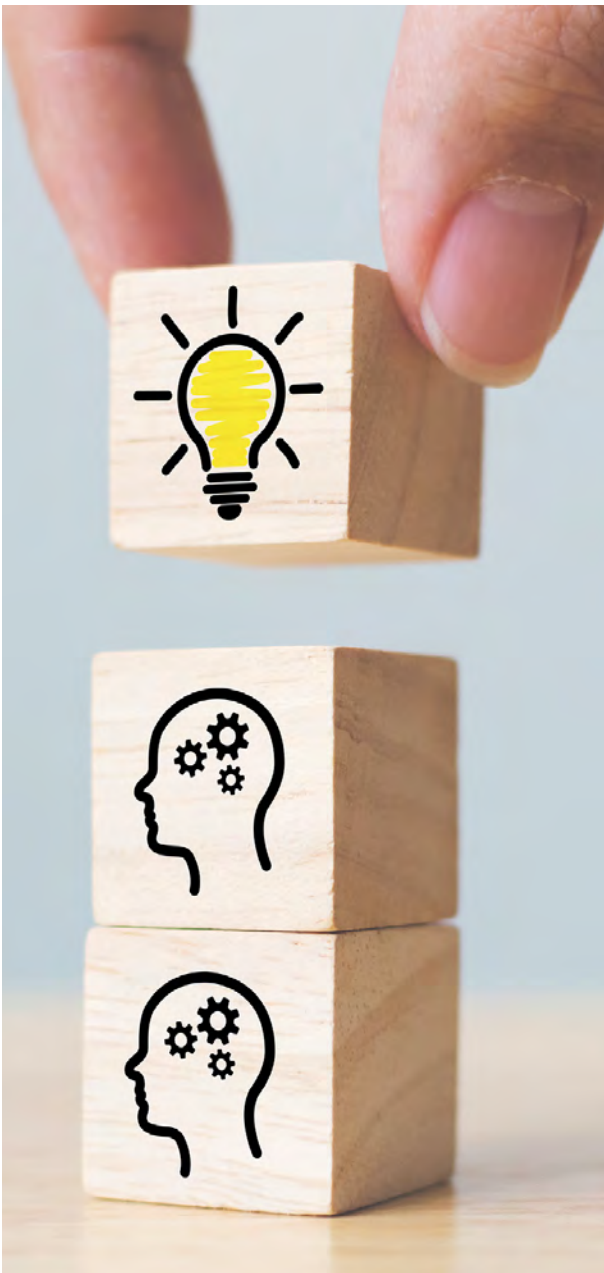
Likewise, the creation of transversal (ad hoc) work teams will be promoted to address "**Transversal Projects**", with a clear objective and a limited time horizon, which will mainly be characterized by the following:

- ▶ Operation totally oriented towards participation in **National or European projects** in the matter for which they are created.
- ▶ **Transversality**, as it is made up of CEDEX technicians from different centres and laboratories.



- ▶ Strengthening of **collaboration** with universities and other technology centres and leading companies in the sector.

The set of these actions will allow us to strengthen ourselves internally and thus **improve our efficiency**.



## THEMATIC PRIORITY: PROMOTING INNOVATION

### Innovation in mobility and innovation in the natural environment

In order to contribute to the implementation and development of the PRTR, the thematic challenges of CEDEX are oriented towards the achievement of the great objectives that are set out in the areas of mobility and the natural environment and environmental quality, all of which are related to resilience, sustainability and digitization.

In this way, CEDEX thematic priorities are directed towards the following two large strategic thematic areas, divided into three themes each one of them, with a total of six **strategic thematic challenges**:

- ▶ **Innovation in mobility**, directed to improving resilience, sustainability and digitization and
- ▶ **Innovation in the natural environment**, also directed to improving resilience, sustainability and digitization and contributing to the protection of biodiversity, more efficient management of natural resources and environmental quality.

For each of the challenges, the **themes and lines of activity** of CEDEX that will significantly contribute to their achievement have been identified.

The identification of the main lines of activity is the result of several working sessions held with

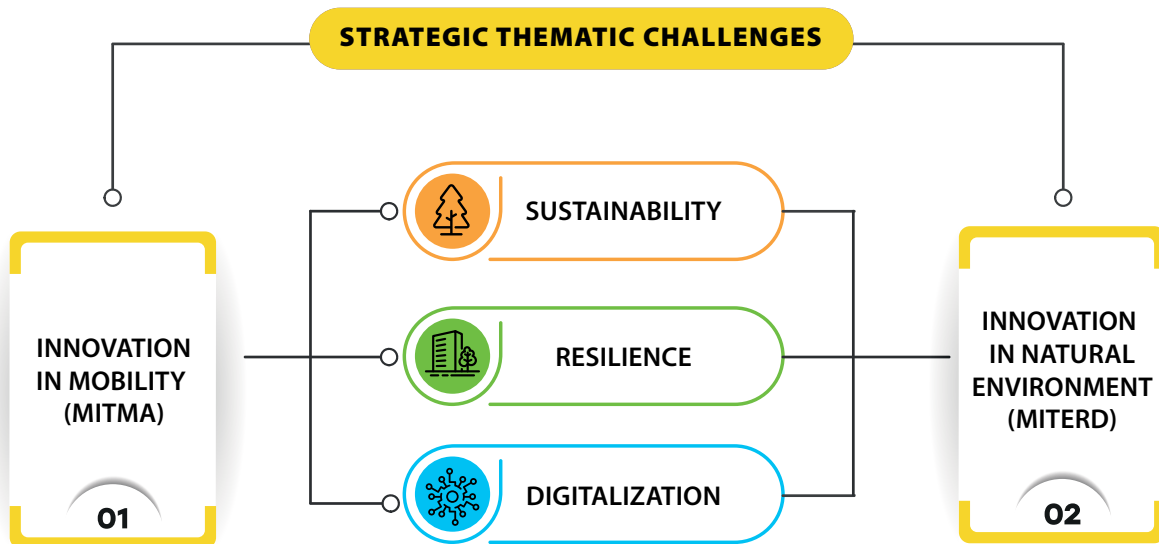
technicians from CEDEX centres and laboratories. Likewise, they have been put in common with the general directorates of our ministries,

to ensure that the future framework of action of CEDEX is in tune with their needs.

**Innovation** must be understood as an orientation towards continuous improvement, refining procedures and seeking new solutions to existing approaches. It supposes a process of continuous learning and progress that is absolutely necessary in all organizations, and its promotion is a priority for CEDEX.

The **themes and lines of activity** of CEDEX identified within the six **strategic challenges** are focused on the collaboration with our management centres and with society in **fulfilling** the great objectives of the **PRTR**, focusing on the contribution to **resilience, sustainability and the digitization** of both **mobility** and the **natural environment**.

**CEDEX is a cutting-edge institution dedicated to activities related to civil engineering, transportation and mobility, and the integration of climate and environmental implications**



## Innovation in mobility

The importance of the **transport and mobility** sector in Spain is very notable from the economic, social and environmental point of view.

Currently, transport and mobility policies are changing. For all these reasons, the Administration saw the need to change its infrastructure policy, with MITMA moving from being an entity more focused on the provision of infrastructures to leading the transport and mobility policy as a whole, including the component sustainability (economic, social and environmental) and innovation in its planning.

MITMA is promoting an action strategy based on a triple perspective: resilience, sustainability and digitization. Within the framework of this context, it is necessary for CEDEX to join the Ministry in its initiatives, reinforcing its support in this field from the triple perspective mentioned, which means facing the following challenges:

- ▶ Thematic challenge 1. Resilience in mobility
- ▶ Thematic challenge 2. Sustainable mobility
- ▶ Thematic challenge 3. Digitization in mobility

CEDEX is one of the executing agents of the National Climate Change Plan, so our commitment to achieving **resilient** mobility is clear and determined, directing a good part of our activity towards this end. In this area, CEDEX recently participated in the **CLARITY** project, developing a web application for preliminary risk analysis in

transport networks. Likewise, CEDEX has many lines of work aimed at increasing **safety** and improving the **operation** of infrastructures, all of which are determining aspects of a resilient transport system. Within the framework of the **GEOLAB** project, the large European facilities are expected to be made available (on the part of Spain, the CEDEX Track Box) to contribute to the resilience of critical infrastructures.

Within the field of rail transport, as a key mode of transport to contribute to **the sustainability of the system**, CEDEX has joined as a founding member of the common company **ERJU** (*Europe's Rail Joint Undertaking*), in a common candidacy with the other entities MITMA railway companies (Adif, Renfe and Ineco). This common company will establish the lines of European railway R+D+i in the next 10 years, so the incorporation of CEDEX shows both its European vocation and that of continuing at the forefront of railway R+D+i. CEDEX is currently participating in the **RAILGAP** project, in which innovative solutions are being developed to improve the sustainability of the railway network by implementing, among other measures, systems that allow the integration of GNSS satellite positioning data with ERTMS.

**Digitization** as a tool to improve transport efficiency requires the development of applications and tools that improve both the collection and management of information. CEDEX is a reference in the field of monitoring, numerical



modelling, highlighting, for example, the applications that are expected to be developed within the framework of the **PROMETEO** project, in which CEDEX explores the application of te-

chnologies based on satellite interferometry to contribute to predictive maintenance of earthworks, especially sensitive assets in the management of linear infrastructures.





## ***Innovation in the natural environment***

The protection of the natural environment and the conservation of its **environmental values** have become one of the main concerns in advanced societies.

**CEDEX**, as an Agency that functionally depends on MITERD, and as a **reference** entity in the field of the environment at the national level, must be a relevant actor in the challenges that arise in the context of **environmental protection** and environmental quality, giving support to the Ministry in its areas of activity of: Water; Coasts and Marine Environment; Quality and Environmental Assessment; Climate change; Biodiversity and Forests; Demographic Challenge; Energy; Environmental education and Just Transition.

At CEDEX we envisage the support to MITERD through the three thematic challenges that are developed in this Strategic Agenda within 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. Digitization in the natural environment

As already indicated, CEDEX should contribute to the implementation of various measures related to water and coastal management within the framework of the National Climate Change Plan, within the framework of **resi-**

**lience** policies. It is worth noting the strategic contribution of CEDEX to the **planning and management of water resources** through the evaluation of the impact of climate change on maximum rainfall in Spain. An example of this is the **Albufeira** project, in which CEDEX contributes to promoting and protecting the good state of the shared water masses of the hydrographic basins between Spain and Portugal (Miño-Sil, Duero, Tagus and Guadiana) and their associated ecosystems.

Within the scope of **sustainability**, CEDEX is a key agent in hydrological and sectoral planning in water matters, as well as in coastal and marine planning. In this last aspect, CEDEX has recently joined the **MSP-OR and ReMAP** projects, in which strategies will be developed to advance the implementation of maritime spatial planning directives in Europe. Not to mention the activity of CEDEX in a wide variety of lines of work related to environmental monitoring and management.

In the field of **digitization**, once again it is necessary to highlight the potential of new technologies to contribute to better management of natural resources and protection of ecosystems. In this sense, the contribution of CEDEX can be highlighted, for example, by implementing information portals on the marine environment (**InfoMAR**); data networks (**gauging yearbook, isotopic data network**); or hydrological models (**CAUMAX, CHAC, CAMREC** and collaboration with the **IBER** model).



# 7. THEMATIC PRIORITY

## PROMOTING INNOVATION

### IN MOBILITY AND THE NATURAL ENVIRONMENT

#### SUSTAINABLE DEVELOPMENT GOALS

	<b>1</b> NO POVERTY		<b>2</b> ZERO HUNGER		<b>3</b> GOOD HEALTH AND WELL-BEING
	<b>4</b> QUALITY EDUCATION		<b>5</b> GENDER EQUALITY		<b>6</b> CLEAN WATER AND SANITATION
	<b>7</b> AFFORDABLE AND CLEAN ENERGY		<b>8</b> DECENT WORK AND ECONOMIC GROWTH		<b>9</b> INDUSTRY, INNOVATION AND INFRASTRUCTURE
	<b>10</b> REDUCED INEQUALITIES		<b>11</b> SUSTAINABLE CITIES AND COMMUNITIES		<b>12</b> RESPONSIBLE CONSUMPTION AND PRODUCTION
	<b>13</b> CLIMATE ACTION		<b>14</b> LIFE BELOW WATER		<b>15</b> LIFE ON LAND
	<b>16</b> PEACE, JUSTICE AND STRONG INSTITUTIONS		<b>17</b> PARTNERSHIPS FOR THE GOALS		



An aerial photograph of a multi-lane highway interchange. The highway is elevated on viaducts and has several lanes in each direction. Below the highway, a large area is flooded with muddy brown water. In the background, there is a residential area with houses and trees. The sky is overcast.

# CHALLENGE 1

## RESILIENCE IN MOBILITY

*... we understand resilience in mobility as the set of measures applied in the transport system to improve its capacity to respond, adapt and emerge strengthened safely face various agents of change, especially the effects of climate change, user loads and socio-economic agents.*



## STRATEGIC INTEREST

The transport system is currently undergoing a series of changes that can sometimes have negative effects on it at structural and functional level. Therefore, CEDEX, from its position, must contribute to developing mechanisms and implementing solutions so that infrastructures and transport continue providing quality services. CEDEX has identified 4 large strategic themes developed in 26 specific lines of activity aimed at providing solutions to increase resilience in mobility.



**CHALLENGE 1. RESILIENCE IN MOBILITY**

Chall. 1 (C1)	Strategic themes (T) and lines of activity (L)	Areas of activity							Singular facility (SF)
<b>C1.T1</b>	<b>Adapting the transport system to climate change</b>								
C1.T1.L1	Vulnerability and risk								
C1.T1.L2	Operational thresholds and indicators								
C1.T1.L3	Robust monitoring of climate agents								
C1.T1.L4	Adapting materials and structures to new climate actions								
C1.T1.L5	Studies of the evolution of the geotechnical behaviour of transport infrastructures								
<b>C1.T2</b>	<b>Increasing safety in the transport system</b>								
C1.T2.L1	Control of service indicators on roads								
C1.T2.L2	Road safety studies								
C1.T2.L3	Road pavement resistance studies								<a href="#">IS.PISTA<sup>1</sup></a>
C1.T2.L4	Studies of durability and resistance of structures								<a href="#">IS.SISMIC<sup>2</sup></a>
C1.T2.L5	Railway certification tests (ENAC accreditation)								<a href="#">IS.LIE<sup>3</sup></a>
C1.T2.L6	Low cost ERTMS deployment. Pilot tests								<a href="#">IS.LIE<sup>3</sup></a>
C1.T2.L7	Port operations risks, emergency protocols, special maritime operations								<a href="#">IS.MARIT<sup>4</sup></a>
C1.T2.L8	Maritime accident studies								
C1.T2.L9	Climate studies in port domains. Environmental conditions, nautical access limits, operations and supporting systems								<a href="#">IS.MARIT<sup>4</sup></a>
C1.T2.L10	Geotechnical support. Resolution of pathologies and evaluation of new techniques of ground reinforcement and improvement								<a href="#">IS.CAJON<sup>5</sup></a>
<b>C1.T3</b>	<b>Transport system design and operation</b>								
C1.T3.L1	Road pavement performance studies								<a href="#">IS.PISTA<sup>1</sup></a>
C1.T3.L2	Railway infrastructure and superstructure performance studies								<a href="#">IS.CAJON<sup>5</sup></a>
C1.T3.L3	Methodological and regulatory development of elements of the transport system								

<sup>1</sup> Full Scale Accelerated pavement Test Track.  
<sup>2</sup> Seismic simulator with six degrees of freedom.  
<sup>3</sup> Railway Interoperability and ERTMS Laboratory : Eurocab and Traffic Simulator.  
<sup>4</sup> Maritime experimentation laboratory and ship maneuvering simulator.  
<sup>5</sup> CEDEX Track box. Large cell for testing railway sections .

Chall. 1 (C1)	Strategic themes (T) and lines of activity (L)	Areas of activity							Singular facility (SF)	
C1.T3.L4	Studies of the behaviour of ships in maneuvering phases and docked at quays								IS.MARIT <sup>4</sup>	
C1.T3.L5	Increase in the service life and adaptation to new uses of port infrastructures									
C1.T3.L6	Dimensioning of port infrastructures. Access areas, canals, docks, quays and sheltering works									
C1.T3.L7	Port and quay operations, port and maritime traffic simulations								IS.MARIT <sup>4</sup>	
C1.T3.L8	Satellite train positioning and 5G technology applications									
<b>C1.T4</b>	<b>Enhancement of the historical heritage of public works. Transport infrastructure</b>									
C1.T4.L1	Research to enhance the value of public works. Dissemination									
C1.T4.L2	Document management									
C1.T4.L3	Rehabilitation and adaptation heritage to new uses									

Contribution to Agenda 2030 SDG	Contribution to PRTR	
	<p><b>Component 1</b> Action plan to ensure sustainable, safe and connected mobility in urban and metropolitan areas.</p>	<p><b>Component 2</b> Housing refurbishment and urban renewal plan</p>
	<p><b>Component 6</b> Sustainable, safe and connected mobility</p>	<p><b>Component 14</b> Plan for the modernisation and competitiveness of the tourism sector</p>
	<p><b>Component 24</b> Revaluation of the cultural sector</p>	

Areas of activity	
Climate change	Studies of structures and materials
Roads, transport and mobility	Ports and navigation
Railways	Geotechnical studies



# CHALLENGE 2

## SUSTAINABLE MOBILITY

... We understand **sustainable mobility** as all those activities aimed at the **decarbonization** of the transport system, its **energy efficiency**, its **maintenance**, the **elimination or minimization of impacts** throughout its life cycle, the application of the principles of **circular economy** and its integrated planning with other areas (territorial, urban, hydrological, natural spaces ...)

















































# STRATEGIC INTEREST

CEDEX is committed to the development of cleaner modes of transport, the promotion of renewable energy sources, the use of recycled materials, as well as the reduction of noise emissions and the carbon footprint caused by mobility infrastructures and services. The Agenda highlights 9 strategic themes, developed through 26 lines of activity, in which CEDEX deploys a good part of its work, and that allow us to contribute substantially to the challenge of sustainable mobility.





**CHALLENGE 2. SUSTAINABLE MOBILITY**

Chall. 2 (C2)	Strategic themes (T) and lines of activity (L)	Areas of activity						Singular facility (SF)
<b>C2.T1 Circular economy</b>								
C2.T1.L1	Ecodesign in transport infrastructures: Life cycle assessment (LCA), durability, mechanical and environmental performance (RAP, scrap tyres, aggregates from slag, industrial by-products)							<a href="#">IS.PISTA<sup>2</sup></a>
C2.T1.L2	Ecodesign in transport infrastructures: Durability, mechanical and environmental behaviour of concrete and structural steels (eco-efficient cements, polymers, CDW)							<a href="#">IS.SISMIC<sup>3</sup></a>
C2.T1.L3	Characterization and management solutions of dredged material							
<b>C2.T2 Support for transport planning. Intermodality</b>								
C2.T2.L1	Analysis and preliminary study for the development of strategic transport planning							
C2.T2.L2	Passenger and freight transport models							
<b>C2.T3 Transport system maintenance</b>								
C2.T3.L1	Monitoring of road service and quality indicators. Concession contracts							
C2.T3.L2	Winter service. Impact of melting salts on pavements and infrastructures							
C2.T3.L3	Predictive maintenance of road pavements							<a href="#">IS.PISTA<sup>2</sup></a>
C2.T3.L4	Optimisation of railway track equipment							<a href="#">IS.LIF<sup>4</sup></a>
<b>C2.T4 Action against noise</b>								
C2.T4.L1	Noise reduction pavements							<a href="#">IS.PISTA<sup>2</sup></a>
C2.T4.L2	Assessment of the effects of noise on the population							
C2.T4.L3	Assessment of the effects of underwater noise on cetaceans							
<b>C2.T5 New trends in mobility</b>								
C2.T5.L1	Boosting active mobility							
C2.T5.L2	Innovative Public Procurement							
<b>C2.T6 Environmental assessment</b>								
C2.T6.L1	Environmental assessment of plans, programs and projects, including climate change considerations and analysis of actions carried out							
<b>C2.T7 Environmental impact. Protection of biodiversity and ecosystems</b>								
C2.T7.L1	Ship collisions with cetaceans							
C2.T7.L2	Restoration of river channels affected by linear infrastructures							

<sup>1</sup> Integration of environmental aspects in product design in order to improve its environmental performance throughout its life cycle.

<sup>2</sup> Full Scale Accelerated pavement Test Track.

<sup>3</sup> Seismic simulator with six degrees of freedom.

<sup>4</sup> Railway Interoperability and ERTMS Laboratory : Eurocab and Traffic Simulator.

Chall. 2 (C2)	Strategic themes (T) and lines of activity (L)	Areas of activity						Singular facility (SF)
C2.T7.L3	Protection of marine biodiversity. Ballast water management, pollutant inputs and particularly sensitive sea areas (PSSA)							
C2.T7.L4	Conservation of ecosystem services. Maintenance and recovery of ecological connectivity (wildlife crossings, ecoducts...)							
<b>C2.T8</b>	<b>Environmental impact. Air quality and air emissions</b>							
C2.T8.L1	Air quality inventories and models							
C2.T8.L2	Estimation of GHGs due to maritime transport. Real-time emissions and spatially and temporally integrated values							
C2.T8.L3	Carbon footprint studies of transport modes and transport system							
<b>C2.T9</b>	<b>Energy efficiency and decarbonisation</b>							
C2.T9.L1	A.T.O. and ERTMS level 3 system to contribute to the energy efficiency of the system							<a href="#">IS.LIE<sup>4</sup></a>
C2.T9.L2	Road adaptation to electric mobility							
C2.T9.L3	Sustainable road pavement construction technologies: cold mix asphalt (CMA), half warm mix asphalt (HWMA), warm mix asphalt (WMA), ultra-thin mixtures and others							<a href="#">IS.PISTA<sup>2</sup></a>
C2.T9.L4	Studies for the implementation of Low Emission Zones (LEZs)							
C2.T9.L5	Green public procurement of roads. Proposal of environmental criteria							

Contribution to Agenda 2030 SDG	Contribution to PRTR	
	<b>Component 1</b> Action plan to ensure sustainable, safe and connected mobility in urban and metropolitan areas	<b>Component 4</b> Conservation and restoration of ecosystems and their biodiversity
	<b>Component 6</b> Sustainable, safe and connected mobility	<b>Component 12</b> Spain 2030 Industrial Policy
	<b>Component 15</b> Digital Connectivity, the promotion of cybersecurity and deployment of 5G	<b>Component 17</b> Institutional reform and strengthening the capacities of the national science, technology and innovation system

Areas of activity	
Climate change	Studies of structures and materials
Roads, transport and mobility	Ports and navigation
Railways	Environment



An aerial view of a complex multi-level highway interchange with several overpasses and ramps. The scene is overlaid with a glowing blue digital network of interconnected nodes and lines, representing digital connectivity. In the background, several modern high-rise apartment buildings are visible under a clear sky.

# CHALLENGE 3

## DIGITALISATION IN MOBILITY

*... we understand **digitalisation in mobility** as the use of **digital applications and technologies** as tools that allow improving the management of transport infrastructures, passenger and freight transport services and data related to transport and mobility.*
























## STRATEGIC INTEREST

The development of digital tools in mobility is enabling great advances in the management of public transport, traffic, infrastructure and logistics, autonomous and connected driving, as well as improvements in operational safety or the emergence of new business models. The emergence of these new activities and applications are strategic for the positioning of CEDEX as a vanguard public body in transport and mobility. The Agenda proposes 7 main thematic areas complemented by 16 specific lines of work that will contribute to promoting smart and connected mobility.



**CHALLENGE 3. DIGITALISATION IN MOBILITY**

Chall. 3 (C3)	Strategic themes (T) and lines of activity (L)	Areas of activity						Singular facility (SF)
<b>C3.T1</b>	<b>Road adaptation to autonomous and connected mobility</b>							
C3.T1.L1	Road equipment, vertical signs and road markings							
C3.T1.L2	Vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communication							
C3.T1.L3	Policy support							
C3.T1.L4	Cooperative Intelligent Transport Systems (C-ITS)							
<b>C3.T2</b>	<b>Creation of digital models of transport infrastructures with the support of drones and BIM</b>							
C3.T2.L1	Inventory of geometric characteristics of road and rail elements, as a basis for the integration of monitoring and BIM implementation							
C3.T2.L2	Acquisition and development of tools and equipment that allow digitalization in BIM environment							
<b>C3.T3</b>	<b>Digital Twin</b>							
C3.T3.L1	Laboratory simulation of the ERTMS system and commissioning tests						<a href="#">IS.LIE<sup>1</sup></a>	
<b>C3.T4</b>	<b>Development of geographic and cartographic information systems (GIS). Web viewers</b>							
C3.T4.L1	Acoustic monitoring of the impact of noise generated by transport into the population (SICAWEB + IDE SICAWEB)							
C3.T4.L2	Vulnerable infrastructures to climate change							
C3.T4.L3	Decision-making support in ports and maritime transport							
C3.T4.L4	New technologies for instrumentation and processing of port geotechnical information (GIS port geotechnical information)							
<b>C3.T5</b>	<b>Real-time monitoring</b>							
C3.T5.L1	Implementation of monitoring systems with sensors: pavements; structures; tunnels; slope movements; innovative developments in geotechnical characterization						<a href="#">IS.PISTA<sup>2</sup></a>	

<sup>1</sup> Railway Interoperability and ERTMS Laboratory : Eurocab and Traffic Simulator.

<sup>2</sup> Full Scale Accelerated pavement Test Track.

<sup>3</sup> CEDEX Track box. Large cell for testing railway sections .

Chall. 3 (C3)	Strategic themes (T) and lines of activity (L)	Areas of activity						Singular facility (SF)
<b>C3.T6</b>	<b>Advanced numerical modelling</b>							
C3.T6.L1	Geotechnical study of pathologies and project solutions							<a href="#">IS.CAJON<sup>5</sup></a>
C3.T6.L2	Advanced computational fluid dynamics (CFD) applied to the interaction between waves and maritime structures							
<b>C3.T7</b>	<b>Big Data</b>							
C3.T7.L1	Historical database of AIS messages for studies of maritime traffic and its environmental effects							
C3.T7.L2	Data processing and machine learning for ground characterization and profiling							

Contribution to Agenda 2030 SDG	Contribution to PRTR
	<p><b>Component 4</b> Conservation and restoration of ecosystems and their biodiversity</p> <p><b>Component 6</b> Sustainable, safe and connected mobility</p> <p><b>Component 15</b> Digital Connectivity, the promotion of cybersecurity and deployment of 5G</p>

Areas of activity	
Climate change	Ports and navigation
Roads, transport and mobility	Geotechnical studies
Railways	



# CHALLENGE 4

## RESILIENCE IN THE NATURAL ENVIRONMENT



... we understand **resilience in the natural environment** as the capacity of natural systems and their infrastructures to **resist and recover**, or where appropriate **adapt**, to the effects caused by external agents, maintaining or modifying its essential characteristics of structure and functioning.



## STRATEGIC INTEREST

Currently, the natural environment faces risks such as habitat fragmentation, loss of biodiversity, overexploitation of resources, drought and floods or the presence of invasive species, to which climate change effects have been added, magnifying its consequences. Since its foundation, CEDEX has contributed to the protection, improvement and restoration of the natural heritage, as well as to the improvement of the resilience of the infrastructures built in the natural environment. To remain a reference, CEDEX has identified 6 large strategic themes, within which 25 lines of activity aimed at increasing resilience in the natural environment are listed.





**CHALLENGE 4. RESILIENCE IN THE NATURAL ENVIRONMENT**

Chall. 4 (C4)	Strategic themes (T) and lines of activity (L)	Areas of activity						Singular facility (SF)
<b>C4.T1</b>	<b>Adaptation to climate change</b>							
C4.T1.L1	Characterization of the impact of climate change on the hydrological cycle and the water environment							
C4.T1.L2	Analysis of coastal and fluvial dynamics, and the prognosis of their evolution in climate change scenarios							<a href="#">IS.MARIT<sup>1</sup></a>
C4.T1.L3	Coastal strip management and development of climate change adaptation strategies							<a href="#">IS.MARIT<sup>1</sup></a>
<b>C4.T2</b>	<b>Increasing the safety of hydraulic infrastructures</b>							
C4.T2.L1	Studies to improve hydrological and hydraulic safety through physical, mathematical models and application of isotopic techniques							<a href="#">IS.HIDRO<sup>2</sup></a>
C4.T2.L2	Development of methodologies for conducting hydrological studies of dams. Support in policy development							<a href="#">IS.HIDRO<sup>2</sup></a>
C4.T2.L3	Studies of material pathologies. Concrete. Waterproofing systems							
C4.T2.L4	Geotechnical support in design and operation of dams and reservoirs. Pathologies							
<b>C4.T3</b>	<b>Structural and functional integrity of the environment</b>							
C4.T3.L1	Stability studies of waste landfills and debris places							
C4.T3.L2	Stability of geological structures in the Network of Natural Parks							
C4.T3.L3	Stability of geological structures affecting the maritime-terrestrial public domain (cliffs). Environmental geotechnical issues							
C4.T3.L4	Environmental design of marine outfalls							
C4.T3.L5	Erosion protection coastal structures							<a href="#">IS.MARIT<sup>1</sup></a>
<b>C4.T4</b>	<b>Extreme events. Floods and droughts</b>							
C4.T4.L1	Support for adaptive flood risk management through physical and numerical model studies							
C4.T4.L2	Basic, methodological and regulatory studies for the characterization of flood hazard and risk							
C4.T4.L3	Flood adaptation in urban and peri-urban areas							<a href="#">IS.MARIT<sup>1</sup></a> <a href="#">IS.HIDRO<sup>2</sup></a>
C4.T4.L4	Identification and hydrological characterization of droughts							
C4.T4.L5	Studies of river flood protection infrastructures							<a href="#">IS.HIDRO<sup>2</sup></a>

<sup>1</sup> Maritime experimentation laboratory and ship maneuvering simulator.

<sup>2</sup> Hydraulics laboratory.

Chall. 4 (C4)	Strategic themes (T) and lines of activity (L)	Areas of activity						Singular facility (SF)
<b>C4.T5</b>	<b>Environmental restoration and biodiversity protection</b>							
C4.T5.L1	Methodologies for the study and monitoring of good ecological status and conservation of aquatic ecosystems							
C4.T5.L2	Environmental restoration of the coast, the hydrographic network and the spaces adjacent to infrastructures							
C4.T5.L3	Nature-based solutions for environmental restoration, infrastructure integration and impact mitigation							
C4.T5.L4	Integrated land management							
C4.T5.L5	Affection by contaminated soils (pollutant retention barriers)							
<b>C4.T6</b>	<b>Enhancement of the historical heritage of hydraulic works in the natural environment. Hydraulic works</b>							
C4.T6.L1	Research to enhance the value of hydraulic works in the natural environment. Dissemination							
C4.T6.L2	Document management							
C4.T6.L3	Rehabilitation of heritage and adaptation to new uses							

Contribution to Agenda 2030 SDG	Contribution to PRTR
	<b>Component 4</b> Conservation and restoration of ecosystems and their biodiversity
	<b>Component 5</b> Preservation of the coast and water resources
	<b>Component 14</b> Plan for the modernisation and competitiveness of the tourism sector
	<b>Component 24</b> Revaluation of the cultural sector

Areas of activity	
<b>Climate change</b>	<b>Sea and coasts</b>
<b>Water</b>	<b>Geotechnical studies</b>
<b>Hydraulic infrastructures</b>	<b>Environment</b>
<b>Studies of structures and materials</b>	



A long, straight path of wind turbines stretches across a green field towards a blue sea under a clear sky. The turbines are white and tall, with three blades each. The path is a mix of grass and a paved or gravel surface. The sea is on the left, and the sky is on the right.

# CHALLENGE 5

## SUSTAINABILITY IN THE NATURAL ENVIRONMENT

*... we understand **sustainability in the natural environment** as the **efficient management** of natural systems and their infrastructures, so that their continuity in the future and their availability in optimal conditions for future generations can be guaranteed as much as possible.*

## STRATEGIC INTEREST

The preservation of biodiversity and natural heritage, as well as its sustainable management, are the greatest environmental challenges today. The loss of biodiversity, the current rate of extinction, the scarcity of resources or their misuse (water and marine), the degradation of coastal ecosystems or problems related to environmental quality (polluting emissions) are the main problems to which CEDEX has contributed by proposing solutions since its creation. Therefore, 7 strategic themes have been identified, developed in 24 lines of activity, which will contribute to increasing the sustainability of the natural environment and its ecosystems.





**CHALLENGE 5. SUSTAINABILITY IN THE NATURAL ENVIRONMENT**

Chall. 5 (C5)	Strategic themes (T) and lines of activity (L)	Areas of activity						Singular facility (SF)
<b>C5.T1</b>	<b>Support for water and sectoral water planning</b>							
C5.T1.L1	Inventory of water resources in natural regime							
C5.T1.L2	Basic studies and methodological developments							
C5.T1.L3	Water resources systems (availability and ecological flows)							
<b>C5.T2</b>	<b>Support for coastal and marine planning</b>							
C5.T2.L1	Regulation of activities at sea. Technical instructions for dredging, beach restoration, artificial reefs and discharges at sea							
C5.T2.L2	Coastal and marine environment directives. Support for its implementation							
C5.T2.L3	Support for maritime spatial planning							
<b>C5.T3</b>	<b>Wastewater Treatment, Sanitation, Efficiency, Savings and Reuse</b>							
C5.T3.L1	Methodological development for risk management							
C5.T3.L2	Methodological and regulatory development for efficient management							
C5.T3.L3	Isotopic applications laboratory Maritime experimentation laboratory and ship maneuvering simulator							
<b>C5.T4</b>	<b>Environmental conservation, monitoring and management</b>							
C5.T4.L1	Radiological monitoring of the aquatic environment						<a href="#">IS.ISOTOPIC<sup>3</sup></a>	
C5.T4.L2	Characterization of the hydrological cycle by environmental tracers and isotopes						<a href="#">IS.ISOTOPIC<sup>3</sup></a>	
C5.T4.L3	Studies of climate, atmosphere and sea using isotopic techniques						<a href="#">IS.ISOTOPIC<sup>3</sup></a>	
C5.T4.L4	Achievement and maintenance of the good status of water bodies (study of unique problems, modelling of physical and biological processes, methodologies)							
C5.T4.L5	Characterization and monitoring of environmental variables and pollutants in water bodies							
C5.T4.L6	Studies for sediment management in rivers and reservoirs							
C5.T4.L7	Characterization and monitoring of marine litter, beach sands and microplastics							

<sup>1</sup> Isotopic applications laboratory.

<sup>2</sup> Maritime experimentation laboratory and ship maneuvering simulator.

Chall. 5 (C5)	Strategic themes (T) and lines of activity (L)	Areas of activity					Singular facility (SF)
C5.T4.L8	Protection against accidental contamination. Risk analysis and anti-pollution products.						
C5.T4.L9	Radiological characterization of building materials and radon protection						<a href="#">IS.ISOTOPIC<sup>3</sup></a>
<b>C5.T5</b>	<b>Environmental assessment</b>						
C5.T5.L1	Environmental assessment of plans, programs and projects, including climate change considerations and retrospective analysis of actions						
<b>C5.T6</b>	<b>Industrial environment</b>						
C5.T6.L1	Best available techniques						
C5.T6.L2	Integrated pollution prevention and control						
<b>C5.T7</b>	<b>Energy efficiency and decarbonisation</b>						
C5.T7.L1	Studies of behaviour of fixed and floating structures for marine renewable energies						<a href="#">IS.MARIT<sup>4</sup></a>
C5.T7.L2	Studies of behaviour of foundations used to obtain geothermal energy. Impact on bearing capacity						

Contribution to Agenda 2030 SDG	Contribution to PRTR
	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Component 4</b> Conservation and restoration of ecosystems and their biodiversity</p> </div> <div style="width: 45%;"> <p><b>Component 5</b> Preservation of the coast and water resources</p> </div> </div> <hr/> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Component 12</b> Spain 2030 Industrial Policy</p> </div> </div>

Areas of activity	
Climate change	Sea and coasts
Water	Geotechnical studies
Hydraulic infrastructures	Environment
Studies of structures and materials	

# CHALLENGE 6

## DIGITALISATION IN THE NATURAL ENVIRONMENT



... we understand by **digitalisation in the natural environment** the use of **applications and digital technologies** at the service knowledge, protection, conservation and efficient management of natural systems and their infrastructures, as well as the availability of information open to the public.





















## STRATEGIC INTEREST

The development and implementation of digital tools for environmental monitoring and management is key due to the multiple advantages it brings: greater accuracy in climate predictions, real-time management of the water cycle, systematic monitoring of the coastal and marine environment, collection and analysis of environmental data, development of mathematical models, warning systems for extreme weather events or monitoring of polluting emissions, among others. CEDEX is firmly positioned in this challenge, working on 15 lines of activity in 6 thematic groups, addressing the main issues related to the digitalization of the natural environment.





**CHALLENGE 6. DIGITALISATION IN THE NATURAL ENVIRONMENT**

Chall. 6 (C6)	Strategic themes (T) and lines of activity (L)	Areas of activity						Singular facility (SF)
<b>C6.T1</b>	<b>Creation of digital models of hydraulic infrastructures with the support of drones and BIM</b>							
C6.T1.L1	Acquisition and development of tools and equipment that allow digitalization in BIM environment							
C6.T1.L2	Integration of BIM digital models and real-time monitoring							
<b>C6.T2</b>	<b>Development of geographic and cartographic information systems (GIS). Web viewers.</b>							
C6.T2.L1	Update and development of hydrological databases							
C6.T2.L2	Isotopic database on precipitation, surface water and groundwater							
C6.T2.L3	Marine Environment Information Portal (InfoMAR)							
C6.T2.L4	Real-time access to external data. Oceanographic and meteorological information							
C6.T2.L5	Generation, processing and analysis of data related to geographic information and mapping of the coastal and marine environment							
<b>C6.T3</b>	<b>Environmental monitoring and instrumentation</b>							
C6.T3.L1	Monitoring the coastline using sensors on satellites and drones							
C6.T3.L2	Technologies for systematic monitoring of the coastal and marine environment and human activities							
C6.T3.L3	Assessment and monitoring of noise on wildlife and natural areas							
C6.T3.L4	Isotopic data network							
<b>C6.T4</b>	<b>Advanced numerical modelling</b>							
C6.T4.L1	Development of 3D numerical models for the study of hydraulic structures							
C6.T4.L2	Advanced computational fluid dynamics (CFD)							
<b>C6.T5</b>	<b>Big Data</b>							
C6.T5.L1	Hydrological Data Hub: collection, processing, review and exploitation of information							
<b>C6.T6</b>	<b>Open Data</b>							
C6.T6.L1	Hydrological data and models: capacity yearbook, CAUMAX, CHAC, CAMREC, IBER model collaboration							

Contribution to Agenda 2030 SDG				Contribution to PRTR	

Areas of activity	
	Water
	Sea and coasts
	Hydraulic infrastructures
	Environment





GOBIERNO DE ESPAÑA

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