



GOBIERNO
DE ESPAÑA

MINISTERIO
DE FOMENTO

Innovation Plan for Transport and Infrastructures

2018-2020





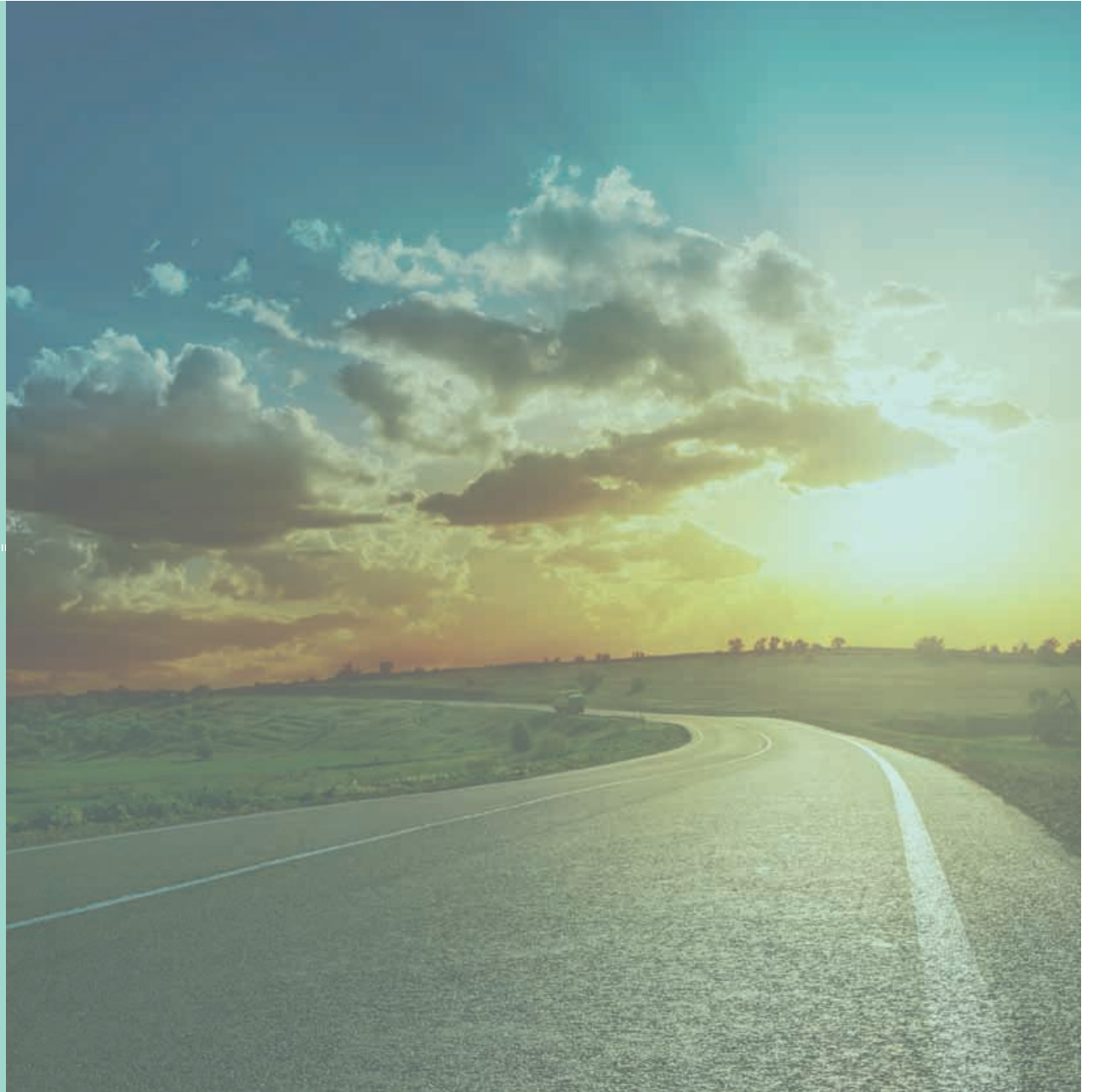
Innovation Plan for Transport and Infrastructures

February 2018

This Plan has been drawn up by Ineco with the collaboration of all the companies of the Fomento Group.



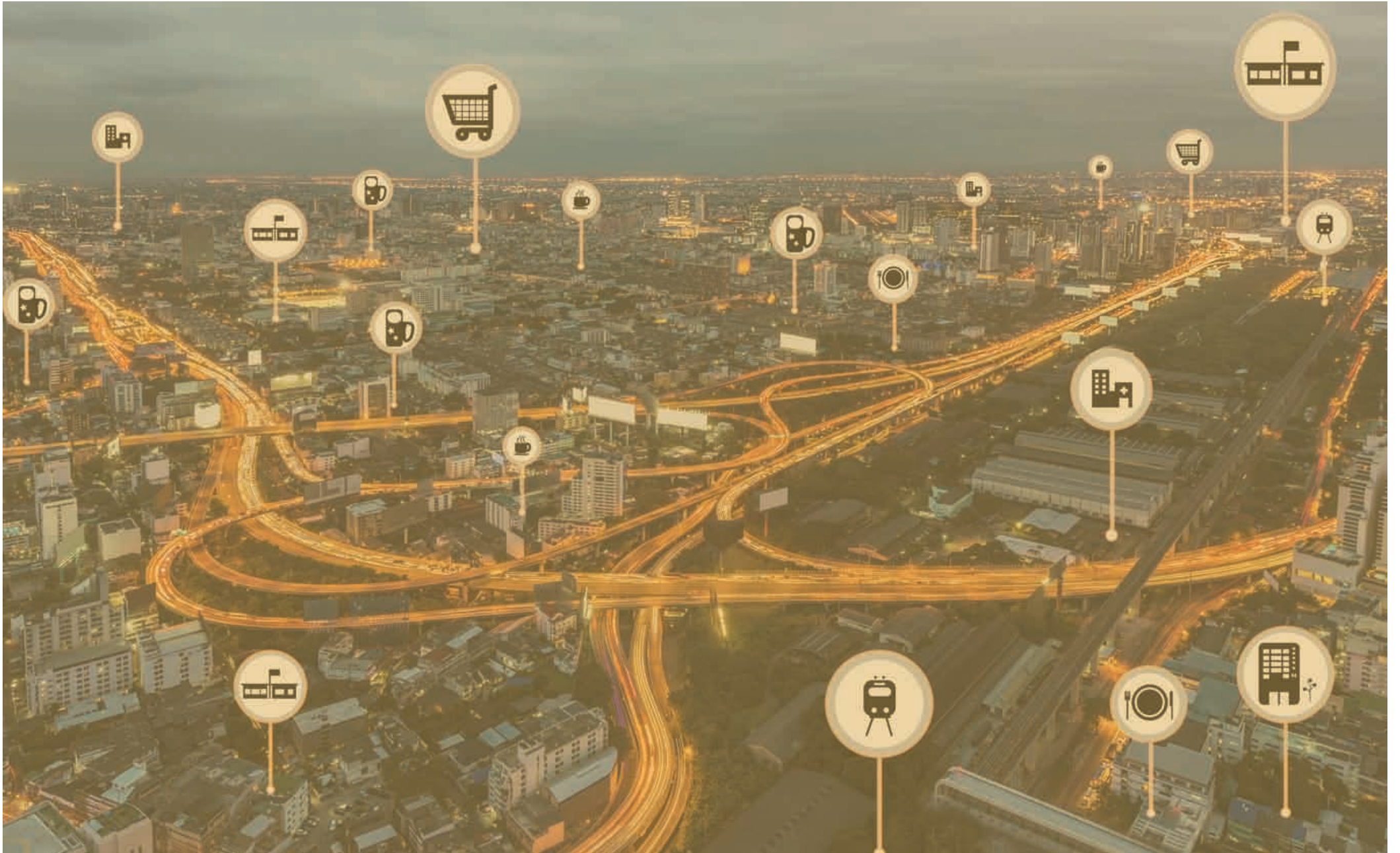
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1
Introduction



The knowledge economy is transforming the global economic landscape. The speed and intensity with which economic activities absorb new technologies and the ease with which information is obtained and shared is shaping a new economic reality. This situation highlights the enormous importance of innovation and human capital as sources of competitiveness and growth in a country. In response to this challenge, Spain urgently needs to create and to make innovation part of its economic foundation. This is why the Spanish Ministry of Public Works presents this **Innovation Plan for Transport and Infrastructures**, which aims to incorporate, quickly and efficiently, innovation into these two sectors. A Plan that encourages investment in knowledge and innovation, maintains and promotes economic recovery and fosters the development of new sustainable economies.

In recent years, the Ministry of Public Works and the companies and institutions under its responsibility -including the stakeholders that have contributed to the drafting of this Plan: Adif, Renfe, Aena, Enaire, Crida, Puertos del Estado, Ineco, Cedex and Sasemar- (hereafter “Fomento Group”), have been developing, approving and implementing successive innovation plans in order to modernise and improve the public services they provide to society in terms of transport and infrastructure. These have been of great importance to the Ministry of Public Works and have had a significant impact on the modernisation and improvement of the quality of the services provided to citizens.

This Plan aims to integrate and coordinate the entire activity that the different companies and institutions of the Fomento Group are carrying out with regard to innovation and sets the joint roadmap for the coming years. The **Transport and Infrastructure Innovation Plan** has been conceived as a cross-cutting plan that allows a great diversity of actions to be coordinated and placed within a framework of common initiatives. Furthermore, it will serve as the starting point to foster collaboration and cooperation among all Group companies and institutions and encourage the creation of synergies among them.

The Ministry of Public Works cannot forget its responsibility for promoting innovation among the different public companies and institutions as well as among those in the private sector. Having cutting-edge technologies requires encouraging the emergence of an ecosystem in which large companies and SMEs invest in innovation, and universities, technology centres and entrepreneurs to become involved and participate in this process. This Plan intends to promote and facilitate an innovative network that integrates all sectors of society and to articulate an innovative network of connections among all of them.

The Plan is confined to the 2018-2020 period – although its implementation may be extended to subsequent years – and focuses on four major strategic areas: User Experience, Smart Platforms, Smart Routes, and Energy Efficiency and Sustainability.

Finally, it is important to underscore the effort and cooperation of all of the companies and institutions of the Ministry of Public Works in the drafting of this Plan, as well as of all public stakeholders of the Ministry itself, whose firm commitment to innovation has made this document possible.

Framework of reference

Innovation occupies an important place in the European Union's strategy for generating growth and jobs. It is also strongly linked to other cross-cutting policies such as those on competitiveness, the environment, industry and energy. The role of innovation is to turn the results of research into new and better services and products in order to remain competitive on the world market and to improve the quality of life of European citizens.

The European Union's main initiative in the sphere of research and innovation is the Europe 2020 Strategy. This initiative has the political backing of the leaders of the European Union, whose members all agree that investment in research and innovation is essential for Europe's future.

Horizon 2020¹ – or H2020 for short – is the financial instrument created by the European Commission to finance and set in motion the 'Innovation Union', a flagship Europe 2020 Strategy initiative that seeks to improve the conditions of and access to funding for research and innovation in Europe, such that innovative ideas may be turned into products and services that promote growth and create jobs.

The Innovation Union has three specific objectives:

- Making Europe a global scientific power.
- Removing barriers to innovation, such as e.g. market fragmentation, lack of funding or under-utilisation of public procurement for innovation.
- Radically changing the way in which the public and private sectors work together, especially through European innovation partnerships (EIPs) among companies and institutions – involving European institutions, national and/or regional public authorities, and companies.

¹ Source: [Horizon 2020](#)



At the Spanish level, the 'Digital Agenda for Spain' is the strategy the Spanish Government is following to develop the digital society and economy in our country. This strategy sets out the roadmap as regards information and communications technologies and eGovernment to meet the objectives of the Digital Agenda for Europe in 2020² and includes specific goals for developing the Spanish digital society and economy. This initiative is jointly led by the Ministry of Energy, Tourism and the Digital Agenda (Minetad) and the Ministry of Finance and Civil Service (Minhapf).

The "Digital Strategy for a Smart Spain"³ is currently being drafted and will build upon the results of the current Digital Agenda for Spain and update its content, addressing the new challenges that have emerged in past few years.

An inter-ministerial group has been recently set up to draw up the Plan for the Digital Transformation of the Spanish Economy. This Plan's measures will be integrated into the Digital Strategy for a Smart Spain. The digitalisation policy contained in this Plan (the 2018-2020 Transport and Infrastructure Innovation Plan from the Ministry of Public Works) will be consistent and coordinated with the Plan for the Digital Transformation of the Spanish Economy and will help in identifying critical elements and removing obstacles to its implementation. Furthermore, it will act as a lever to accelerate digital transformation.

Within the framework of the Digital Agenda for Spain, the Secretary of State for the Information Society and the Digital Agenda (Sesiad) defined, and agreed with cities and the industry, a smart city model that has been internationally



recognised. The International Telecommunication Union approved two standards aimed at defining interoperability (ITU-T Y.SCP) and city platforms (ITU-T Y. FRAMESCC)

during its September 2017 meeting in Geneva. In addition, Spain submitted to the ITU contributions in smart buildings that were in line with the Spanish standard UNE 178108. The new National Plan for Smart Territories will provide continuity to this work within the Technical Committee for Standardisation 178 of the Spanish Association for Standardisation (Aenor), which is currently working on drafting standards about smart ports, airports and stations as 'internal objects' of cities.

The strategic importance that Building Information Modelling (BIM) will have within the Spanish innovation strategy is worth noting. This new paradigm in the management of building and civil engineering projects will have a significant impact on the transport and infrastructure sectors. Therefore, it has been considered a cross-cutting element in all of this Plan's initiatives.

The BIM Commission, which was set up by the Ministry of Public Works, promotes the introduction of the BIM through the involvement of multiple public and private stakeholders.



The Commission's work is structured through different groups which are in charge of guiding the expansion of the methodology in our country from diverse perspectives, such as the technological and the strategic. The Ministry of Public Works' firm commitment to introducing BIM technology is an international milestone and will act as a lever for the development of innovative infrastructures.

On the other hand, the 2013-2020 Spanish Science and Technology and Innovation Strategy is the strategic framework for R&D&I and contains the vision and the general objectives for science, technology and innovation policies in our country.

This Strategy must contribute to the consolidation of the Spanish science, technology and innovation system through the quality and the scientific-technical, social and

economic impacts of research, the increasing involvement and leadership of companies in R&D&I activities and, especially, the development of an innovation environment that allows the major challenges that society faces to be addressed, facilitates the acquisition of new skills and the hiring of talent, strengthens our country's international leadership and collaboration in R&D&I and encourages civil society and its organisations to participate in the innovation process.

The Government's instrument for developing and achieving the objectives of the Spanish Strategy is the 2017-2020 State Plan for Scientific and Technical Research and Innovation, which was devised by the Ministry of Economy, Industry and Competitiveness (Mineco) through the Secretary of State for Research, Development and Innovation.

The ultimate aim of the Plan is to contribute to and promote the country's scientific and technological leadership and innovation capabilities as essential elements for the creation of quality jobs, the increase of business productivity and competitiveness, the improvement of the delivery of public services and, finally, the development and well-being of citizens.

Likewise, the Mineco is preparing, via the General Secretary for Industry and Small and Medium Enterprises, a new Strategic Framework for Industrial Spain to stimulate industrial development. The framework, the main objective of which is to boost industrial competitiveness by reducing logistics-related costs, has been structured around four competitive levers: Infrastructure, Regulation, the Company Sphere, and the Deregulation of the Railway Sector. Within the company sphere, one of the priority axes of action is to encourage the adoption of new technologies and digitalisation in order for the excellence, reliability, effectiveness and efficiency of logistics companies to improve, which would bring about a reduction of costs and an improvement of the competitiveness of the Spanish industrial sector.

This Plan has taken the above-mentioned documents into account and is in line with the objectives and goals set out in their strategies.

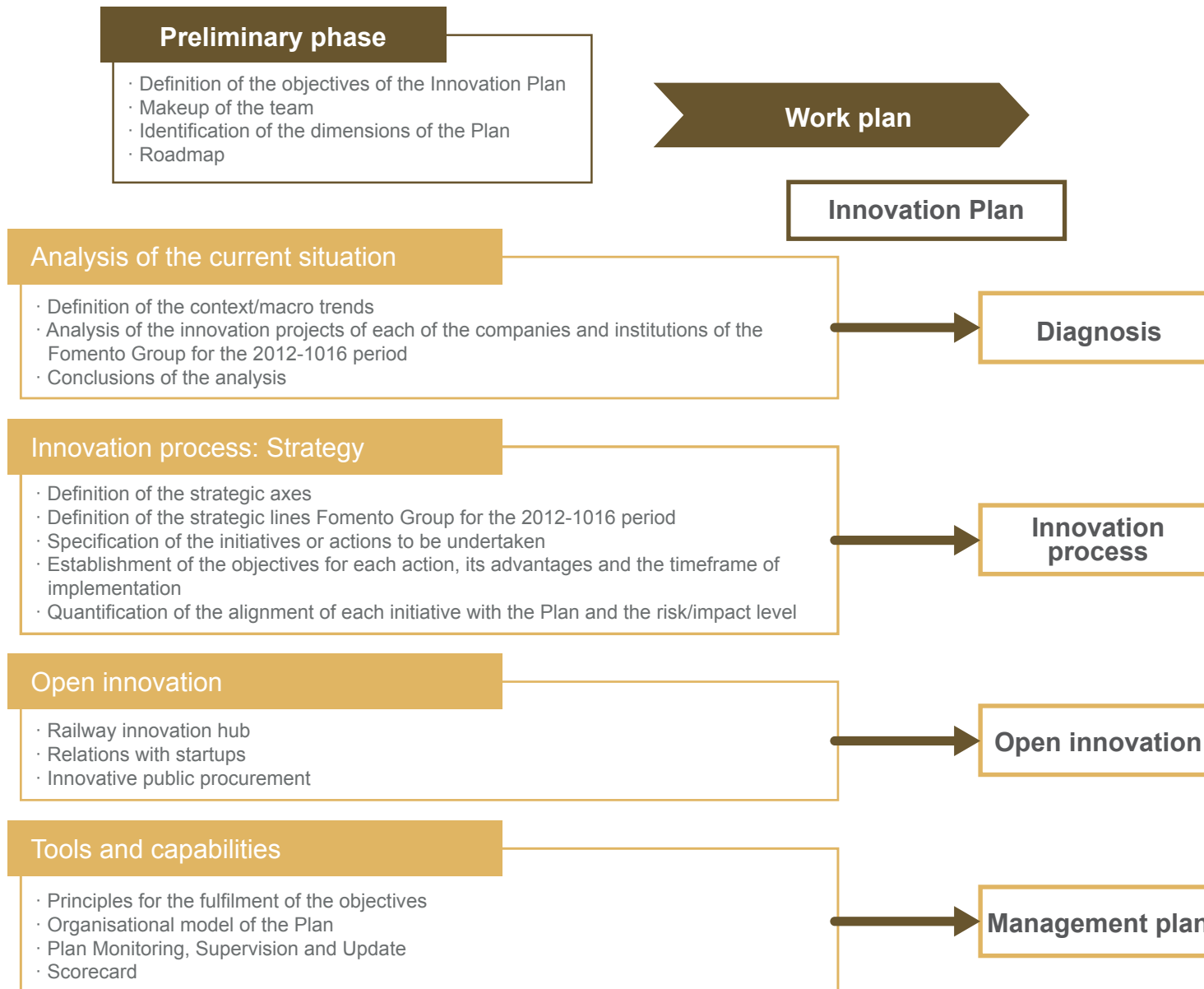
² Source: Agenda Digital para Europa en 2020 - ³ Source: Estrategia Digital para una España Inteligente

1.2

Methodology



A series of elements have been taken into account from a methodological point of view in the drawing up of the Transport and Infrastructure Innovation Plan, which are shown in the following diagram:



Preliminary phase

In May 2017 the Ministry of Public Works commissioned Ineco to prepare the **Transport and Infrastructure Innovation Plan**. The Plan involves all companies and institutions that are integrated in the said Ministry and guides their actions in terms of innovation for the next four years.

During this initial phase the strategic objectives will be set, the team that will be in charge of drawing up the Plan formed and the roadmap that will govern the devising and drafting thereof established.

The Transport and Infrastructure Innovation Plan's objectives are as follows:

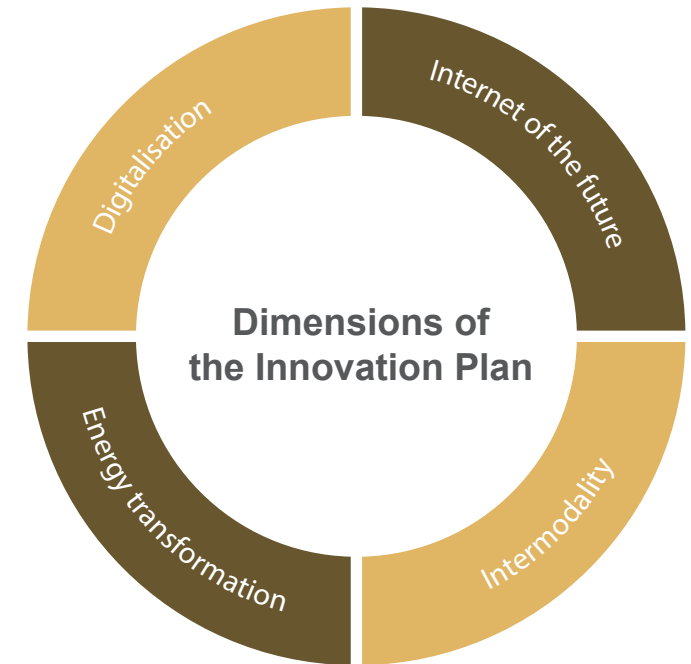
1. To expedite the introduction of technology at the service of people's well-being, giving precedence to innovation in safety, accessibility and sustainability.
2. To boost the economic and social profitability of public and private investments by increasing their efficiency and effectiveness.
3. To make Spain a more attractive place for companies and innovative investments in the field of mobility and transport.
4. To mobilise investment and technology from beyond our borders and to consolidate Spain's international leadership in the field of mobility and transport.

This Plan also aims to promote transparency in the actions of public operators, who must follow an open data policy that may attract the private sector and lead to an open government and an open economy.

The team that has been in charge of drafting this Plan was set up within Ineco's Directorate General for Transformation, Internationalisation and Innovation and, specifically, the Sub-Directorate General for Cooperation and Innovation. The latter assumed the leadership in and responsibility for devising the Plan, facilitating and encouraging the participation of the rest of Ineco's areas as well as of the people responsible for innovation from the other Group companies and institutions.

The directors of Adif, Aena, Enaire, Crida, Puertos del Estado and Renfe were involved in carrying out this work on a weekly basis. The opinion of other institutions, such as the Centre for Public Works Studies and Experimentation (Cedex), the Ministry of Public Works and different private entities was also sought.

The Ministry of Public Works laid down some strategic areas, or dimensions, around which the Innovation Plan has been structured and which have been depicted in the following diagram.



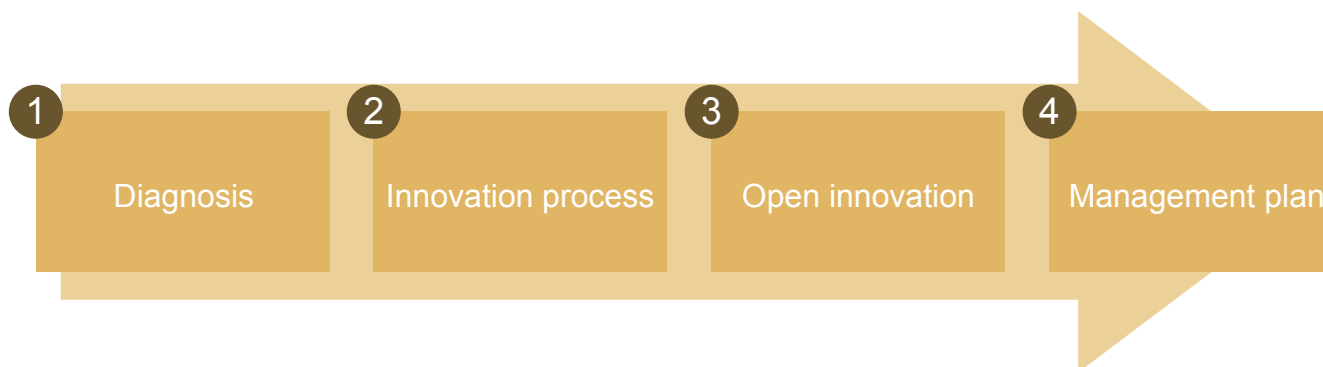
In line with the European Commission's strategy,⁴ **digitalisation** in the transport and infrastructure sectors was taken into account in the devising of this Plan as an opportunity to configure an efficient, interconnected mobility system. The digitalisation of products, services and processes must be the foundation for the development of safe and attractive mobility solutions with an eye towards automation. In addition, the digital transformation will allow for making decisions based on individual data through the use of smart platforms. The standardisation of communication formats and protocols pertaining to transport data is addressed in detail in the Plan's initiatives.

Another dimension of the Plan, which revolves around digitalisation, is known as the **Internet of the Future**. The evolution of the Internet of Things entails the transition from connected systems to smart systems that are capable of harnessing the information collected via sensors and actuators. To this end, the Plan provides for the development of an ecosystem of Smart Platforms that meets the needs of the Spanish transport system whilst ensuring interoperability among the different elements. In order to achieve this, the developments will be based on the National Plan for Smart Cities developed by the Secretary of State for the Information Society and the Digital Agenda (Sesiad). On the other hand, the Plan includes initiatives aimed at developing applications that provide smart platforms with functionality through big data or machine learning techniques.

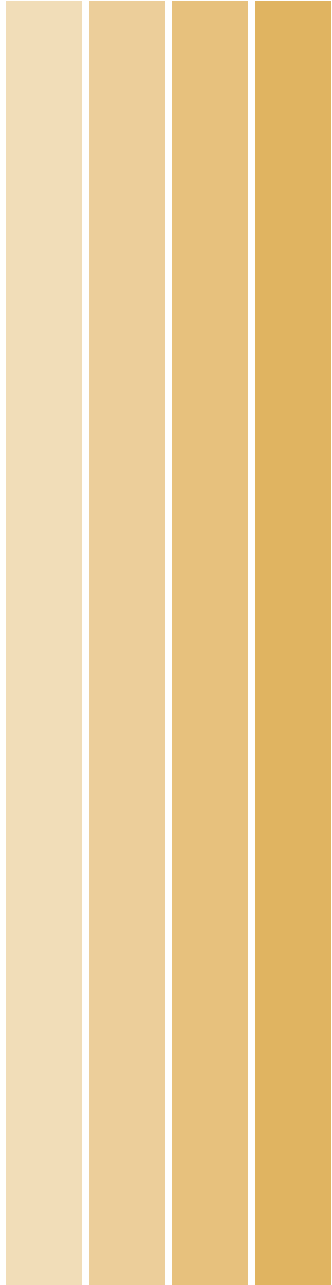
Intermodality, or the complementary relationships among the different modes of transport, has been proposed as the third dimension of the Plan to optimise the transport system and improve its efficiency and effectiveness. The aim is to have an integrated, global vision of mobility and transport and to be able to coordinate all those companies and institutions involved in order to enhance the quality of life of citizens and to speed up and improve commercial transactions in our country via multimodal transport, which optimally combines the different modes of transport by taking advantage of their strengths and minimising their weaknesses. It is necessary to guarantee the integration of all transport modes and to introduce interoperability at all system levels.

The fourth dimension on which the Innovation Plan has been structured is **energy transformation**. This is aligned with the European Commission's policy priorities, as set out in the Energy Union's strategy⁵ and in the European Strategy for Low Emission Mobility.⁶ The potential of cooperative, connected and automated vehicles to reduce energy consumption and emissions from transport stands out. In addition, it is aligned with the 2017-2020 State Plan for Scientific, Technical and Innovation Research,⁷ which is currently being drawn up by the Mineco in collaboration with the Council for Scientific, Technological and Innovation Policy and identifies sustainable, smart and clean transport as one of the challenges.

The roadmap to be followed in the devising of the Innovation Plan was set during this same initial phase, a roadmap which has been divided into four phases:



⁴ Digitising European industry. Reaping the full benefits of a Digital Single Market [COM(2016) 180 final]. ⁵ Source: Energy Union ⁶ A European Strategy for Low-Emission Mobility [COM(2016) 501 final]



2
**Diagnosis:
Analysis of
the current
situation**

Definition of macro trends

Transport and infrastructures, like virtually all economic activities, are not immune to the technological disruption that is transforming services and processes. These technologies facilitate the construction of smarter, safer and more integrated systems.

In order to undertake this transformation, it is essential to take into account the macro trends that condition the immediate future and build an environment that encourages the broad adoption of technologies.

Certain global macro trends affecting transport and infrastructures, which will be determining factors in the collective mobility of the future, as well as our population's future needs, were taken into account in drawing up this Plan. These macro trends are discussed below:

Urbanisation

Today, more than half of the world's population lives in cities. It is estimated that this figure will reach 70 per cent of the total population by 2050. Despite occupying just 2 per cent of the planet's land, cities account for 60 to 80 per cent of global energy consumption and generate 70 per cent of greenhouse gas emissions. Against this backdrop, cities are expected to move towards technological integration, opting for solutions that promote urban development and smart mobility.

The technology and regulatory frameworks

The integration of information and communication technologies (ICTs) in the management of infrastructures and transport is driving users and public actors to use open data providing relevant information. It is necessary to make progress in the development of a regulatory framework that is capable of controlling and regulating the availability of data in order to move towards an open government and an open economy.

The environment

The transport and mobility sector's commitment to the environment is directed towards sustainability and the reduction of emissions; the confluence of transport, energy and technology; energy optimisation; and the impact of infrastructures, which must be taken into consideration in the immediate future.

An ageing population

The upward trend in the ageing of the world's population is a fact. According to the UN's 2017 World Population Prospects report,⁷ the number of people aged 60 and over will rise from 962 million in 2017 to 2.1 billion in 2050. It is expected that improvements in infrastructure accessibility, vehicles and new transport services will be necessary to meet the needs of this cohort.

⁷ Source: https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf



- Technology integration
- Solutions for urban development
- Smart mobility in cities



- Open data Open government Open economy
- Data as a resource
- Transparency of public stakeholders and actions
- Intermodality



- Accessibility to the infrastructure
- Accessibility to vehicles
- New transport services



- Sustainability Emission reduction
- Confluence of transport, energy and technology. Energy optimisation
- The impact of infrastructures on the environment



Analysis of innovation projects

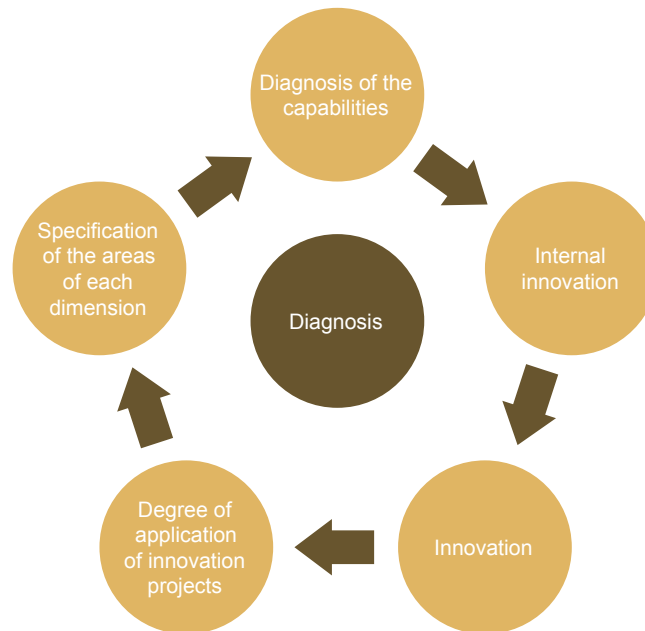


All the innovation projects carried out from 2012 to 2016 by the Fomento Group companies that have participated in this study (Adif, Aena, Crida, Enaire, Ineco, Puertos del Estado and Renfe) were analysed.

The following process was followed:

A total of 577 innovation projects were analysed. Of these projects, 267 were internal projects (46% of the total), which were carried out using only resources from each analysed company. The remaining 310 innovation projects (54%) were collaborative projects, i.e. projects for which other bodies provide resources (mainly projects that fall within the EU Framework Programme for Research and Innovation).

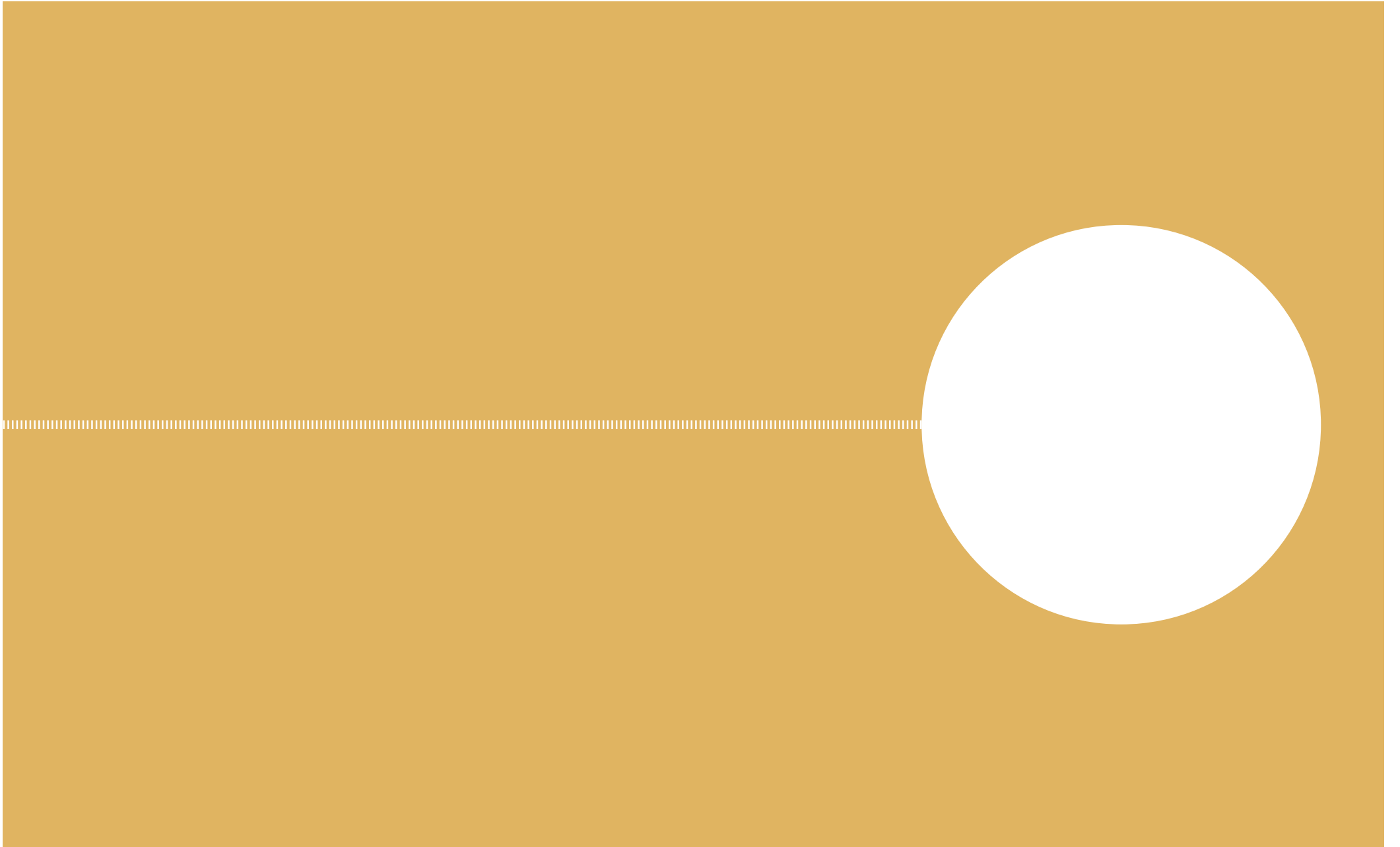
The different projects were analysed in detail. However, only the main conclusions of this analysis have been included herein to keep things short.

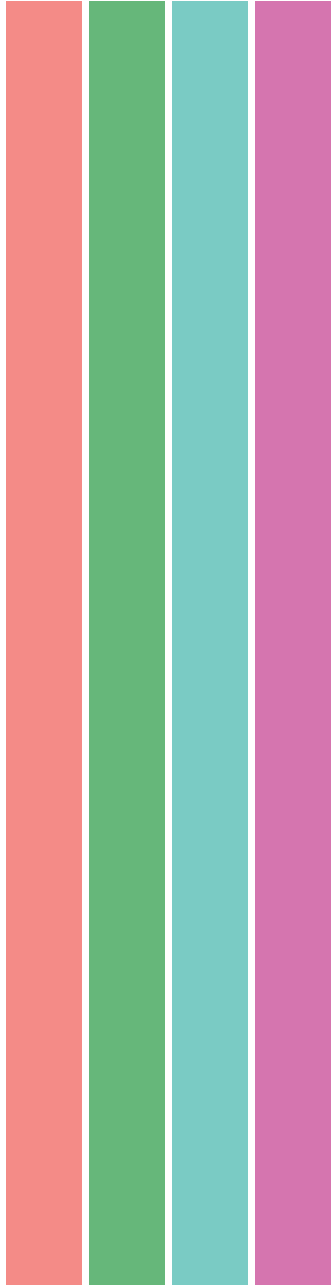


Conclusions of the analysis

The following conclusions were drawn from the analysis of the current state of the innovation projects carried out by the Fomento Group's companies:

1. Greater collaboration, sharing knowledge and creating synergies among Group companies is required. Collaboration among Group companies is considered to be a key to success in achieving the development of technology solutions and managing to increase the efficiency and effectiveness of their innovation processes.
2. Open innovation must be encouraged beyond the umbrella of European projects and collaboration with universities, companies, start-ups, suppliers, etc. intensified. In order to be able to maintain the competitive advantage they gain through innovation, Group companies must collaborate with other stakeholders.
3. A culture of innovation must be fostered at all levels. Moving towards a culture of innovation requires different skills and practices. The key to generating a culture of innovation is knowing how to get people from the entire organisation involved, facilitating their participation and valuing their contributions, to foster a culture of trust and open collaboration.
4. The Group's position must be maintained within the European Union (EU) and improved in other countries outside it. The innovation projects of the companies belonging to the Fomento Group are well placed in Europe thanks to programmes from the EU Framework Programme for Research and Innovation (Horizon 2020, Sesar...). Taking advantage of innovation opportunities in international markets outside the EU is acknowledged to be an area for improvement.
5. Innovation must be the tool that helps to position the Group's image and brand in international markets. Innovation must be used by Group companies to properly position their different brands beyond our borders.





3
**Innovation
process:
Strategy**

Context

This **Transport and Infrastructure Innovation Plan** is a document of reference that brings together the efforts envisaged by the Fomento Group to promote the digitalisation of the infrastructures and of the services associated therewith.

In turn, it is a highly valuable tool for focusing efforts and generating synergies among the different actors, whereby their different views may be unified through the analysis of the current situation to arrive at a common vision for the future.

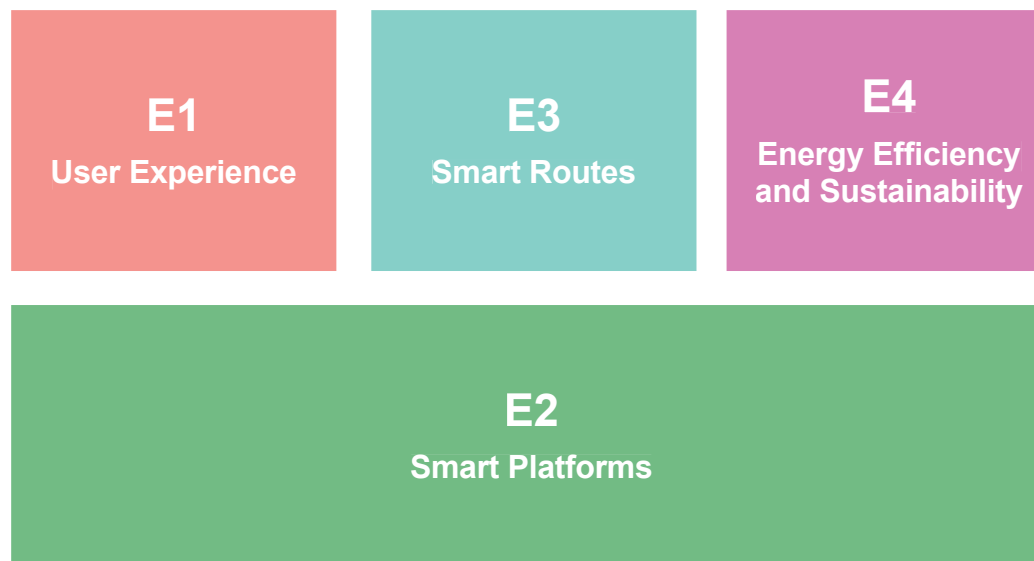
This is why this Plan has to contemplate four fundamental aspects:

- Driving Spain to face the challenge of digitally transforming its transport infrastructures and systems.
- Constituting a clear roadmap for both public and private innovation efforts.
- Specifying the initiatives – especially in the short and medium terms – that must be taken within the Fomento Group and uniting the innovation efforts of the actors that comprise it.
- Promoting open innovation processes of collaboration among public and private stakeholders in terms of innovation inside the Fomento Group.

The Ministry of Public Works considers these aspects to be key challenges and will firmly rely on innovation as a means to overcome them and greatly improve the efficiency of the transport system and the service provided to citizens.

This willingness to change has been structured around four fundamental transformation axes:

- **Axis 1:** User Experience: the current mobility paradigm considers a fluid user experience, in all its possible facets, both physical and digital, to be a key need.
- **Axis 2:** Smart Platforms, as the foundation on which the other three axes should rest, which would gather and articulate all the information from the different services and infrastructures.
- **Axis 3:** Smart Routes, supported by cross-cutting platforms in the sharing of information and by predictive systems to make them truly smart, not just connected.
- **Axis 4:** Energy Efficiency and Sustainability. Energy sustainability based on the energy efficiency of service and infrastructures constitutes the Plan's fourth pillar.



The Smart Platform Strategic Axis runs through and supports the other three axes.

According to the above diagnostic, these four strategic axes constitute a global response to the dimensions of the Plan: digitalisation, intermodality, the Internet of Things, and energy transformation.

The different thematic areas that comprise each strategic axis are the Plan's strategic lines. These strategic lines respond to those innovative trends or technologies in the sphere of transport and infrastructures which are considered essential for the Plan to succeed. These strategic lines are listed below:

• **E1: User Experience:**

- E1L1: Mobility as a Service
- E1L2: Barrier-Free Travel
- E1L3: User Profile

• **E2: Smart Platforms:**

- E2L1: Smart Station
- E2L2: Smart Airport
- E2L3: Smart Port
- E2L4: User Platform
- E2L5: Freight Platform
- E2L6: Open Data
- E2L7: New Data Sources
- E2L8: Single Sky
- E2L9: Smart Maritime Management

• **E3: Smart Routes:**

- E3L1: Road and Railway Digitalisation
- E3L2: Modelling and Forecasting
- E3L3: Smart Territories
- E3L4: Logistics and Freight
- E3L5: New Transport Paradigms

• **E4: Energy Efficiency and Sustainability:**

- E4L1: Renewable Energies
- E4L2: Decarbonisation
- E4L3: New Infrastructures
- E4L4: The Autonomous Vehicle
- E4L5: Education, Communication and Entrepreneurship

At the last level of disaggregation the strategic lines are broken down into initiatives. The initiatives set forth actions and projects to be implemented as a result of the Plan. Each initiative is presented and the actions they involve, their objectives and their advantages described. An estimated budget for implementation and a summary of the associated stakeholders, which are the result of the consultations made within the context of the drafting of the Plan, are also provided. With regard to these stakeholders, it should be noted that new actors may join the initiatives during the execution of the Plan. Apart from that, a preliminary analysis of the risks associated with the technology, the regulations and the budget has been included in every initiative.

The technology risk was assessed by analysing the readiness of the technologies used. An indicator from 0 to 10 was assigned to them; higher values indicate less technological readiness.

To assess the regulatory risk, the regulatory and legal development in the fields related to the initiative was analysed. A qualitative scale from 0 to 10, which took into account factors such as the existence of regulations and the degree of readiness thereof, was established.

As far as the budgetary risk is concerned, it was assessed according to two basic criteria: the size of the estimated budget and the budgetary uncertainty associated with the initiative. Based on these criteria, a qualitative value on a scale from 0 to 10 was assigned to the risk.

Technology Risk

- 0** TRL 9 – Actual system proven in operational environment inside the Group
- 1** TRL 9 – Actual system proven in operational environment
- 2** TRL 8 – System complete and qualified
- 3** TRL 7 – System prototype demonstration in operational environment
- 4** TRL 6 – Technology demonstrated in relevant environment
- 5** TRL 5 – Technology validated in relevant environment
- 6** TRL 4 – Technology validated in lab
- 7** TRL 3 – Experimental proof of concept
- 8** TRL 2 – Technology concept formulated
- 9** TRL 1 – Basic principles observed Level 2
- 10** TRL 1 – Basic principles observed Level 1

TRL: Technology readiness level

Regulatory Risk

- 0** Already developed regulations with a high degree of maturity and with internationally accepted standards
- 1** Already developed regulations with a high degree of maturity
- 2** Already developed regulations with an average degree of maturity
- 3** Already developed regulations with a low degree of maturity
- 4** Regulations under development and to be introduced in the short term
- 5** Regulations under development and to be introduced in the medium term
- 6** Regulations under development and to be introduced in the long term
- 7** Regulations under development at the international level with emerging initiatives at the national level
- 8** There are several initiatives aimed at regulation and standardisation from the private and public spheres
- 9** There are several initiatives aimed at regulation and standardisation from the private spheres
- 10** There are no regulation or standardisation initiatives

Budgetary Risk

		Budget uncertainty				
		Very low	Low	Average	High	Very high
Budget size	Very low	0	1	2	4	5
	Low	1	3	4	5	6
	Average	2	4	5	6	7
	High	4	5	6	8	9
	Very high	5	6	7	9	10





Diagram of the Plan

E1 User Experience

- E1L1 Mobility as a Service
- E1L2 Barrier-Free Travel
- E1L3 User Profile

E2 Smart Platforms

- E2L1 Smart Station
- E2L2 Smart Airport
- E2L3 Smart Port
- E2L4 User Platform
- E2L5 Freight Platform
- E2L6 Open Data
- E2L7 New Data Sources
- E2L8 Single Sky
- E2L9 Smart Maritime Management

E3 Smart Routes

- E3L1 Road and Railway Digitalisation
- E3L2 Modelling and Forecasting
- E3L3 Smart Territories
- E3L4 Logistics and Freight
- E3L5 New Transport Paradigms

E4 Energy Efficiency and Sustainability

- E4L1 Renewable Energies
- E4L2 Decarbonisation
- E4L3 New Infrastructures
- E4L4 The Autonomous Vehicle
- E4L5 Education, Communication and Entrepreneurship

Axis 1

User Experience



To expand the traditional concept of travel by offering users products and services according to their tastes and preferences. Building the loyalty of users by tailoring the transport offer to them.

● Strategic Line 1 ●

Mobility as a Service

● Strategic Line 2 ●

Barrier-Free Travel

● Strategic Line 3 ●

User Profile

User experience is a key factor to improving the service provided by the transport network. The services on offer must migrate towards a format of global solutions aimed at detecting and satisfying the needs and preferences of users whilst providing at the same time added value in terms of transport sustainability and efficiency.

This vision is resulting in new paradigms, such as Mobility as a Service (MaaS), barrier-free travel and a careful analysis of user profiles.

MaaS is already considered the international standard for future mobility solutions. The aim is for users to have a unified service experience, in a completely transparent way, during their door-to-door journey, be it in public or in private mode.

Under the **Barrier-Free Travel** denomination the Plan groups those initiatives aimed at eliminating all possible physical and digital obstacles in the end experience of the service by means of new payment, validation and control systems, improvements in accessibility, etc.



The **User Profile** category encompasses all initiatives aimed at integrating information, analysing it (Big Data) and creating new channels of communication with users.

The transport system plays a fundamental role in the daily life of citizens and hence has a direct impact on their well-being. Transport services and, in particular, mass transit services must get to know the preferences and tastes of their users better so as to be able to adapt their offer to the latter's expectations.

Progress must be made in this orientation of services with regard to two complementary aspects. On the one hand, transport services must be designed to align with the behaviour of the majority of users. In order to achieve this, it will be necessary to study the habits of passengers and identify those parameters that influence their decisions. This **generalisation** or knowledge of the overall behaviour of passengers will be very useful when it comes to scheduling and managing regular services,

allowing resources to be optimised, delays and waiting times reduced, fares adjusted, etc.

On the other hand, transport systems must move towards offering **personalised services** that win over customers and improve their personal experience. Companies in the transport sector must be able to know the preferences of their individual customers in order to be able to make them offers and offer them promotions and complementary services that meet their needs. In this respect, the initiatives proposed in the Plan are directed towards the concept of 'passenger profile' or 'passenger identity', which includes the preferences and tastes of every individual user in order to offer them, in a personalised manner, those services and products that suit their preferences and expectations.



Where can initiatives be taken?

Purchases

Users are eager for flexible purchasing systems and methods that they themselves can put into practice quickly and easily. In this regard, all initiatives related to electronic payment, creating customer profiles, etc. are welcome.

Personalisation

There is a need for services allowing users to tailor their travel experience whilst ensuring the privacy and security of their data.

Integration

Service integrators need to enter the market to develop door-to-door transport services.

Travel

New trip-orientated services must be developed to improve the experience of users during the different stages of their journey: during their stay in terminals, on board vehicles, whilst waiting at stops, etc.

Remembrance

Customer loyalty and trip memento initiatives need to be set in motion. Continual learning through experience with customers to provide them real value.

● E1L1 ●

Mobility as a Service

Axis 1

Initiatives

- Definition of the National Mobility-as-a-Service Model
- The public sector as an integrator of data for Mobility as a Service
- Implementation of MaaS pilot projects at the companies of the Fomento Group



Context

In line with the economic transformation that has taken place in many sectors, mobility and transport are undergoing a transition from products to services. The increased use of shared travel services is a clear sign of this transition, where people prefer to pay only for what they consume. At the same time, the increase in information processing and storage capacity is bringing about the appearance of new business models linked to data. This set of changes is included in the concept of **Mobility as a Service (MaaS)**, which represents a substantial change in the passenger transport sector.

Objective

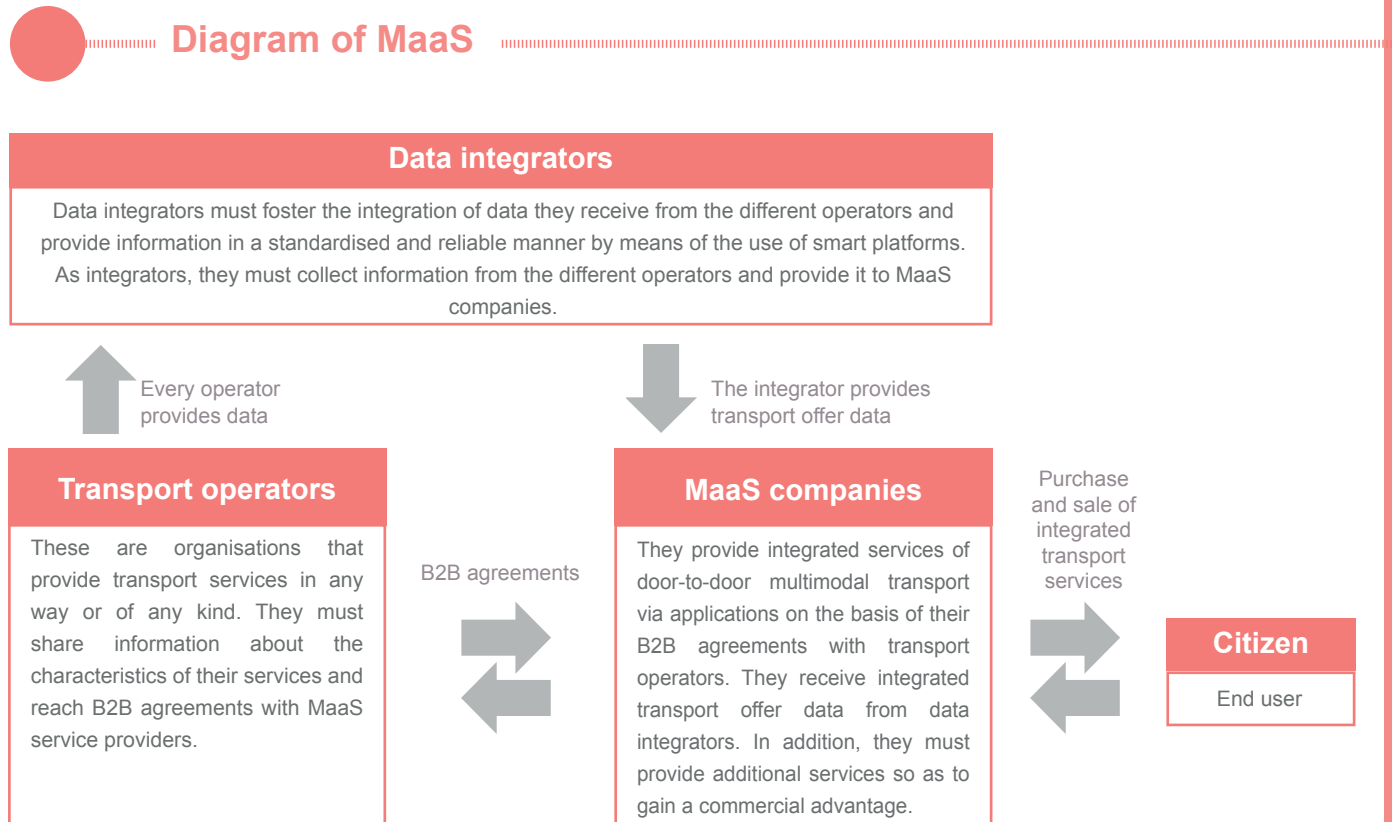
The first practical applications of the MaaS concept have been based on digital platforms that integrate the electronic scheduling, booking and purchasing of and payment for multimodal, door-to-door transport services, bringing public and private services under the same roof.

This is a real change in the way people move, who can purchase combined, tailored transport tickets via an easy-to-use application. In addition, MaaS applications will offer different real-time travel options, taking into account factors such as traffic congestion, user preferences or urgency of travel.

This Plan seeks to promote this type of solution through the proposal of a Spanish model that gives a pioneering boost to Mobility as a Service from the public sector.

On the other hand, the concept of Mobility as a Service will undergo a major transformation in the long term with the foreseeable deployment of autonomous vehicles. Multiple business models linked to on-board services, such as multimedia content, professional, etc., will appear that will cause the experience of the user inside their private car to evolve. All these business opportunities are encompassed by the concept of 'Passenger Economy', and their impact must be taken into account in this Plan.

One of the main factors for the success of the MaaS concept is to achieve the collaboration of public and private stakeholders, which can greatly benefit from this type of model – even if they have different interests. Whilst the private sector can find interesting business opportunities related to service integration, the public sector can reap the benefits associated with reducing congestion: higher productivity, greater road safety, better air quality, and an improved perception of QoS, among others.



E1L1-1 National Mobility-as-a-Service Plan

Objectives

- To lay down the competency and regulatory foundations for the introduction of Mobility as a Service.
- To encourage the development of new business models based on Mobility as a Service.

Advantages

- Establishing a favourable framework for the development of new business models.
- Positioning the state in an emerging sector.
- Promoting public-private partnerships.

Description of the initiative

A National MaaS Plan must be drawn up that articulates the establishment of this type of service.

The **specific actions** that need to be undertaken are listed below:

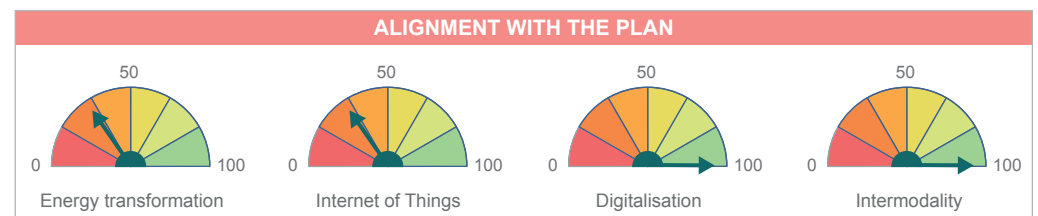
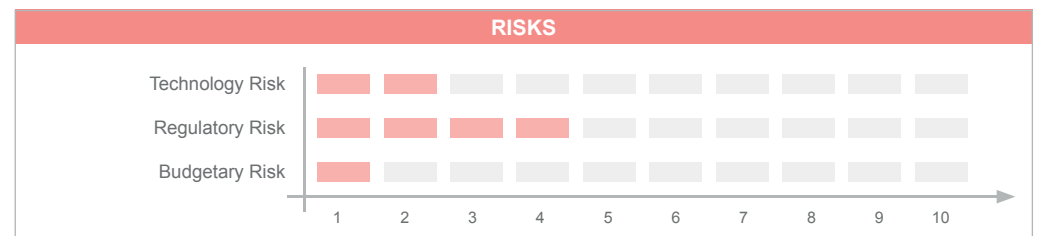
- Analysing and diagnosing the MaaS market in Spain. Interviewing all involved stakeholders.
- Defining the Spanish MaaS model. Defining the competency framework and a short/medium-term action plan.
- Disseminating the concept of MaaS and promoting entrepreneurship in connection to MaaS.

BUDGET	
Drafting of the Plan	≈ €400,000
TOTAL	≈ €400,000



MONITORING INDICATORS
1. The degree of knowledge about MaaS.
2. The number of companies associated with MaaS.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█	█	█				█		
Other stakeholders	Public administrations, transport operators, universities, innovation hubs									



E1L1-2 The Fomento Group as data integrator

Objectives

- To position the Fomento Group as a go-to company in the market of transport supply and demand data.
- To promote all necessary processes and partnerships for the integration of transport data.

Advantages

- Positioning the Fomento Group as the promoter of the introduction of MaaS in Spain.
- Fostering public-private collaboration.
- Encouraging the creation of new business models.

Description of the initiative

The role of data integrator is an important business opportunity within the Mobility-as-a-Service ecosystem. By means of this initiative the Fomento Group intends to become an integrator of reference.

The **actions** that need to be undertaken within the framework of the initiative are as follows:

- Encouraging public-private partnerships for the integration of supply and demand data.
- Defining the protocols and formats for data integration and publishing the White Paper on Open Transport Data.

BUDGET

Consultancy and Partnerships	≈ €400,000
Drafting of the White Paper	≈ €100,000
TOTAL	≈ €500,000

LEADERSHIP



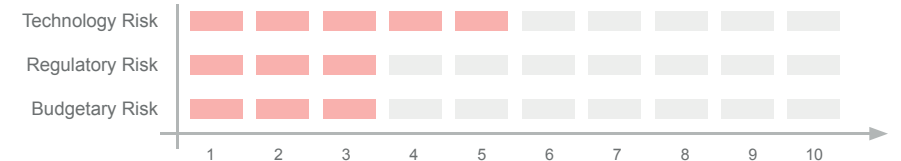
MONITORING INDICATORS

1. The number of transport operators involved.
2. The publication of the White Paper on Open Transport Data.

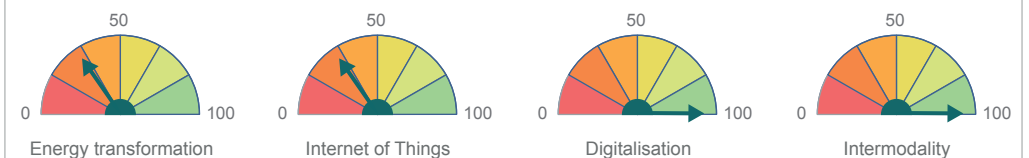
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations, transport operators, universities, innovation hubs									

RISKS



ALIGNMENT WITH THE PLAN



E1L1-3 Mobility-as-a-Service Pilot Project at the Fomento Group.

Objectives

- To develop a proof of concept of a product integrated with B2B agreements whose commercialisation is based on MaaS concepts.
- To reduce the traffic of heavy vehicles by road.
- To reduce the emissions generated by freight transport.

Advantages

- Positioning the Fomento Group as the driver of MaaS.
- Fostering public-private collaboration.
- Providing the Group with visibility at an international level.

Description of the initiative

Establishing a MaaS product that offers a door-to-door ticket by combining Fomento Group services with other services. For the pilot project, one possible alternative would be to combine rail services with car sharing.

The **actions of this initiative** are as follows:

- Striking a partnership with a last mile transport operator.
- Developing an application for the provision of the combined service using the Smart Platforms that are developed within the framework of the Plan.
- Starting up and evaluating the service.

BUDGET

Pilot project	≈ €400,000
TOTAL	≈ €400,000

LEADERSHIP



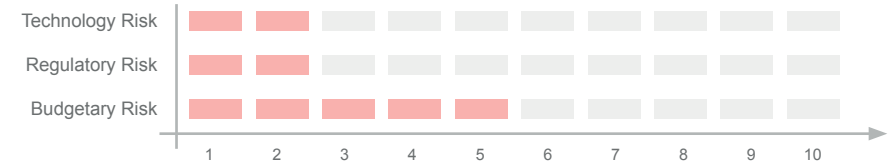
MONITORING INDICATORS

1. The partnership with a last mile transport operator.
2. The perception of the combined-transport tickets with more than one operator.
3. The demand for the new service on offer.

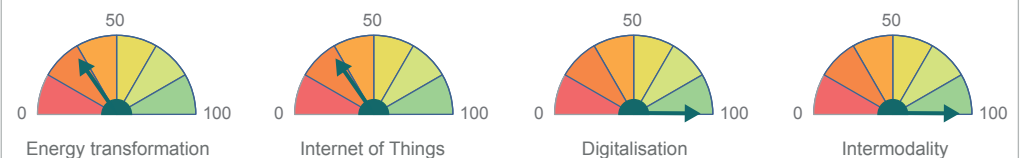
STAKEHOLDERS

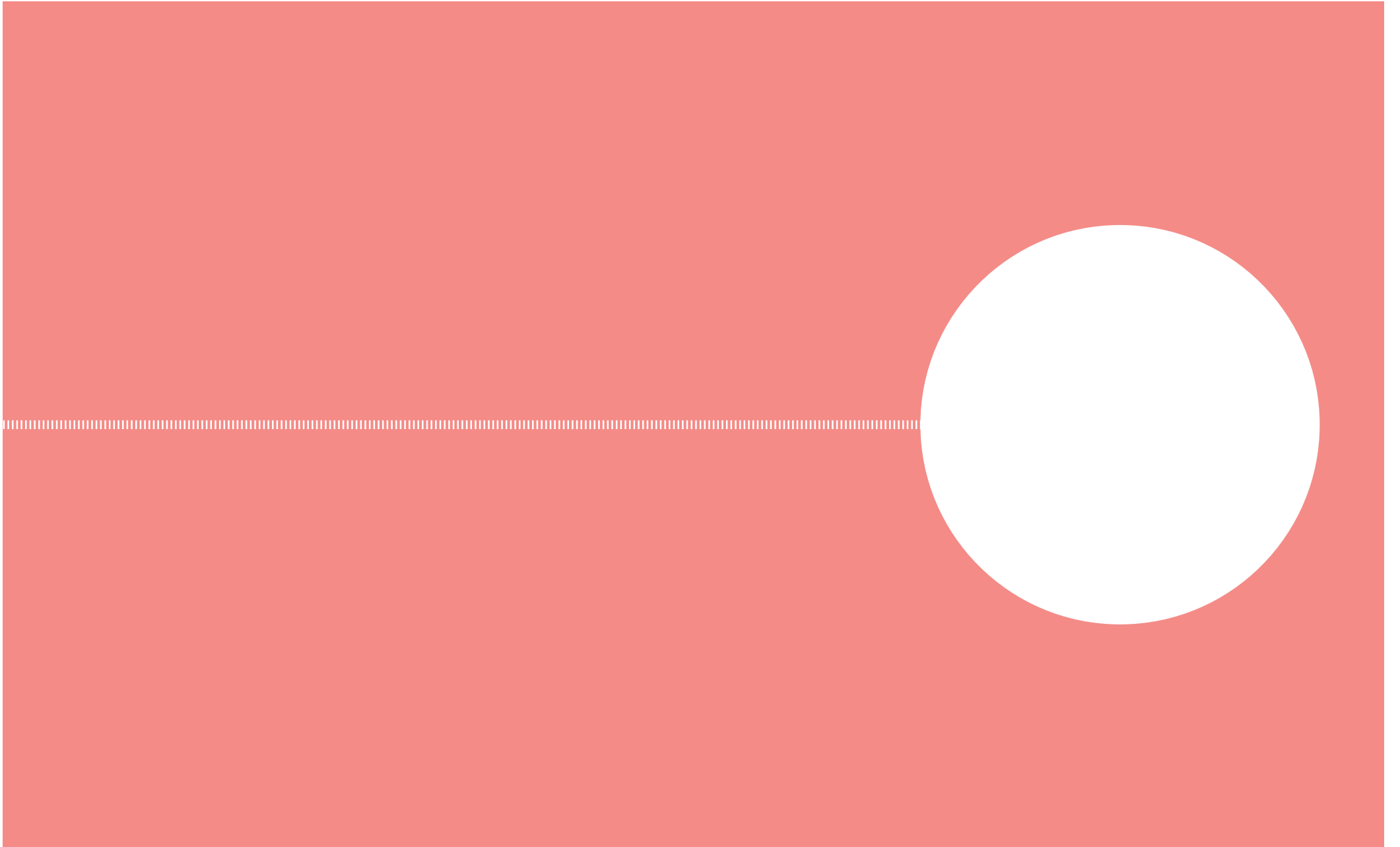
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations, universities, private companies									

RISKS



ALIGNMENT WITH THE PLAN





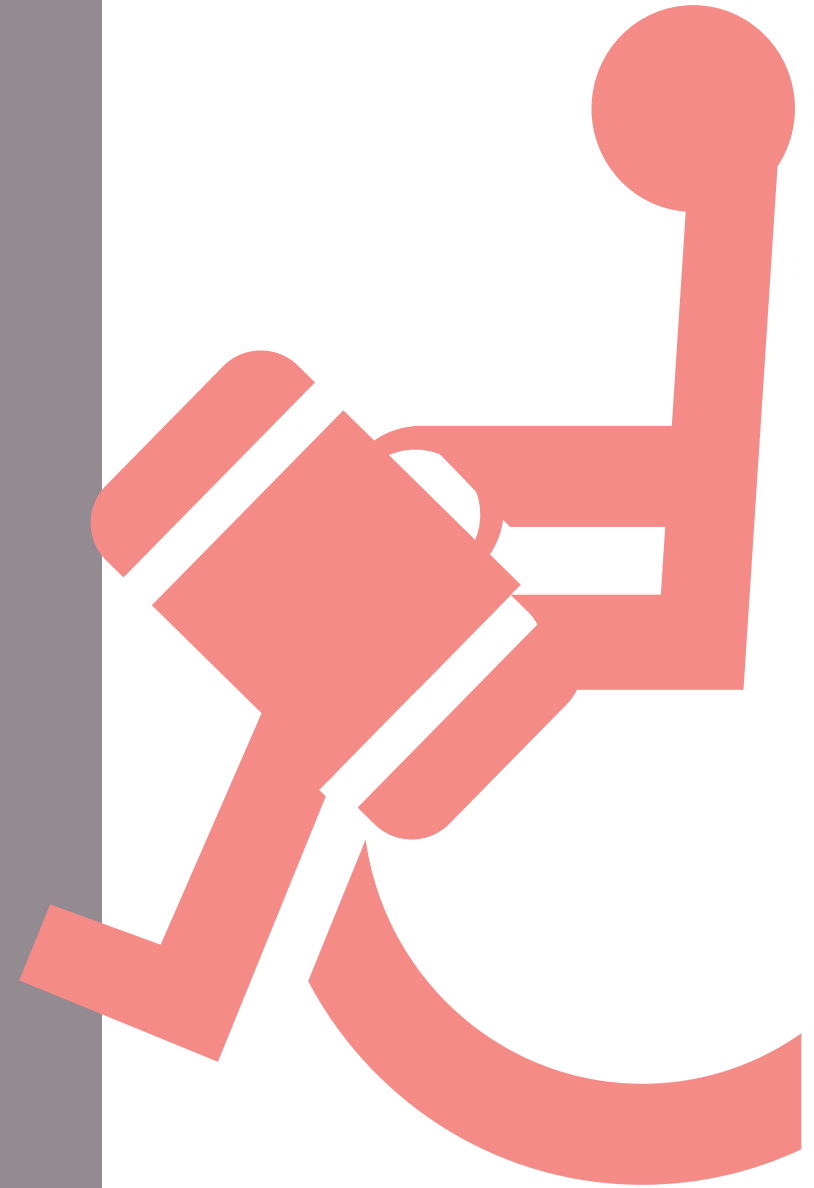
E1L2

Barrier-Free Travel

Axis 1

Initiatives

- Development and introduction of advanced payment systems
- Development and introduction of ticketless validation systems
- Implementation of non-stop security checks
- Plan for Universal Accessibility in the Transport System
- Positioning inside transport terminals



Context

Purchasing, payment, validation and security systems usually increase travel time, leading to a decrease in the attractiveness of modes of public transport. This is particularly true in the case of intermodality since in many of these cases some processes are duplicated.

On the other hand, passengers have a negative view of barriers, both physical and process-related, which worsens their experience inside transport networks.

The development of new technologies opens up numerous possibilities for transforming and eliminating these processes. Travel time, accessibility and comfort of travel will be greatly improved, thus giving intermodality and the use of public transport a boost.

Objective

This strategic line includes all those initiatives which are aimed at improving experience of users through the redesign or elimination of barriers in their journey, whether they be in terminals, on board or to the overall accessibility to the network.

Payment processes for purchasing transport tickets have gradually changed in the last few decades. Cash payments have been on the wane ever since electronic means of payment appeared.

However, it is necessary to keep working on developing **new payment methods** which are suitably adapted to the new business models that will appear around transport, such as the integration of operators or travel cards, among others.

The need to make progress in **ticket validation without there being actual physical tickets** is directly related to the means of payment. The simplification of validation processes would not only significantly reduce costs for operators but also boost intermodality and the integration of transport tickets.

The development of new payment and validation methods must go hand in hand with an increase in system security in terms of both electronic transactions and fraud control.

As far as public safety is concerned, the making of **non-stop security checks** has been envisaged. These systems will allow the experience of users at terminals to be improved, increasing their sense of security whilst reducing waiting times and the number of processes they are required to undergo. These new security systems will be based on innovative technologies that are still under development, such as biometric identification and CCTV-mediated recognition algorithms. Of course, the introduction of these systems will require a major regulatory boost to certify their operation.

The concept of ‘mobility without barriers’ aims at global accessibility to the transport system for all passengers. This means getting all users to have, regardless of their different degrees of mobility (youths, the elderly, people with physical or cognitive disabilities, people travelling with children...), the same ease and conditions of access to public transport. The initiative to create a **Plan for Universal Accessibility to the Transport System** was proposed with this goal in mind, a plan which would guarantee, by means of the new technologies, that the entire Spanish transport system becomes universally accessible. Apart from removing barriers in the transport system, universal accessibility brings new opportunities to e.g. improve QoS and its functionality, increase transport safety and encourage competitiveness in the transport industry.

All these improvements would require installing infrastructure and technology in transport terminals. Along these lines, one of the most important opportunities is **indoor positioning**. These systems open the door to the implementation of multiple functionalities of interest to both users and operators. This is why this Plan has an initiative whose sole purpose is their introduction in Spanish transport terminals.

E1L2-1 Development and introduction of advanced payment systems

Objectives

- To introduce ePayment technologies.
- To reduce the physical sale of tickets and the number of cash transactions.
- To fight fraud associated with the purchase of tickets.

Advantages

- Decreasing times and making the system more attractive for users.
- Improving security.
- Optimising resources.
- Generating data of great interest to transport operators.

Description of the initiative

Developing and introducing innovative electronic payment systems to gradually do away with the sale of physical tickets.

The **specific actions** that need to be undertaken within the framework of the initiative are as follows:

- Developing and introducing advanced payment gateways which are adapted to transport services, delving deeper into cybersecurity and fraud reduction.
- Integrating third parties in the sales channels of the companies of the Fomento Group.
- Analysing the feasibility of using cutting-edge technologies, such as blockchain, for electronically paying for transport tickets.

BUDGET

3 projects to be implemented	≈ €1,200,000
3 pilot projects	≈ €600,000
TOTAL	≈ €1,800,000

LEADERSHIP



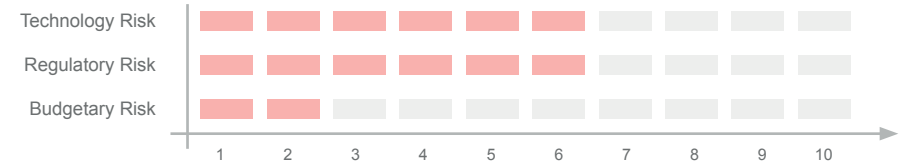
MONITORING INDICATORS

1. The percentage of sales made via electronic processes.
2. The annual investment in ticket purchasing systems.
3. The assessment of the cost of fraud associated with the purchase of tickets.

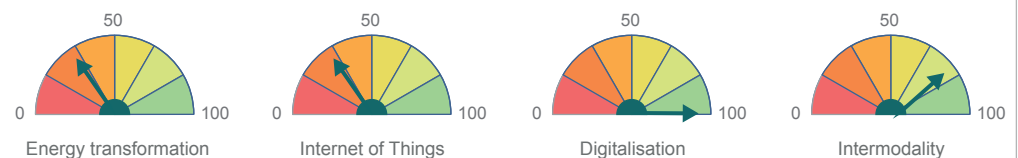
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To introduce ticketless validation technologies.
- To cut public transport operating times.
- To fight fraud associated with the validation of tickets.

Advantages

- Decreasing times and making the system more attractive for users.
- Improving security.
- Optimising resources.
- Generating data of great interest to transport operators.

Description of the initiative

Introducing ticketless ticket validation modes in the Spanish transport system.

The **specific actions** that need to be undertaken would be:

- Setting in motion pilot projects based on mobile telephony-based systems at the Fomento Group.
- Launching pilot projects based on biometry-based systems at the Fomento Group.
- Demanding the use of innovative validation systems in transport service concessions.

BUDGET

4 pilot projects	≈ €800,000
TOTAL	≈ €800,000

LEADERSHIP



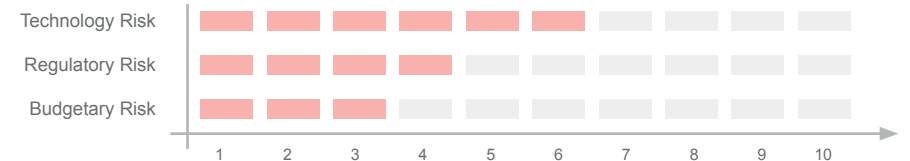
MONITORING INDICATORS

1. The percentage of tickets validated without physical tickets.
2. The annual investment in ticketing.
3. The number of projects based on biometric systems in operation.

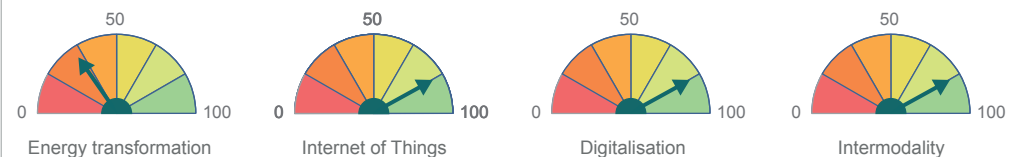
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations, transport operators									

RISKS



ALIGNMENT WITH THE PLAN



E1L2-3 Implementation of non-stop security checks

Objectives

- To introduce innovative security systems for passenger identification.
- To reduce the time spent at terminals.
- To increase system reliability.

Advantages

- Decreasing the time of stay at terminals.
- Increasing system reliability and hence security.
- Improving passenger experience, providing a greater sense of security.

Description of the initiative

Implementing non-stop security checks for passenger identification based on new technologies such as biometric identification.

The **specific actions** that need to be undertaken within the framework of the initiative are as follows:

- Developing biometrics-based security systems.
- Standardising and certifying the systems such that their reliability is ensured.
- Gradually introducing these systems in Spanish terminals.

BUDGET

4 research projects	≈ €1,200,000
2 projects to be implemented	≈ €800,000
TOTAL	≈ €2,000,000

LEADERSHIP



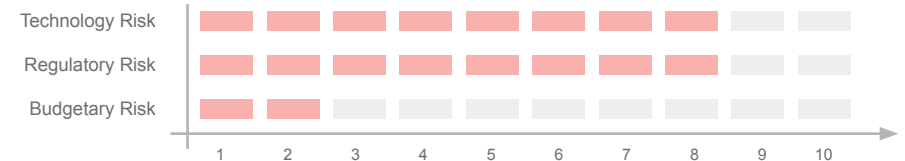
MONITORING INDICATORS

1. The number of biometric technique-based systems that have been certified at the international level.
2. The number of patents that have been developed under the framework of the initiative.
3. The number of systems that have been introduced (under test or in operation).

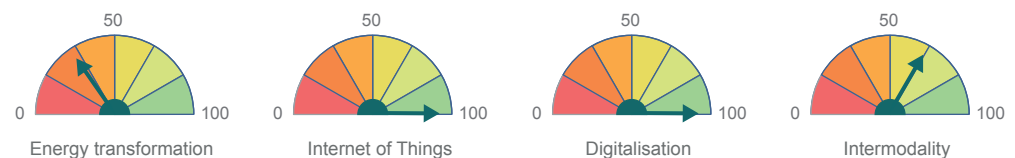
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations, transport operators									

RISKS



ALIGNMENT WITH THE PLAN



E1L2-4 Plan for Universal Accessibility in the Transport System

Objectives

- To ensure universal accessibility to the transport system.
- To use innovative systems and technologies to increase accessibility.

Advantages

- Taking joint action to achieve universal accessibility.
- Enhancing passenger experience.
- Improving the perception of mass transit systems.

Description of the initiative

Devising a Plan for Universal Accessibility in the Transport System on the part of the Fomento Group but which could be made extensible to the entire sector. The main goal is to apply innovative solutions to the Plan's measures.

The **following actions** have been envisaged:

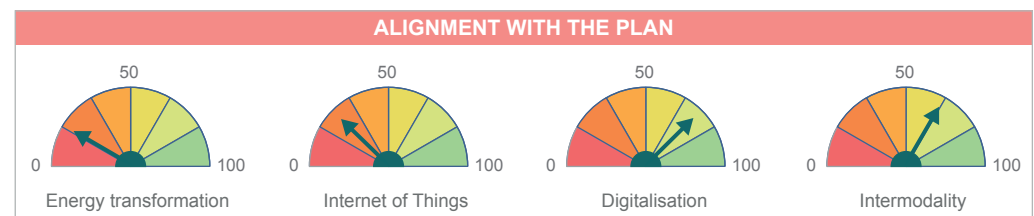
- Creating a multi-sectoral working group to analyse and diagnose the current situation.
- Proposing measures and actions aimed at achieving universal accessibility, both physical and cognitive.
- Monitoring and evaluating the Plan.

BUDGET	
Drafting of the Plan	≈ €200,000
TOTAL	≈ €200,000



MONITORING INDICATORS
1. The number of Plan-related projects that have been set in motion.
2. The degree of improvement in the Universal Accessibility indexes.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Universities, associations									



E1L2-5 Positioning inside transport terminals

Objectives

- To introduce positioning systems inside Spanish transport terminals.
- To encourage the generation of new business models related to this technology.

Advantages

- Allowing numerous functionalities benefiting passengers and operators to be implemented.
- Facilitating the smart operation of terminals.
- Generating highly useful information for terminal management, which otherwise would be hard and expensive to come by.

Description of the initiative

Introducing indoor location systems inside Spanish transport terminals such that they serve as the foundation for the development of multiple functionalities.

The initiative is structured around the following actions:

- Analysing the state of the art and the market of indoor positioning technologies.
- Designing the indoor positioning system for Spanish transport terminals, taking interoperability, the necessary infrastructure and other influencing factors into account.
- Gradually introducing the system by means of pilot projects.

BUDGET

Initial consultancy	≈ €200,000
Design of the System	≈ €400,000
2 pilot projects	≈ €400,000
TOTAL	≈ €1,000,000

LEADERSHIP



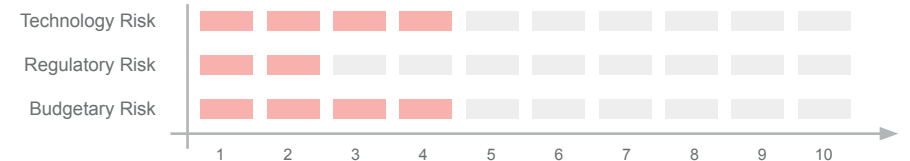
MONITORING INDICATORS

1. The number of indoor positioning-capable terminals.
2. The number of indoor positioning-related companies.

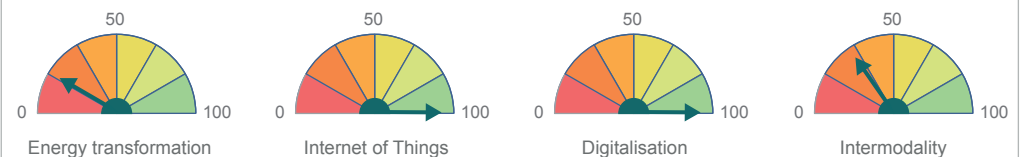
STAKEHOLDERS

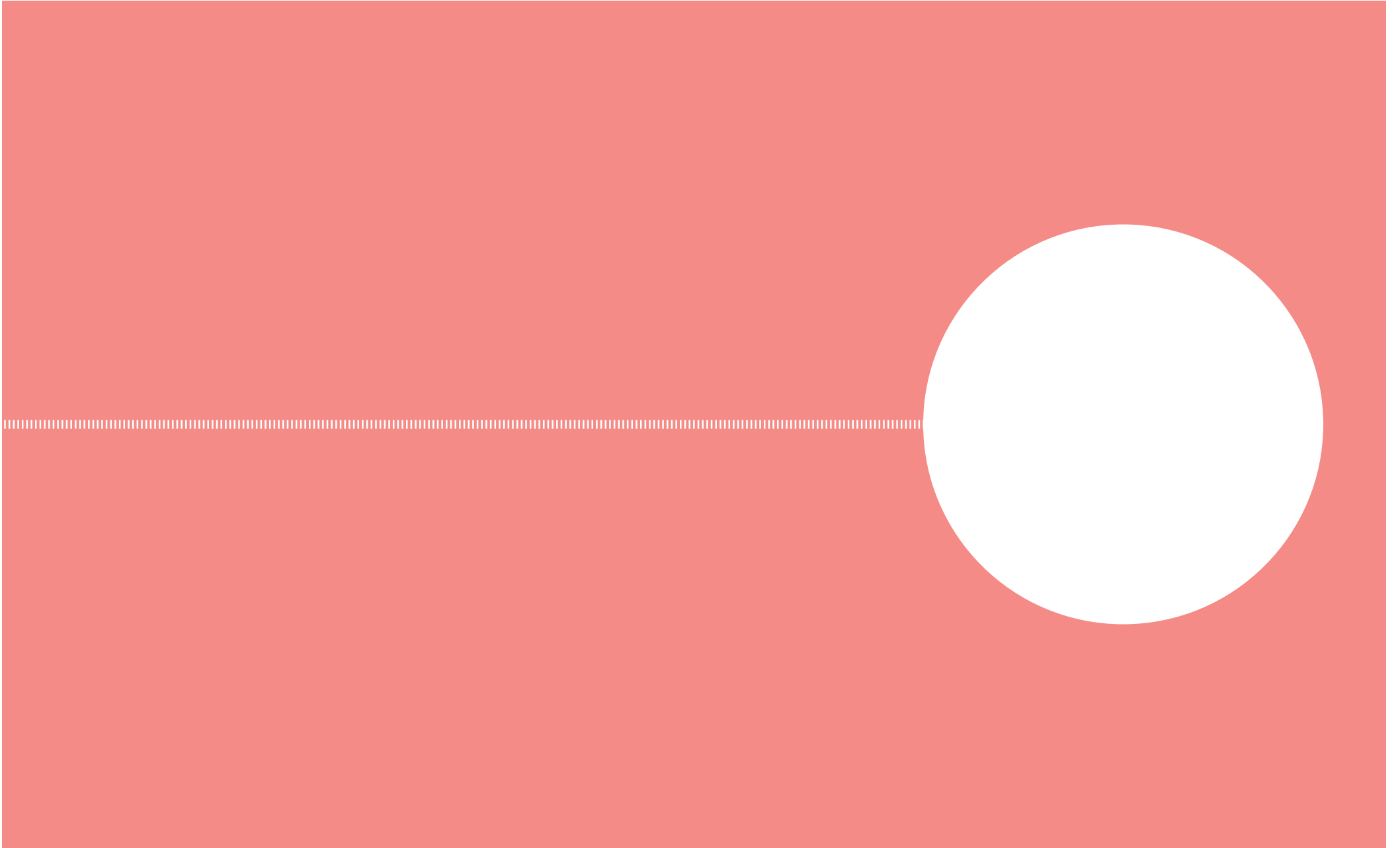
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Technology firms									

RISKS



ALIGNMENT WITH THE PLAN





E1L3

User Profile

Axis 1

Initiatives

- Big Data and data science to improve user experience
- Creation of user profiles
- Creation of a Fomento Group marketplace
- Development of new operator-user communication channels
- Setting up of a user experience lab



Context

One of the basic pillars for improving user experience is the personalisation of journey-related services. This personalisation is based on developing tailor-made transport services as well as on offering complementary products that can expand the experience of the journey. In addition, it should cover all phases, from trip planning to post-trip activities, through services providing information related to tourism or the weather at the destination, booking information or users' opinions of the transport services on offer.

To enhance user experience, it is important to expand further the concept of journey by offering products and services that are complementary to the transport system itself. In this regard, the creation of a **Marketplace** within the Fomento Group that would encourage the provision of this type of services in conjunction with travel tickets is considered to be of great interest.

The increase in the volume of information available, together with the huge evolution in the capacity to store and process data, has led to the emergence of technological paradigms such as **Big Data**. In turn, the appearance of these new architectures has brought along with it numerous data analysis techniques that allow value to be created from information. Along these lines, machine learning and in general data science need to be encompassed.

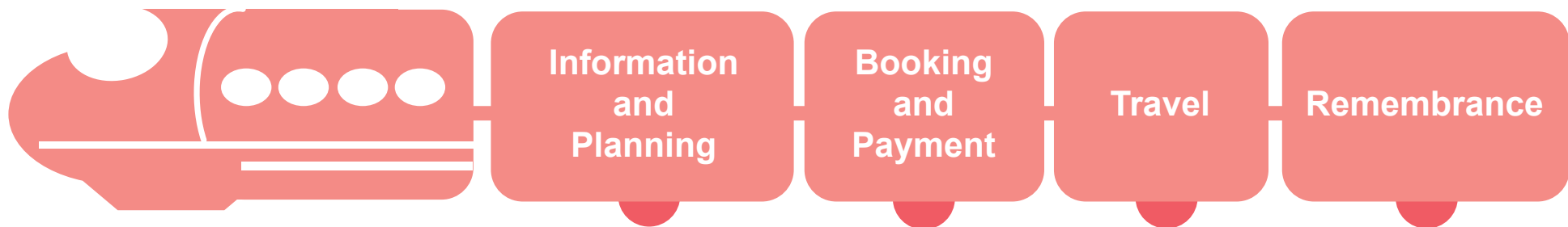
It is essential to note that data analysis techniques not only benefit users but are of great interest to transport planners and operators. The massive processing of information makes it possible to understand the preferences of the users of the transport network and thus optimise the planning and the range of services.

All information analysis- and Big Data-related processes are based on the existence of data that are more or less integrated and meet certain minimum quality standards. In this respect, the initiatives put forward in this strategic line are based on the User Platform, which is part of Axis 2 on Smart Platforms.

The energising influence the concept of **Open Data** has in all these kinds of processes is also relevant. The free provision of anonymised data drives the creation of new business models that benefit both users and operators. In this sense, collaborating with innovation hubs and universities in the promotion of new projects becomes important.

Finally, the importance of data privacy and anonymity must be accounted for. To this end, this Innovation Plan delves deeper into the **User Profile** concept, which should be understood as the space in which the user of the transport system manages their data and decides how they are used.

The technologies associated with this strategic line are right now at a high level of readiness, which considerably reduces the technology risk and allows these initiatives to be developed and implemented in the short term.



- Phases of the journey experience -

E1L3-1 Big Data and Data science for improving user experience

Objectives

- To generate value from the user information generated by transport operators.
- To use the information integrated in the User Platform (see Strategic Axis 2 – Smart Platforms).
- To provide users with personalised services.
- To optimise transport planning and offering processes based on the knowledge of users.

Advantages

- Enhancing user experience.
- Optimising the planning and operation of transport services.

Description of the initiative

Using Big Data architectures and data science techniques to harness the user data generated by the Fomento Group. The predictive or classification models that are eventually generated will be used to develop new services or to optimise existing services.

The main actions included in this initiative are listed below:

- Analysing the availability of information at the Fomento Group and in its smart platforms, particularly the User Platform.
- Developing Big Data architectures allowing data to be properly processed.
- Creating models based on data science and service deployment.

BUDGET

Big Data consultancy	≈ €300,000
Data Science consultancy	≈ €300,000
TOTAL	≈ €600,000

LEADERSHIP

renfe

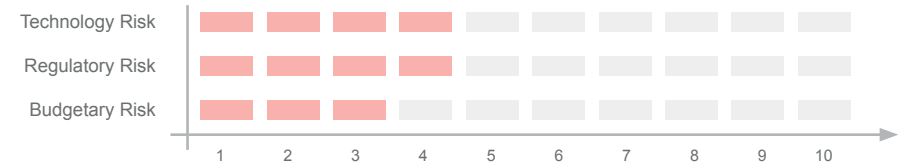
MONITORING INDICATORS

1. The number of user experience-related predictive models that are being used.
2. The revenue generated by data analysis.

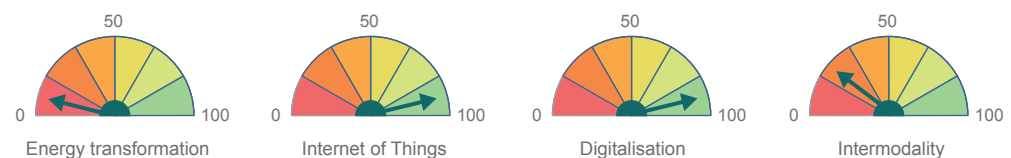
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations, transport operators									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To create a space for each user within the Fomento Group's platforms.
- To get to know the specific preferences of every user so as to offer them personalised services.
- To allow users to manage their own data and decide how they are used.

Advantages

- Knowing passenger preferences so as to personalise the offer.
- Providing users with transparency by allowing them to manage their own data.

Description of the initiative

Creating a unified profile for each user within the Fomento Group in order to be able to manage their preferences in an integrated manner. This could be later expanded beyond the Group as a 'transport identity document'.

The **main actions** that are included in this initiative are listed below:

- Creating an application for registering users and their preferences that brings the information of the entire Fomento Group under the same roof.
- Launching a communication and incentive campaign.
- Integrating the application with other platforms of the Plan, such as the User Platform or the MaaS pilot platform.

BUDGET

Development of the application	≈ €200,000
Advertising and incentives	≈ €200,000
Integration with platforms	≈ €200,000
TOTAL	≈ €600,000

LEADERSHIP



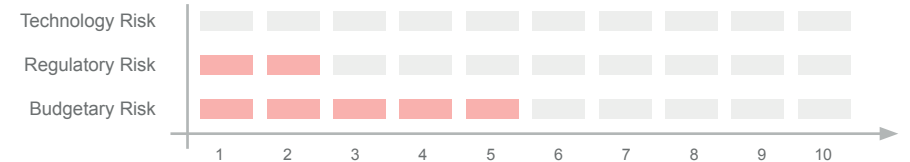
MONITORING INDICATORS

1. The number of registered users.
2. The opinion of users.

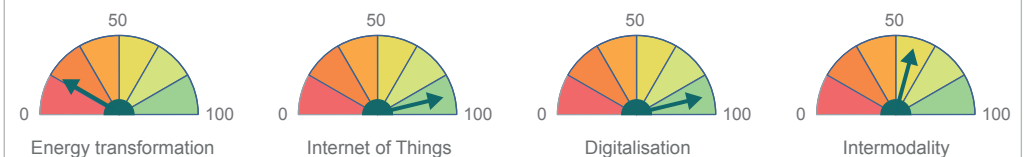
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators									

RISKS



ALIGNMENT WITH THE PLAN



E1L3-3 Creation of the Fomento Group's Marketplace

Objectives

- To create a Fomento Group Marketplace, through which third-party products and service could also be offered.
- To increase the commercial attractiveness of the Fomento Group's services.
- To evolve the Group's sales channels.

Advantages

- Improving the purchasing experience of users.
- Developing new business lines around the travel concept: sale of complementary services and sale of data.

Description of the initiative

Creating a Marketplace which offers, apart from the Fomento Group's products and services, third-party products and services so as to expand concept of travel.

The **specific actions** that need to be undertaken under this initiative are listed below:

- Developing the Marketplace portal and including the Group's services in it.
- Entering into partnerships with third parties to offer their products on the Marketplace. Carrying out joint commercial actions.
- Launching a communication and incentive campaign.

BUDGET

Development of the Portal	≈ €300,000
Advertising and incentives	≈ €200,000
TOTAL	≈ €500,000

LEADERSHIP



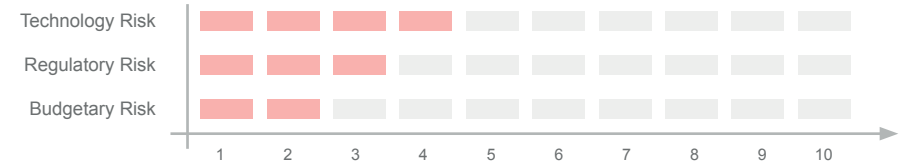
MONITORING INDICATORS

1. The number of sales made via the Marketplace.
2. The number of products on offer.

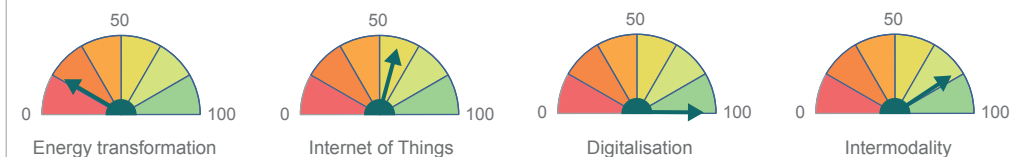
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators									

RISKS



ALIGNMENT WITH THE PLAN



E1L3-4 Opening of new operator-user communication channels

Objectives

- To improve the two-way communication between operators and users.
- To evolve market research techniques using the new technologies.
- To involve users in service planning processes.
- To automate the processes.

Advantages

- Winning over customers through their participation.
- Bringing down the costs associated with customer service and market studies.

Description of the initiative

Developing tools to improve operator-customer communications and revolutionising processes such as market studies and customer service.

The **specific actions** that need to be set in motion are as follows:

- Creating a citizen participation portal for citizens to get involved in the planning processes: new lines, new services, etc.
- Developing an advanced social network management system: implementing feeling analysis mechanisms to take advantage of the opinions voiced on social media.
- Developing advanced chatbot systems for customer service.

BUDGET

Development of the Portal	≈ €200,000
Feeling analysis	≈ €200,000
Chatbot system	≈ €200,000
TOTAL	≈ €600,000

LEADERSHIP



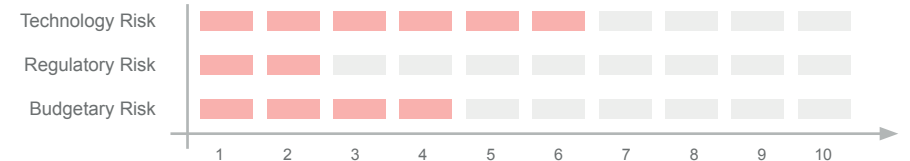
MONITORING INDICATORS

1. The number of users of the participation portal.
2. The introduction of the feeling analysis system.
3. The users' opinion of the automated customer service.

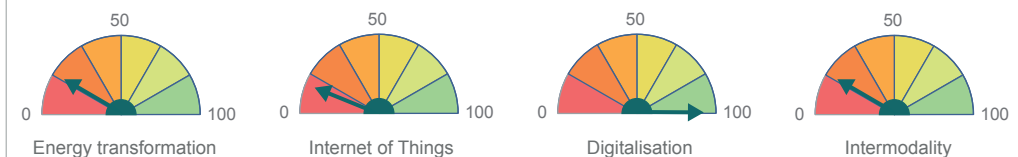
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators									

RISKS



ALIGNMENT WITH THE PLAN



E1L3-5 Setting up of a user experience lab

Objectives

- To spot business opportunities that can have a big impact on the field of user experience.
- To introduce technologies that disrupt the experience of the journey.

Advantages

- Identifying big-impact business opportunities and setting them in motion early on.
- Gaining international visibility and a competitive advantage.

Description of the initiative

Setting up a lab for exploring new user experience-related business models, a field of enormous economic potential that is undergoing continual development.

The **specific actions** that need to be set in motion are as follows:

- Forming a multidisciplinary working group within the framework of the Fomento Group.
- Launching disruptive pilot projects.

BUDGET

Laboratory	≈ €900,000
TOTAL	≈ €900,000

LEADERSHIP



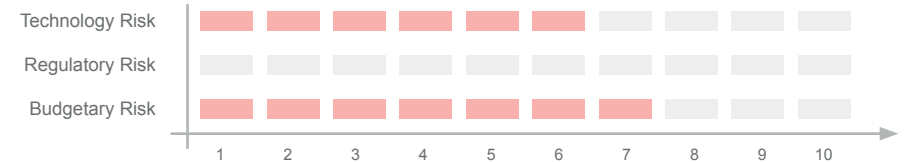
MONITORING INDICATORS

1. The number of patents that are generated by the Lab.

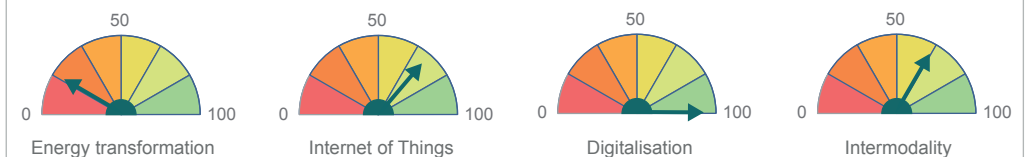
STAKEHOLDERS

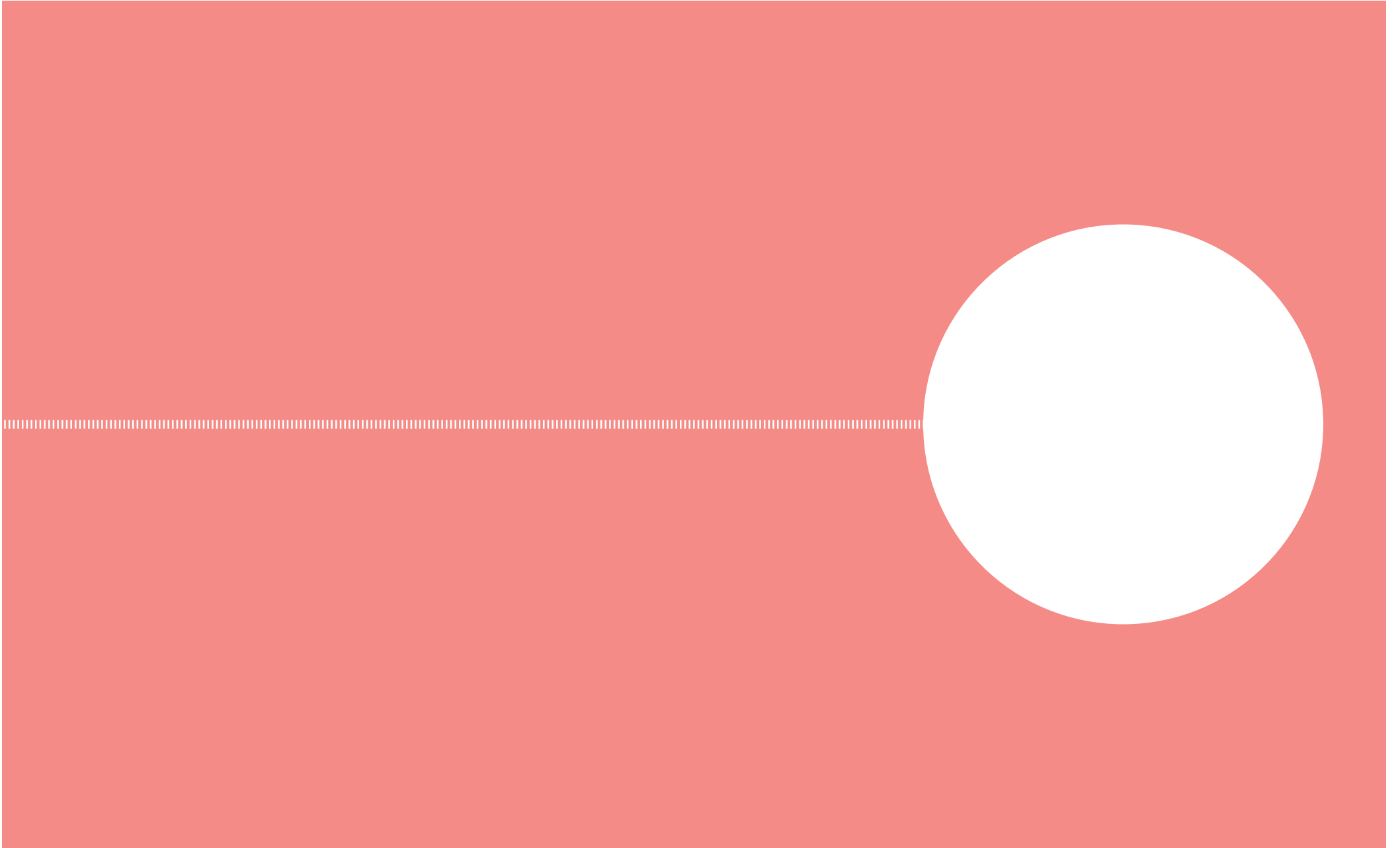
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators									

RISKS



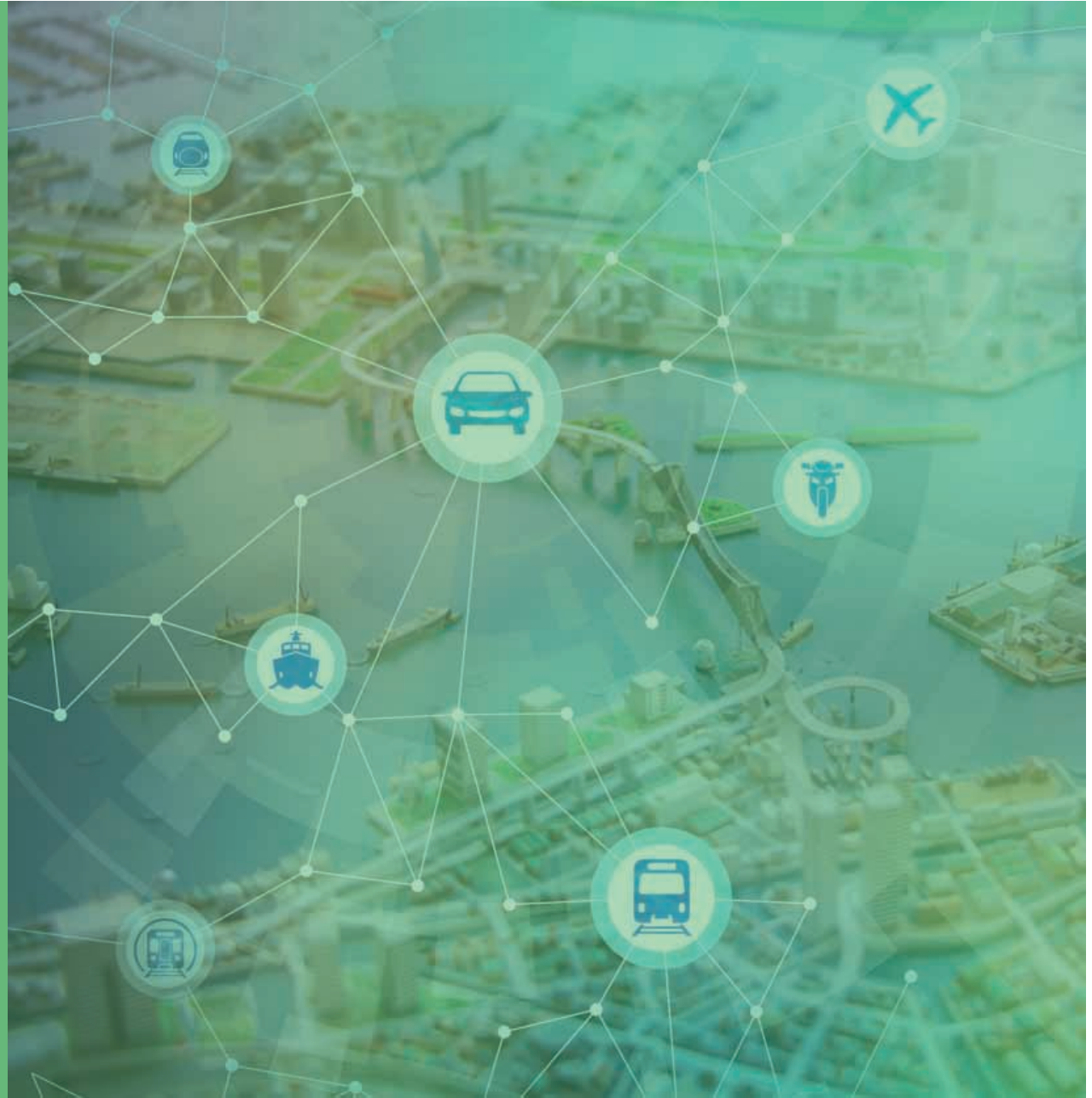
ALIGNMENT WITH THE PLAN





Axis 2

Smart Platforms



Strategic Line
1

Smart Stations

Strategic Line
2

Smart Airports

Strategic Line
3

Smart Ports

Strategic Line
4

User Platform

Strategic Line
5

Freight Platform

Strategic Line
6

Open Data

Strategic Line
7

**New Data
Sources**

Strategic Line
8

Single Sky

Strategic Line
9

**Smart Maritime
Management**



The main objectives of the Smart Platforms strategic lines are to improve the efficiency of the services provided by the Fomento Group's companies whilst maximising their analytical capabilities.

This improvement will be achieved through the collection and processing of all that information that is relevant for managing the services. For the Fomento Group this type of horizontal platform will allow the services that its companies provide to their customers to be improved as regards efficiency, quality and security.

Among the **improvements brought about by smart platforms** the following stand out:

- Improvement of accessibility and dissemination of information.
- Integration of management systems and services.
- Interoperability with other platforms.
- Combination of information that has been traditionally organised in a compartmentalised manner.
- Coordination of the service on the basis of events.
- Automation of activities.
- Improvement of analytical capabilities, allowing predictive models that anticipate events to be generated.

Smart platforms are the elements that unify the entire smart solution ecosystem, providing it with intelligence thanks to the joint processing they do of all the information that is generated by different means.

On the other hand, the Axis includes initiatives that have been designed to improve the transport data universe both from the point of view of using new sources of data and by means of the use of open data.

Furthermore, all smart air navigation management-related initiatives have been included in this Axis under the Single Sky Strategic Line because of the importance technology platforms will have in the development thereof.

The importance of the framework of reference

National Smart City Model

The development of the smart platform ecosystem defined in this Plan will be based on the regulatory framework that was developed by the Spanish Association for Technical Committee for Standardisation 178 (TCS 178) for smart cities and territories. TCS 178, which is sponsored by the Secretary of State for the Information Society and the Digital Agenda, has developed several standards that define the interoperability and technologies of smart platforms. These standards, which are of great interest for the implementation of initiatives of this Plan, have been assumed by the International Telecommunications Union (ITU) with an eye towards their worldwide adoption.

In addition, the necessary integration of station, airport and port platforms with city platforms requires coordination and the search for synergies among the bodies in charge of developing them. This is why the initiatives of the Transport and Infrastructure Innovation Plan will be proactively aligned with the National Smart Territory Model.



BIM Commission

Another fundamental aspect to the development of smart platforms is the introduction of the BIM methodology. In this case, initiatives are being taken to extend BIM to the infrastructure operation and maintenance stage, emphasising its integration with smart platforms. The main objective of these initiatives is to foster the use of the BIM in the Spanish transport system from the planning to the dismantling or refurbishment of infrastructures. In order to achieve it, the idea is to have the collaboration and counsel of the BIM Commission's working groups.

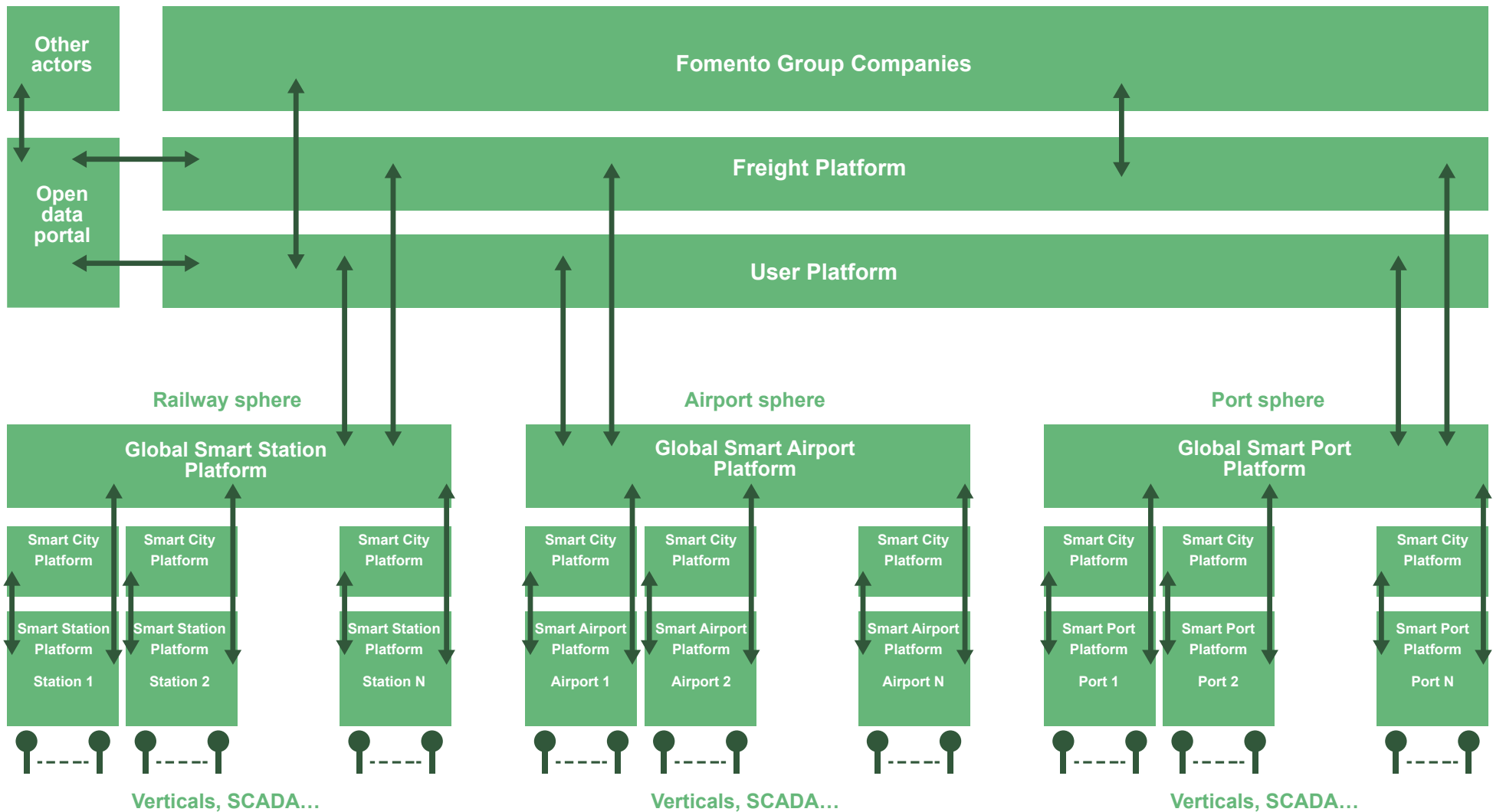


This Plan proposes building an ecosystem of Smart Platforms at the Fomento Group that is aimed at integrating all the data generated within the Spanish transport system.

A scheme is proposed wherein two cross-cutting platforms – the User Platform and the Freight Platform – will act as high level integrators and in turn articulate all open data mechanisms.

Below them, each Group company will manage the platforms introduced in the infrastructures that fall within its purview: stations, airports, ports, etc.

Lastly, the proposed system devotes a chapter to new data sources showing great potential, such as mobile phones, GPS and social networks, among others.





● E2L1 ●

Smart Stations

Axis 2

Initiatives

- Smart Station Platform
- Integration of the Smart Station Platform with the city platform
- Integration of BIM models into the Smart Station



Context

Next-generation stations – also known as smart stations – must effectively manage information to improve efficiency and sustainability as well as to provide better service to users through an intensive use of new technologies. Likewise, stations must be capable of listening and understanding what is happening both inside them and in the cities around them, thus allowing better decisions to be made and providing the right information and services to both their managers and users.

It is precisely these new technologies the ones that will provide the building with intelligence through an expansion of traditional comfort functions by incorporating new security services and providing communication, entertainment and leisure features, among others. In addition, the use of advanced, real-time analytical techniques will allow the services that are currently provided to be enhanced. In order to achieve this, it will be necessary to have elements capable of acquiring the relevant information via e.g. sensors, actuators and other devices, such as the mobile phones of users.

Another basic element is the application of **Building Information Modelling (BIM)** to the Smart Station. BIM will provide great advantages to smart stations during both their embryonic or design phase and their operation and maintenance phase. During the first

phase, the different software that supports the project will be able to predict with a great deal of success the behaviour that the building will have in the event of certain events or stimuli.

It is also important to note that, from the point of view of sustainability and the environment, new technologies will supplement and correct an insufficient or deficient use of passive measures in the conception and design or the renovation of buildings. There is, therefore, a lot of room for the application of new technologies in all construction phases to make buildings that are more sustainable and smarter, as well as energy efficient and environmentally friendly, in all respects. Likewise, new technologies and telecommunications are essential for reaching the objectives of energy saving and efficiency in buildings set by the EU.

Keep in mind that stations are important elements of cities and, as such, are one of the great assets of **smart cities**. Regardless of the fact that the internal operation of stations is increasingly automated, stations can act as one of the main sensors of cities since they possess a large amount of information that is very valuable to both the cities themselves and other entities or institutions.

On the other hand, stations are a clear example of a structuring, integrating element in smart cities as they combine aspects such as mobility, tourism, hyper-connectivity, sustainability and security.

Advantages

The advantages that can be obtained from deploying Smart Platforms in Smart Stations can be grouped into the following categories:

- Improved effectiveness and efficiency of installations.
- Improved services and user experience.
- Wi-Fi, 4G and 5G connectivity.
- Sustainability and the environment.
- Integration with the city.

The initiatives that are included in this strategic line are aimed at providing stations with the necessary technological infrastructure at the horizontal platform level for vertical applications and solutions to be developed and integrated. Horizontal is the name given to those platforms by means of which information is shared transversally – thus avoiding information silos – and from which the different specific solutions for a given business model hang – the so-called vertical solutions.



E2L1-1 Smart Station Platform

Objectives

- For the Fomento Group to develop its own horizontal platform for Smart Stations.
- To gradually introduce the eventually developed platform into Spanish stations.
- To encourage the evolution of an ecosystem of interoperable Smart Platforms that includes the station, airport, port, city and other cross-cutting platforms such as the User and Freight Platforms.

Advantages

- Gaining independence from manufacturers and saving on licensing costs.
- Attaining maximum flexibility and adaptability to present and future needs.
- Having a model that can be easily integrated with other platforms.
- Having the possibility to export and commercialise the platform.

Description of the initiative

The Fomento Group will develop its own platform in accordance with the interoperability standard UNE 178104. The Smart Station Platform will share the same base with the Smart Airport and Smart Port Platforms but adapted to the specific needs of the station environment.

The **specific actions** that need to be undertaken are listed below:

- Analysing and defining the platform from a technological and a functional standpoint.
- Developing the Fomento Group's own horizontal platform.
- Integrating in the platform those functionalities and verticals that are developed under other Plan initiatives.
- Developing scorecards with Business Intelligence and Analytics capabilities for station management.
- Tentatively introducing the Platform in a real environment.

BUDGET

Development of the Platform	≈ €350,000
Integration with other platforms and verticals	≈ €150,000
Mock introduction of the platform	≈ €200,000
TOTAL	≈ €700,000

LEADERSHIP



MONITORING INDICATORS

1. The number of systems that have been integrated in the platform.
2. The number of stations where the platform has been introduced.
3. The number of commercial initiatives that are developed to sell the solution.

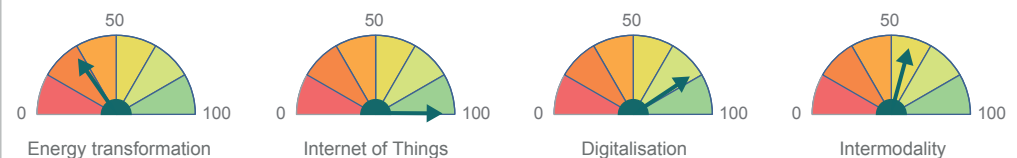
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To integrate the data from the station platform with the data from the city platform.
- To have integrated information allowing functionalities for enhancing user experience to be generated.
- To carry out a proof of concept in a real environment to assess the potential for the exchange of information between the station and the city.

Advantages

- Improving the service provided to users and citizens, offering quality information generated by integrating data.
- Improving security and mobility.
- Significantly enhancing user experience.

Description of the initiative

The initiative consists in integrating the station and the city via their respective smart platforms. Thus, both platforms will be able to share variables such as city traffic, incidents, security issues, reasons for travel and tourist information.

The idea is to carry out the integration using real platforms, developing use cases that employ integrated station-city information to offer services to station users that will allow them to have all the information that is relevant for their journey at both the point of departure and the point of destination thereof.

The **specific actions** that need to be undertaken are listed below:

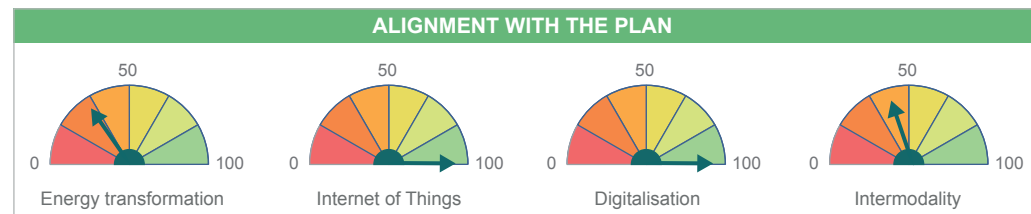
- Analysing all platform integration needs. The Smart Station Platform that is developed under the framework of this Plan will ensure full integration.
- Developing ICTs for platform integration.
- Developing a use case that shows the benefits of integration.

BUDGET	
Integration of platforms	≈ €100,000
Development of applications	≈ €200,000
Mock introduction of the platform	≈ €100,000
TOTAL	≈ €400,000



MONITORING INDICATORS
1. The percentage of integration-required activities that have been carried out.
2. The number of information entities that have been integrated.

STAKEHOLDERS		Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders											
Other stakeholders	Local administrations										



Objectives

- To integrate BIM methodologies in the management of Smart Stations.
- To manage station maintenance via the Smart Station Platform and relying on a BIM model.

Advantages

- Extending the use of BIM technology to the infrastructure’s operation phases.
- Integrating BIM models into the Smart Platforms.
- Having the possibility to commercialise the solution.

Description of the initiative

Integrating BIM models with the Smart Station Platform for terminal management and maintenance. In order to do so, the development of a BIM model of an existing station and the integration of BIM tools with the platform have been envisaged. In addition, a scorecard for model management will be developed.

The **actions** that need to be undertaken are listed below:

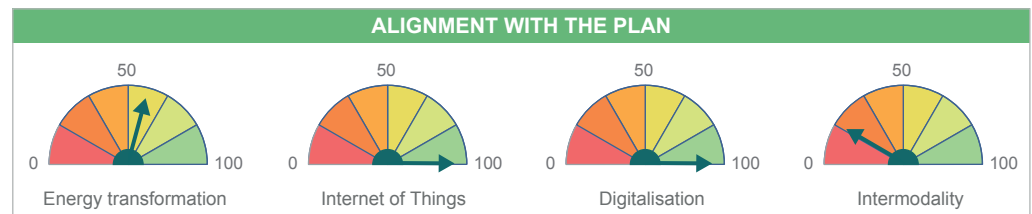
- Developing a BIM model of an existing station for station management and maintenance.
- Integrating the BIM model with the Smart Station Platform.
- Developing a scorecard for station management and maintenance using the BIM model.

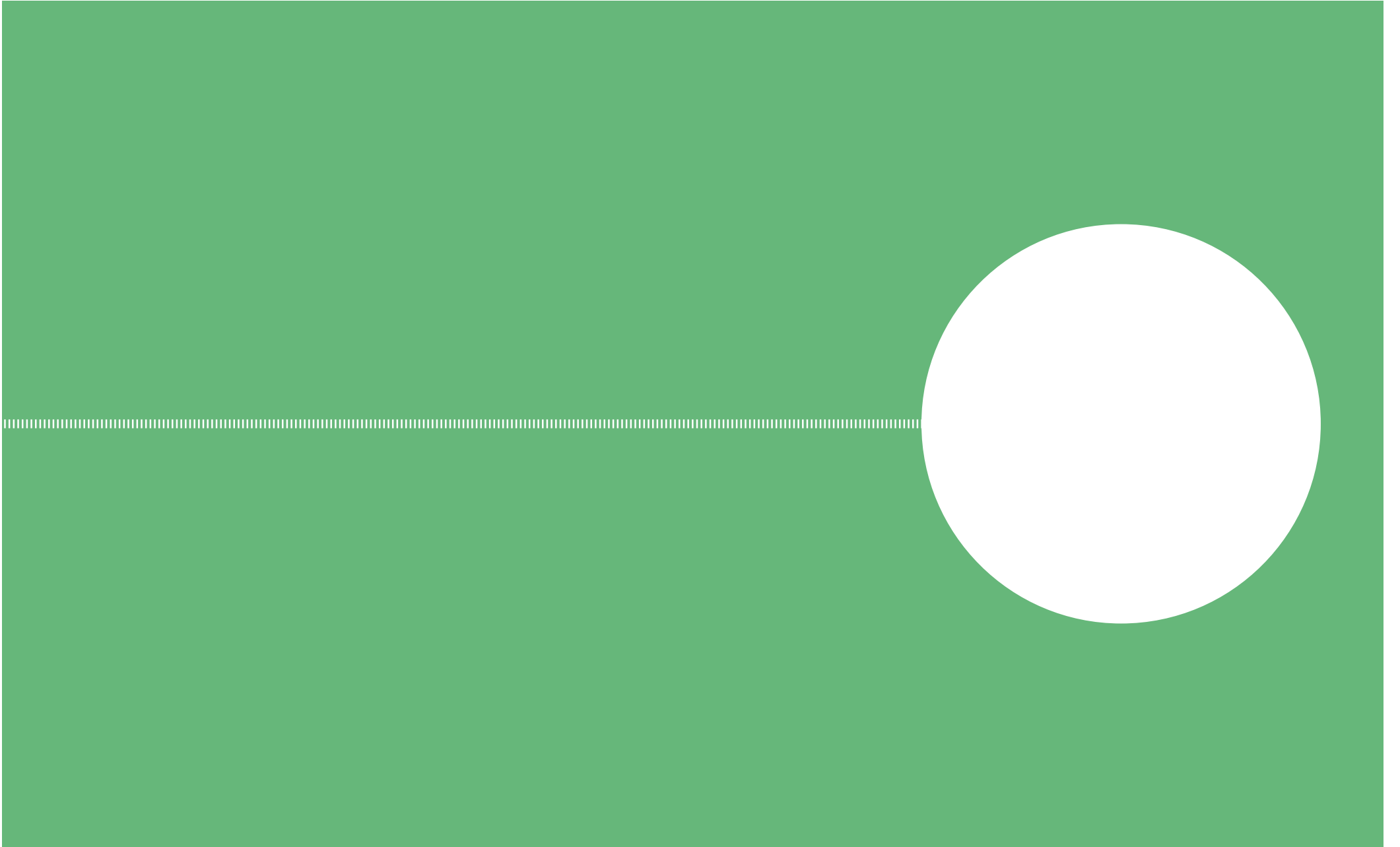
BUDGET	
Development of the BIM model	≈ €250,000
Model-platform integration	≈ €100,000
Development of the scorecard	≈ €50,000
TOTAL	≈ €400,000



MONITORING INDICATORS
1. The number of BIM-integrated maintenance/operation processes.

STAKEHOLDERS																															
	<table border="1"> <tr> <th>Ministry of PW</th> <th>Adif</th> <th>Renfe</th> <th>Aena</th> <th>Enaire</th> <th>Crida</th> <th>Puertos del Estado</th> <th>Ineco</th> <th>Cedex</th> <th>Sasemar</th> </tr> <tr> <td>Stakeholders</td> <td style="background-color: #c8e6c9;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="background-color: #c8e6c9;"></td> <td></td> <td></td> </tr> <tr> <td>Other stakeholders</td> <td colspan="9"></td> </tr> </table>	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar	Stakeholders										Other stakeholders									
Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar																						
Stakeholders																															
Other stakeholders																															





● E2L2 ●

**Smart
Airports**

Initiatives

- Smart Airport Platform
- Integration of the Smart Airport Platform with the city platform
- Integration of BIM models into the Smart Airport



Axis 2

Airports are infrastructures which are intimately associated with technology. The needs arising from air ticket sales, security and border controls create an ecosystem which is underpinned by a significant technological infrastructure.

However, the different technologies do not run in a coordinated manner and thus there are information silos. The development of Smart Platforms creates an opportunity to unify all this information and to generate new functionalities within the airport environment.

The **Smart Airport** concept revolves around a horizontal platform that is capable of effectively managing information to improve the efficiency, security and sustainability of the infrastructure. In addition, the platform will allow multiple functionalities to be developed so as to improve the experience of passengers and of the different airport agents.

To this end, the platform must communicate with all sensors and actuators installed inside the terminal as well as with other systems, including the mobile devices of users. This feature will allow the state of the airport to be known in real time and smart solutions generated.

The different agents that are involved in airport scheduling and management will use the Smart Airport Platform as a single point of communication. In addition, it will be possible to integrate the airport platform with the city platform.

The initiatives included in this strategic line are directed towards developing standardised, interoperable platforms for airports that consolidate, following international trends, Spain's presence in the Smart Product sector.

It is necessary to stress the importance of **Building Information Modelling (BIM)** in the management and maintenance of the airports of the future. In this regard, the integration of the smart platform with BIM models has been envisaged.

In addition, cybersecurity aspects of in-airport communications need to be transversely taken into account.



Objectives

- For the Fomento Group to develop its own horizontal platform for Smart Airports.
- To gradually introduce the eventually developed platform in Spanish airports.
- To encourage the evolution of an ecosystem of interoperable smart platforms that includes the station, airport, port, city and other cross-cutting platforms such as the User and Freight Platforms.

Advantages

- Gaining independence from manufacturers and saving on licensing costs.
- Attaining maximum flexibility and adaptability to present and future needs.
- Having a model that can be easily integrated with other platforms.
- Having the possibility to export and commercialise the platform.

Description of the initiative

The Fomento Group will develop its own platform in accordance with the interoperability standard UNE 178104. The Smart Airport Platform will share the same base with the Smart Station and Smart Port Platforms but adapted to the specific needs of the airport environment.

The **specific actions** that need to be undertaken are listed below:

- Analysing and defining the platform from a technological and a functional standpoint.
- Developing the Fomento Group's own horizontal platform.
- Integrating in the platform those functionalities and verticals that are developed under other Plan initiatives.
- Developing scorecards with Business Intelligence and Analytics capabilities for terminal management.
- Tentatively introducing the Platform in a real environment.

BUDGET

Development of the Platform	≈ €350,000
Integration with other platforms and verticals	≈ €150,000
Mock introduction of the platform	≈ €200,000
TOTAL	≈ €700,000

LEADERSHIP



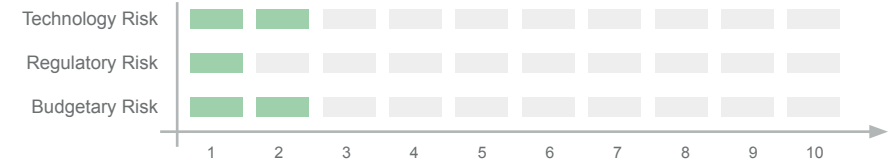
MONITORING INDICATORS

1. The number of systems that have been integrated in the platform.
2. The number of stations where the platform has been introduced.
3. The number of commercial initiatives that are developed to sell the solution.

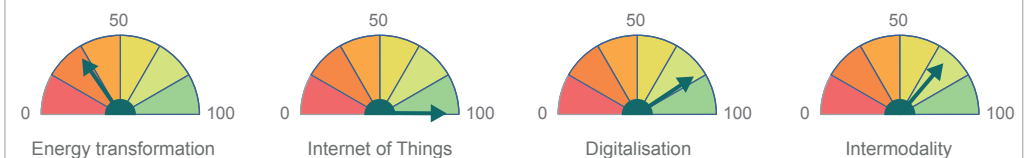
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To integrate the data from the airport platform with the data from the city platform.
- To have integrated information allowing use cases for enhancing user experience to be developed.
- To carry out a proof of concept in a real environment to assess the potential for the exchange of information between the station and the city.

Advantages

- Improving the service provided to users and citizens, offering quality information generated by integrating data.
- Improving security and mobility.
- Improving the airports' capacity to meet the needs of passengers.

Description of the initiative

The initiative consists in integrating airport and city via their smart platforms. Thus, both platforms will be able to share variables such as city traffic, incidents, security issues, reasons for travel and tourist information.

The idea is to carry out the integration using real platforms, developing use cases that employ integrated airport-city information to offer services to airport users that will allow them to have all the information that is relevant for their journey at both the point of departure and the point of destination thereof.

The **actions** that need to be undertaken are listed below:

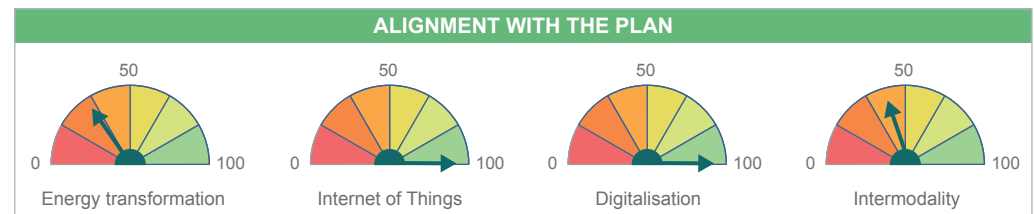
- Analysing all platform integration needs. The Smart Airport Platform that is developed under the framework of this Plan will ensure full integration.
- Developing ICTs for platform integration.
- Developing a use case that shows the benefits of integration.

BUDGET	
Integration of platforms	≈ €100,000
Development of applications	≈ €200,000
Mock introduction of the platform	≈ €100,000
TOTAL	≈ €400,000



MONITORING INDICATORS
1. The percentage of integration-required activities that have been carried out.
2. The number of information entities that have been integrated.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Local administrations									



Objectives

- To integrate BIM methodologies in the management of Smart Airports.
- To manage airport maintenance via the Smart Airport Platform and relying on a BIM model.

Advantages

- Extending the use of BIM technology to the infrastructure's operation phases.
- Integrating BIM models into the Smart Platforms.
- Having the possibility to commercialise the solution.

Description of the initiative

Integrating BIM models with the Smart Airport Platform for terminal management and maintenance. In order to do so, the development of a BIM model of an existing airport and the integration of BIM tools with the platform have been envisaged. In addition, a scorecard for model management will be developed.

The **actions** that need to be undertaken are listed below:

- Developing a BIM model of an existing airport for airport management and maintenance.
- Integrating the BIM model with the Smart Airport Platform.
- Developing a scorecard for airport management and maintenance using the BIM model.

BUDGET

Development of the BIM model	≈ €250,000
Model-platform integration	≈ €100,000
Mock introduction of the platform	≈ €50,000
TOTAL	≈ €400,000

LEADERSHIP



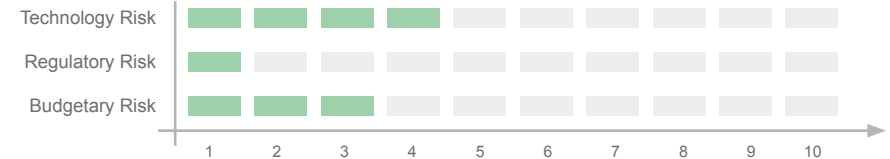
MONITORING INDICATORS

1. The number of BIM-integrated maintenance/operation processes.

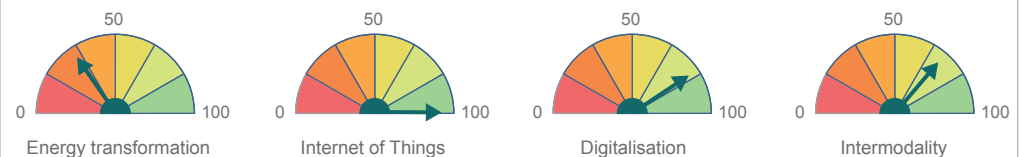
STAKEHOLDERS

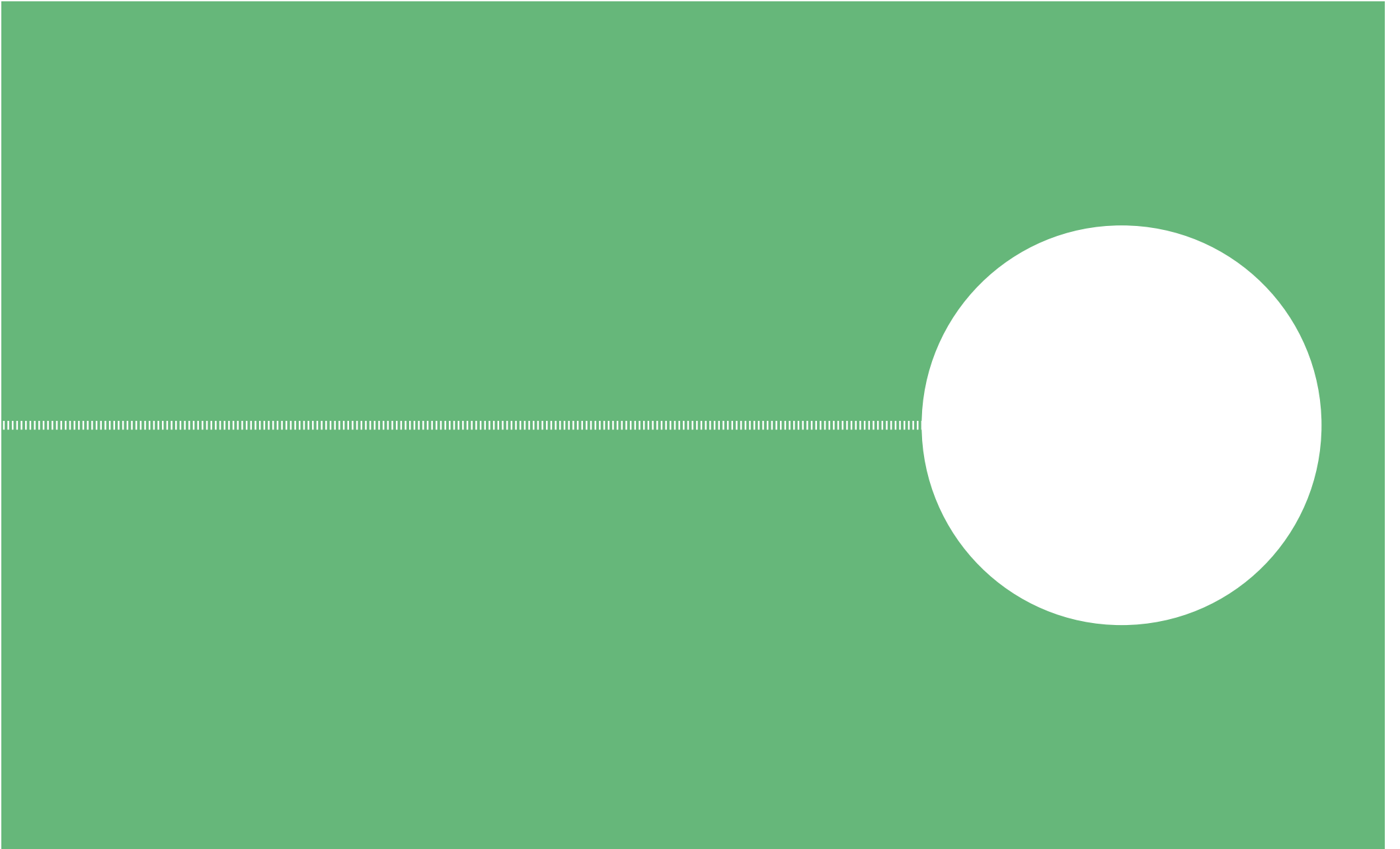
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders										

RISKS



ALIGNMENT WITH THE PLAN



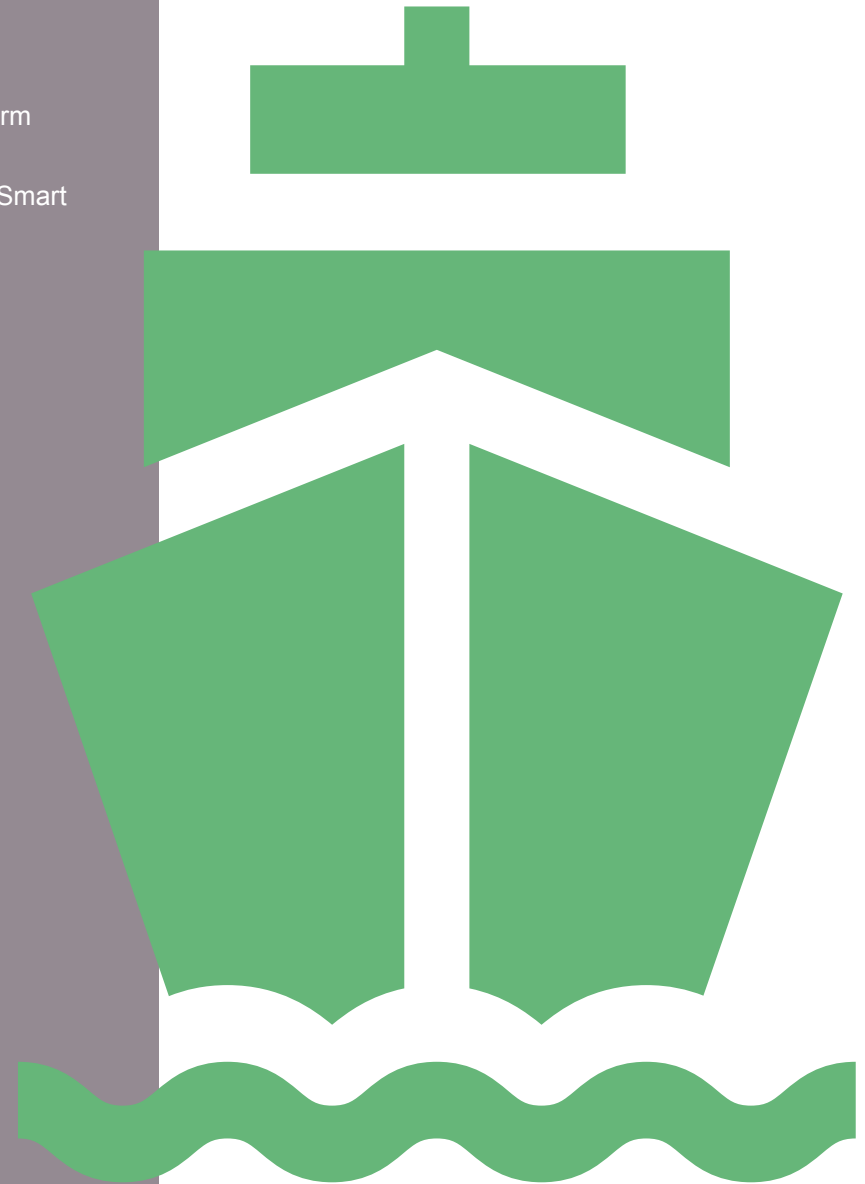


Smart Ports

Axis 2

Initiatives

- Smart Port Platform
- Integration of the Smart Port Platform with the city platform
- Integration of BIM models into the Smart Port



A Smart Port can be technically defined as a port where information is exchanged among the system, users and managers through the intensive use of information technologies, thus constituting a smart management system.

Smart management systems make it possible to increase the production capacity of ports by optimising information flows, which results in savings in operating and investment costs as it reduces infrastructure investment needs are reduced. Furthermore, this benefit is especially significant in port environments where multiple agents, such as the manager, terminals, shipping companies and freight forwarders, among others, converge.

Delving deeper into the concept, Smart Port Platforms must be capable of automatically generating and applying, via a centralised information base, measures for optimising port operation, thus configuring a true smart system.

On the other hand, the importance of the port-city relationship makes it essential to integrate their platforms in such a way that decisions may be taken in a coordinated manner and the impacts on citizens minimised.

For example, the smart management of loading and unloading operations at ports can reduce the impact of heavy port traffic on city traffic.

In addition, cybersecurity issues need to be taken into consideration in a cross-cutting manner in terms of both communications inside the port and ship approach operations.



Objectives

- For the Fomento Group to develop its own horizontal platform for Smart Ports.
- To gradually introduce the eventually developed platform in Spanish ports.
- To encourage the evolution of an ecosystem of interoperable smart platforms that includes the station, airport, port, city and other cross-cutting platforms such as the User and Freight Platforms.

Advantages

- Gaining independence from manufacturers and saving on licensing costs.
- Attaining maximum flexibility and adaptability to present and future needs.
- Having a model that can be easily integrated with other platforms.
- Having the possibility to export and commercialise the platform.

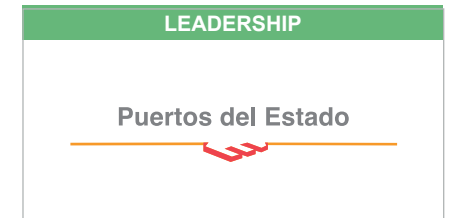
Description of the initiative

The Fomento Group will develop its own platform in accordance with the interoperability standard UNE 178104. The Smart Airport Platform will share the same base with the Smart Station and Smart Airport Platforms but adapted to the specific needs of the port environment.

The **specific actions** that need to be undertaken are listed below:

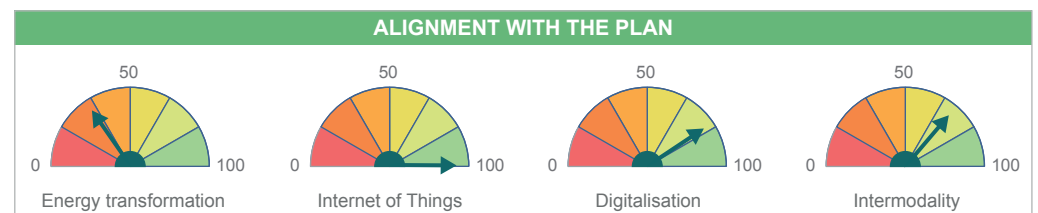
- Analysing and defining the platform from a technological and a functional standpoint.
- Developing the Fomento Group's own horizontal platform.
- Integrating in the platform those functionalities and verticals that are developed under other Plan initiatives.
- Developing scorecards with Business Intelligence and Analytics capabilities for station management.
- Tentatively introducing the Platform in a real environment.

BUDGET	
Development of the Platform	≈ €350,000
Integration with other platforms and verticals	≈ €150,000
Mock introduction of the platform	≈ €200,000
TOTAL	≈ €700,000



MONITORING INDICATORS
1. The number of stations where the platform has been introduced.
2. The revenue from selling the Platform.

STAKEHOLDERS																															
	<table border="1"> <thead> <tr> <th>Ministry of PW</th> <th>Adif</th> <th>Renfe</th> <th>Aena</th> <th>Enaire</th> <th>Crida</th> <th>Puertos del Estado</th> <th>Ineco</th> <th>Cedex</th> <th>Sasemar</th> </tr> </thead> <tbody> <tr> <td>Stakeholders</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Other stakeholders</td> <td colspan="9">Public administrations</td> </tr> </tbody> </table>	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar	Stakeholders										Other stakeholders	Public administrations								
Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar																						
Stakeholders																															
Other stakeholders	Public administrations																														



Objectives

- To integrate the data from the port platform with the data from the city platform.
- To generate functionalities that use integrated information. To manage information in a comprehensive manner.
- To carry out a proof of concept in a real environment to assess the potential of the integration.

Advantages

- Improving the service provided to citizens, offering quality information generated by integrating data.
- Improving security and mobility.
- Improving the ports' capacity to meet the needs of users.

Description of the initiative

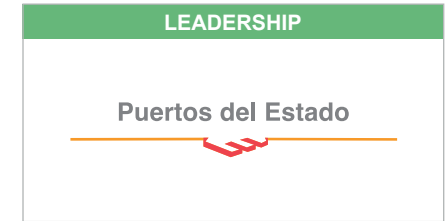
The initiative consists in integrating port and city via their smart platforms. Thus, variables such as traffic, delays, incidents and so on will be shared and jointly managed.

The idea is to perform the integration on real platforms, generating applications that use integrated port-city information to offer services to citizens.

The **specific actions** that need to be undertaken are listed below:

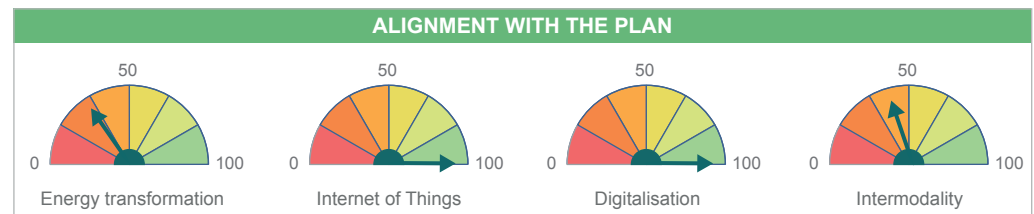
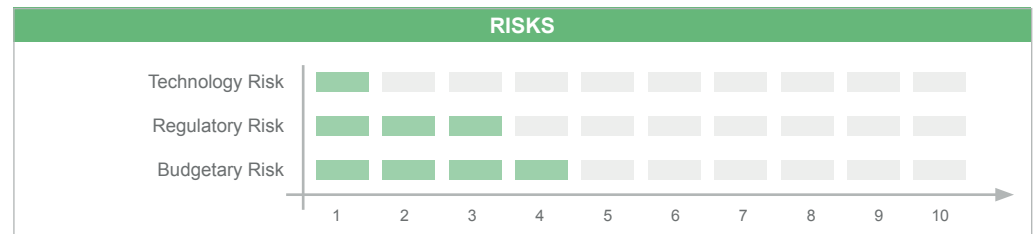
- Analysing all platform integration needs. The Smart Port Platform that is developed under the framework of this Plan will ensure full integration.
- Developing ICTs for platform integration.
- Introducing the platform in a real environment.
- Developing a use case that shows the benefits of integration.

BUDGET	
Integration of platforms	≈ €100,000
Development of applications	≈ €200,000
Mock introduction of the platform	≈ €100,000
TOTAL	≈ €400,000



- | MONITORING INDICATORS |
|--|
| 1. The percentage of integration-required activities that have been carried out. |
| 2. The number of information entities that have been integrated. |

STAKEHOLDERS		Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders											
Other stakeholders	Local administrations										



Objectives

- To integrate BIM methodologies in the management of Smart Ports.
- To manage port maintenance via the Smart Port Platform and relying on a BIM model.

Advantages

- Extending the use of BIM technology to the infrastructure’s operation phases.
- Integrating BIM models into the Smart Platforms.
- Having the possibility to commercialise the solution.

Description of the initiative

Integrating BIM models with the Smart Port Platform for terminal management and maintenance. In order to do so, the development of a BIM model of an existing port and the integration of BIM tools with the platform have been envisaged. In addition, a scorecard for model management will be developed.

The **actions** that need to be undertaken are listed below:

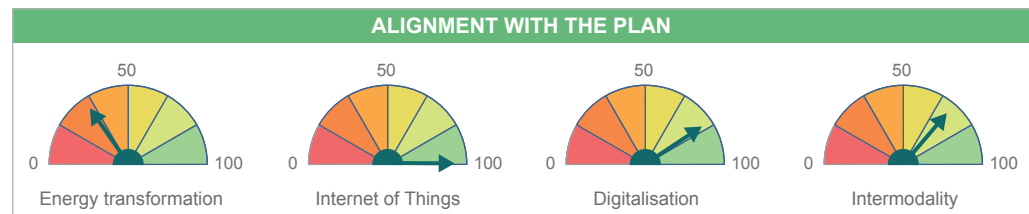
- Developing a BIM model of an existing port for port management and maintenance.
- Integrating the BIM model with the Smart Port Platform.
- Developing a scorecard for station management and maintenance using the BIM model.

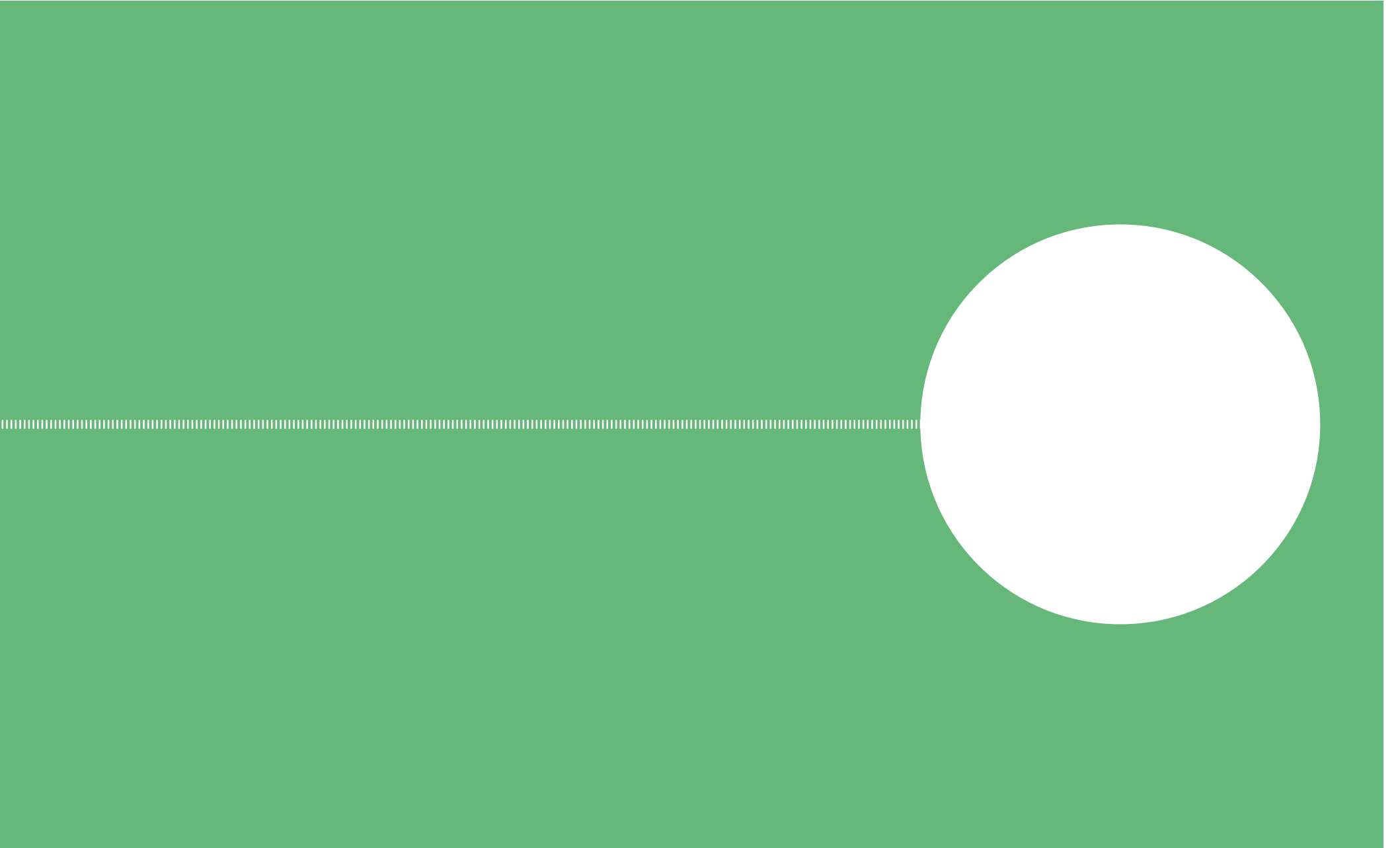
BUDGET	
Development of the BIM model	≈ €250,000
Model-platform integration	≈ €100,000
Development of the scorecard	≈ €50,000
TOTAL	≈ €400,000



MONITORING INDICATORS
1. The number of BIM-integrated maintenance/operation processes.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders										





● E2L4 ●

User Platform

Axis 2

Initiatives

- User Platform
- Integration of the User Platform with other platforms and tools
- Integration with mobile apps that generate mobility data

Context

One of the main things the Fomento Group needs to do is to generate **knowledge relating to the users** of its infrastructures.

The **User Platform** Strategic Line proposes digitally transforming the relationship that the Fomento Group maintains with infrastructure users. Currently, the main source of information that is available is the surveys the Group conducts among users, either at terminals or via the different applications – both mobile and web – that it has recently developed to improve communication. But these campaigns only collect a very small portion of the information that the **User Platform** can potentially mean for the Group.

Objectives

- To create a repository of information of high strategic value to the Group from the use of the infrastructures and services of the Group's companies, habits related to mobility, commercial trends and tastes, and interests and motivations in relation to the transport system.
- To tailor the information given to users on the basis of all available information, supporting the User Experience Strategic Line and providing it with the passenger knowledge that is necessary to configure its initiatives.

Acquired information

Time information relating to terminals

Average time of stay at the terminal; early arrival with regard to the means of transport's departure.

Use of infrastructures

Walks around the terminal.

Commercial information

Most visited commercial premises; impact of advertising elements.

Mobility habits

Routes taken by users to arrive to the terminals; means of transport used; the reason for their journeys; their valuation of the services.

Tastes and trends

Commercial preferences of users based on their purchases at terminals as well as on the services they access via the Group's web pages; web pages most visited at terminals.

The **User Platform** will be a centralised repository of information regarding passengers, which will be fed by the different systems and applications that are already available today as well as by those systems that are currently being designed and developed. On the other hand, this platform provides the different Group companies with knowledge they can use to improve their offers and services.

The existence of this platform would also bring about **cost savings** since all user experience-orientated smart functions would be unified under a

single platform. This integration would, on the one hand, prevent each Group company from having to implement these functionalities on its own and, on the other, make information of greater strategic value available.

The functionalities of the specific management of the infrastructure (such as security and maintenance, among others) would be gathered in the specific platforms of the different infrastructures (Smart Station, Smart Airport, and Smart Port). Another aspect to be taken into consideration is **interoperability**.

Conducting intermodality studies

thanks to the collection of anonymous – but traceable – information on the use of the different stations, airports and ports made by the same person.

Compiling travel preferences,

which would allow passenger expectations to be managed, thereby creating a unique passenger experience irrespective of whether the passenger is at a station, an airport or another infrastructure.

Big Data Analysis based on all the information collected from users,

which it will be possible to harness to improve infrastructures and passenger services and to use and run commercial spaces.

Simulating the impacts on customers of new services or of the modification of current ones,

which it will be possible to leverage to improve infrastructures and passenger services and to use and run commercial spaces.

Improving the capacity to design new services

for example, a combined offer of services to those passengers who take multimode trips.

Stations, airports and ports are elements that demand services from and offer them to the city, so proper coordination among them will allow better services to be offered to both users and citizens in general. Having a user platform that interoperates with cities will allow the services demanded by passengers to be coordinated and new business models generated based on the combined use of the services offered by the city and the platform.

Objectives

- To develop the User Platform and introduce it at the Fomento Group as a Big Data repository of all passenger information.
- To integrate all available passenger information without needing to replace current systems and applications.
- To serve as the foundation for the development of other Plan initiatives on the basis of a cross-cutting passenger information platform that may be run by the Group's companies.

Advantages

- Having a sole user information platform for Group companies.
- Collecting Big Data from the multimodal information of travellers.
- Having a knowledge base for generating user experiences.
- Encouraging the creation of new business models and lines within the Group.

Description of the initiative

The Fomento Group will develop its own platform in accordance with the interoperability standard UNE 178104. The platform will incorporate all the data of interest pertaining to users collected by the different applications of the Fomento Group's companies either through sales platforms, surveys, horizontal platforms or other data sources such as mobile devices. This platform will be a key part of the smart platform ecosystem designed within the framework of this Plan.

The **actions** that need to be undertaken are listed below:

- Analysing the requirements with the help of all Fomento Group companies.
- Developing the Group's Big Data User Platform.
- Creating the mechanisms that will allow the other systems to feed the platform.
- Making the platform available to the Fomento Group companies in order for them to be able to exploit the integrated information.

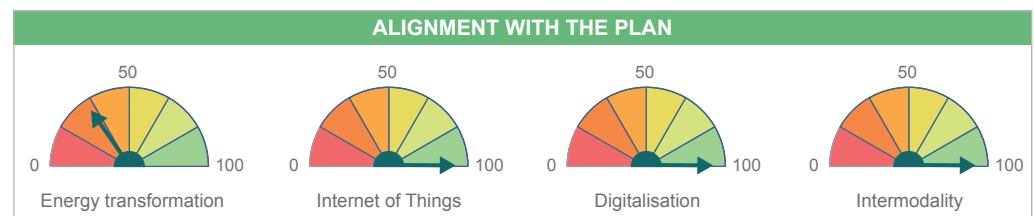
BUDGET	
Development of the User Platform	≈ €550,000
Development of the scorecard	≈ €150,000
TOTAL	≈ €700,000



- MONITORING INDICATORS**
1. The percentage of the Platform that has been developed up to that moment.
 2. The number of systems that are fed by the Platform.
 3. The number of user characteristics collected by the platform.

STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█	█	█			█	█		
Other stakeholders	Local administrations, transport operators									



Objectives

- To integrate the User Platform with the other smart platforms of the Fomento Group: Smart Station, Smart Airport, Smart Port and Freight Platform.
- To integrate the User Platform with the National Transport Model so as to articulate the route planning and travel planning functionalities (see initiative E3L2-1 within the Modelling and Forecasting Strategic Line of Axis 3).

Advantages

- Having a cross-cutting platform and a single point of information of interest about user information.
- Having a transport model integrated in the platform in order for automatic feedback and calibration to be possible.

Description of the initiative

Integrating data of interest about users from all of the Fomento Group's smart platforms. The integrated data will make it possible to offer high value-added services focused on intermodality. In this regard, the integration the User Platform with the National Transport Model that will be developed under another initiative of this Plan is essential.

The **actions** that need to be undertaken are listed below:

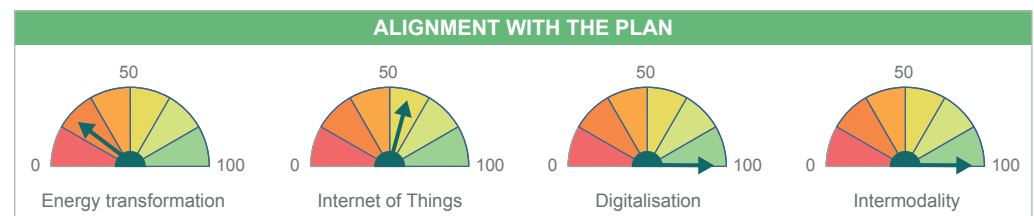
- Analysing the needs of the User Platform and integrating it with other Fomento Group smart platforms.
- Analysing the needs of the User Platform and integrating it with the National Transport Model that will be developed under another initiative of this Plan.

BUDGET	
Integration with other platforms	≈ €250,000
Integration with the National Transport Model	≈ €50,000
TOTAL	≈ €300,000



MONITORING INDICATORS
1. The number of platforms that have been integrated in the User Platform.

STAKEHOLDERS	
	Ministry of PW Adif Renfe Aena Enaire Crida Puertos del Estado Ineco Cedex Sasemar
Stakeholders	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Other stakeholders	Transport operators



Objectives

- To integrate applications that generate mobility data via mobile devices in the User Platform without having to replace current applications or develop new ones. The data can come from multiple sources, such as GPS, surveys, etc. These applications can be other applications developed within the framework of this Plan, such as the one dedicated to MaaS services.

Advantages

- Having real-time information on user movements, thus allowing multiple functionalities, such as predictive demand models, to be developed.

Description of the initiative

Integrating Fomento Group mobile apps that generate mobility data into the User Platform. These applications can be of various types: ticket booking, Mobility as a Service, user profile, etc. Many of them are associated with other initiatives of this Plan.

The **actions** that need to be undertaken are listed below:

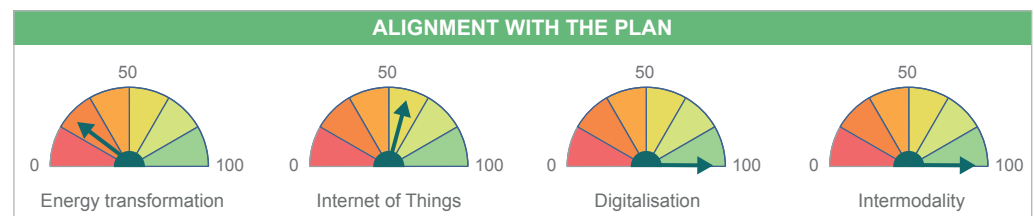
- Analysing the needs and integrating mobile apps that generate mobility data into the User Platform.
- Developing a software component that can be included in current and future mobile apps for collecting mobility data.

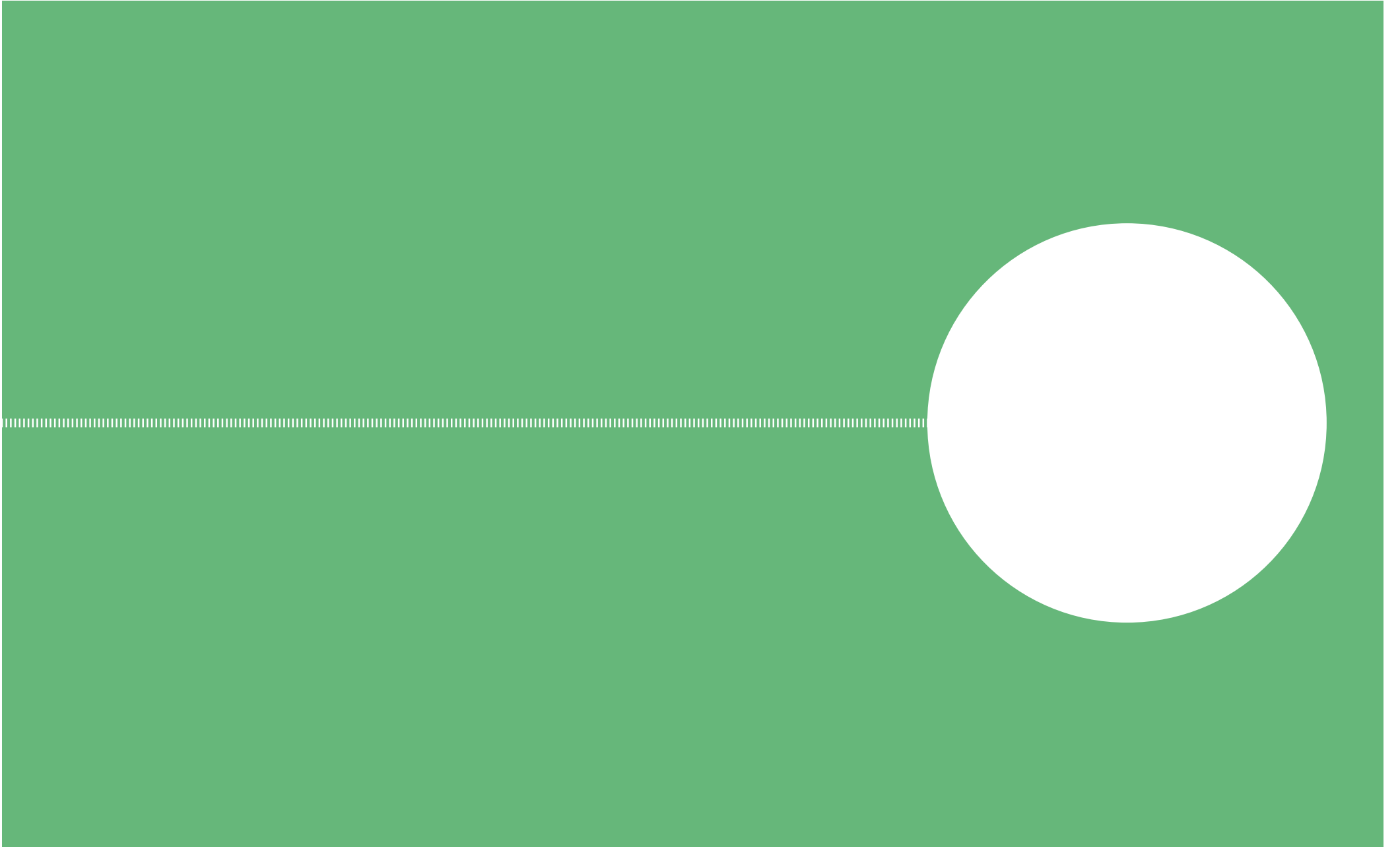
BUDGET	
Integration with other applications	≈ €400,000
TOTAL	≈ €400,000



MONITORING INDICATORS
1. The number of mobility data-generating applications that are integrated in the User Platform.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█	█	█			█	█		
Other stakeholders	Transport operators									







E2L5



**Freight
Platform**

Axis 2

Initiatives

- Freight Platform
- Integration of the Freight Platform with other platforms and tools



Context

Freight transport faces challenges such as intermodality, the problems arising from urban delivery logistics processes (last mile distribution) and the necessity cities have to make the transport of both people and freight sustainable.

The power of the **Smart Freight Platform** lies in the integration of the information on goods that all the companies in the Fomento Group have. Each company provides information that is useful for its own business, but the value of this information can be multiplied if combined with information from the other companies and actors in the transport industry.

What is it all about?

The **Smart Freight Platform** would provide, among other things, the following advantages:

- **Solutions to intermodality in freight transport** through the coordinated planning of routes and work routines among the different modes:
 - Optimised freight traceability processes, with an intermodal approach.
 - Efficient fleet management, allowing the location and status of each transport unit to be known in real time and in an integrated manner with the different modes involved in the logistics chain.
- **Coordination with urban delivery and secondary distribution centres.**
- **Improvements in the efficiency of freight transport modes** and, consequently, a reduction of air and noise pollution.

What information will it manage?

- **Comprehensive information on goods:** location, status, route planning, traceability, operator, etc.
- **Comprehensive fleet information:** location, status, consumption, maintenance, routing, capacity, etc.



*A Smart Freight Platform is defined as an **efficient, automated, intermodal** logistics innovation platform that combines the delivery of goods by rail and last mile delivery by means of a global fleet management system.*

E2L5-1 Freight Platform

Objectives

- To develop the Freight Platform and introduce it at the Fomento Group as a single point of information regarding freight transport.
- To integrate the information of interest to those agents involved in freight transport that has been collected on smart terminal platforms or other sources of big data such as mobile devices.
- To serve as the foundation for the development of other Plan initiatives on the basis of a cross-cutting freight transport information platform.

Advantages

- Having a single platform of information of interest to all agents involved in freight transport.
- Having accurate, up-to-date information of huge interest to the entire logistics chain.
- Encouraging the creation of new business models and lines within the Group.

Description of the initiative

The Fomento Group will develop its own platform in accordance with the interoperability standard UNE 178104. The platform will incorporate all data of interest for freight traffic that is generated within the Fomento Group via either smart terminal platforms or other data sources such as mobile devices. This platform will be a key part of the smart platform ecosystem designed within the framework of this Plan.

The **actions** that need to be undertaken are listed below:

- Analysing and defining the platform from a technological and a functional standpoint.
- Developing the Fomento Group's own horizontal platform.
- Integrating in the platform those functionalities and verticals that are developed under other Plan initiatives.
- Developing scorecards with Business Intelligence and Analytics capabilities for station management.
- Tentatively introducing the Platform in a real environment.

BUDGET

Development of the Freight Platform	≈ €600,000
Development of the scorecard	≈ €100,000
TOTAL	≈ €700,000

LEADERSHIP

Puertos del Estado



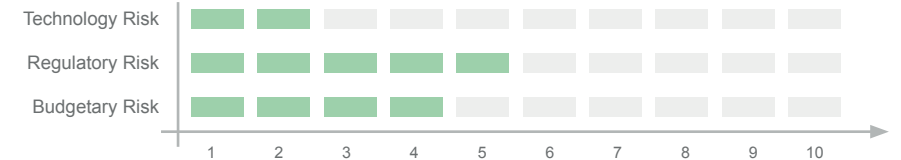
MONITORING INDICATORS

1. The number of individual users of the Platform.
2. The revenue from selling the Platform.

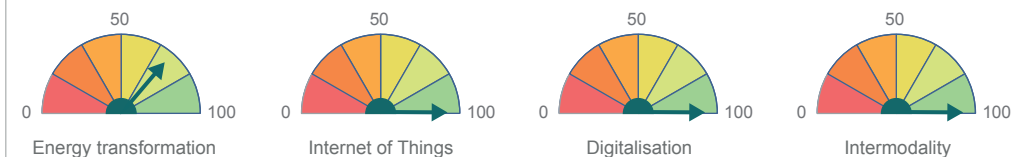
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators, logistics operators									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To integrate the Freight Platform with other Fomento Group smart platforms: Smart Station, Smart Airport, Smart Port and User Platforms
- To integrate the platforms of other interested logistics operators.
- To integrate the User Platform with the National Transport Model so as to articulate the route planning and travel planning functionalities (see initiative E3L2-1 within the Modelling and Forecasting Strategic Line of Axis 3).

Advantages

- Having a cross-cutting platform and a single point of information of interest to all agents involved in freight transport.
- Fostering public-private collaboration.
- Having a transport model integrated in the platform in order for automatic feedback and calibration to be possible.

Description of the initiative

Integrating the data of interest for freight transport from all of the Fomento Group's smart platforms. The integrated data will make it possible to offer high value-added services focused on intermodality. The possibility of integrating the platforms of private logistics operators that are interested in participating in the project will be analysed. On the other hand, the integration of the User Platform with the National Transport Model that will be developed under another initiative of the Plan is deemed essential.

The **actions** that need to be undertaken are listed below:

- Analysing the needs of the Freight Platform and integrating it with other Fomento Group smart platforms.
- Analysing the needs of the Freight Platform and integrating it with the platforms of other logistics operators.
- Analysing the needs of the Freight Platform and integrating it with the National Transport Model that will be developed under another initiative of this Plan.

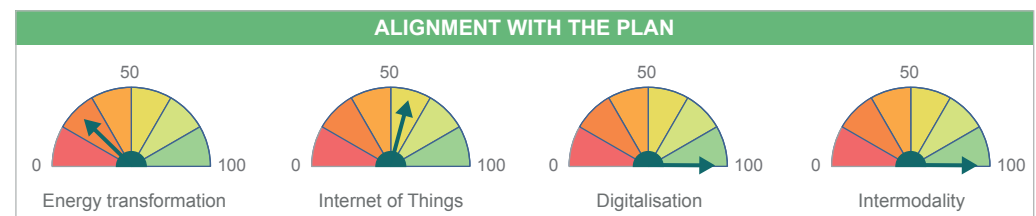
BUDGET	
Integration with other platforms	≈ €250,000
Integration with the National Transport Model	≈ €50,000
TOTAL	≈ €300,000



MONITORING INDICATORS

1. The number of platforms that have been integrated in the Freight Platform.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators, logistics operators									



● E2L6 ●

Open Data

Axis 2

Initiatives

- Promotion of new projects using open data
- Definition of the catalogue of open transport data
- Development of the open transport data multimodal portal



Context

The Ministry of Industry, Energy and Tourism, Red.es, the Ministry of Finance and Public Administrations, and the Spanish Government's open data portal drafted a report entitled "Open Data Trends and Initiatives" and published it in September 2014. It identifies fourteen thematic areas which have great potential from the point of view of better governance and the promotion of innovation and on which data publication efforts should focus in the near future. Transport and infrastructures is one of these thematic areas with great potential.

Objectives

- To encourage the **publication of open data** by the companies of the Fomento Group and the public sector in general.
- In addition, it is considered important to make progress in the **standardisation and cataloguing** of open data in order to promote the development of interoperable and intermodal solutions.

A piece of data is open if anyone is free to use, reuse, and redistribute it – subject only, at most, to the requirement to attribute and/or share-alike.

The information which the concept *Open Data* refers to is **non-personal information**, i.e. data that does not contain information about specific individuals. This is why the information provided on open data portals is **anonymous and aggregate**. Moreover, information that may be subject to national security restrictions is not considered to be open data.

Beyond the transparency associated with open data and the public sector, these policies have huge interest to boost economic activity around data since they encourage research, innovation and the development of new business projects.



Objectives

- To encourage high-potential projects related to the Fomento Group's open data.
- To encourage entrepreneurship associated with the use of open transport data.
- To facilitate the provision of information to the open transport data catalogue and the intermodal portal.
- To promote the use and exploitation of open transport data.

Advantages

- Supporting the creation of new business opportunities.
- Providing the Fomento Group with visibility and encouraging open innovation.

Description of the initiative

Furnishing all necessary tools and funding training courses with the aim of facilitating the provision of information for the catalogue of open transport data, the development of APIs for the exploitation of data and the creation of new business models related to the use of open data.

The **actions** that need to be undertaken are listed below:

- Launching an awareness and publicity campaign around the knowledge associated with the catalogue of open transport data, the potential associated with the exploitation thereof and the tools needed to do so.
- Organising training courses on the tools and technologies associated with the initiative.

BUDGET

Advertising campaign and conferences	≈ €50,000
Training courses	≈ €150,000
TOTAL	≈ €200,000

LEADERSHIP



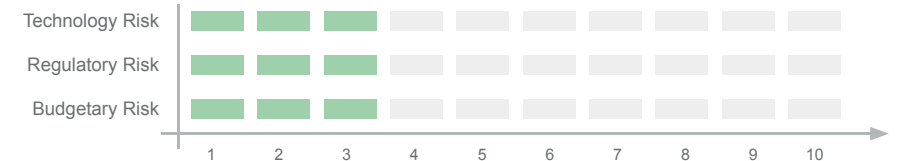
MONITORING INDICATORS

1. Number of conference attendees
2. The number of participants in training courses.

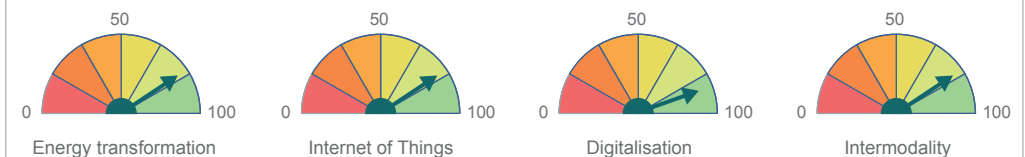
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█	█	█	█	█	█	█		
Other stakeholders	Regional and local administrations, private companies									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To define a catalogue of data related to transport and mobility that covers all modes of transport in order for it to be published as open data.
- To define formats and standards for each element in the catalogue of open data so that it can be compared regardless of its source.
- To establish a information governance and maintenance model.

Advantages

- Laying the foundation for the creation of the transport sector’s unified repository of transport and mobility data.
- Homogenising the data.
- Structuring the data and designing its interoperability.

Description of the initiative

The initiative consists in continuing the efforts made by the Ministry of Public Works and DG MOVE to define a catalogue of open data of regular passenger transport. The aim is to provide a more innovative vision, taking into account parameters of interest for the future of the transport system.

The **actions** that need to be undertaken are listed below:

- Defining the Catalogue of Open Regular Passenger Transport Data.
- Looking for public and private organisations that would like to join the catalogue via agreements with the Ministry of Public Works or the Fomento Group.
- Defining the information maintenance procedures and responsibilities.

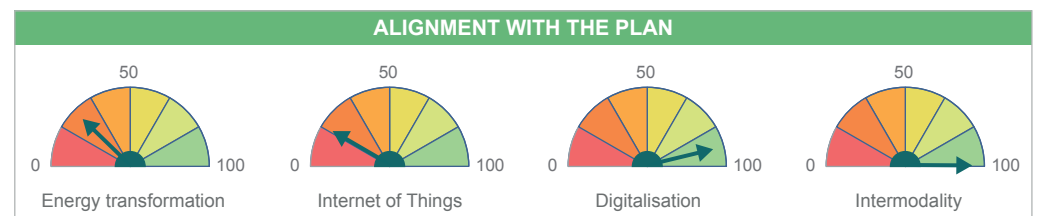
BUDGET	
Definition the Open Transport Data Catalogue	≈ €200,000
TOTAL	≈ €200,000

LEADERSHIP



MONITORING INDICATORS
1. The number of entities that have joined the catalogue.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Regional and local administrations, private companies									



Objectives

- To develop a national portal for accessing regular passenger transport data to be used by third parties.
- To develop Application Programming Interfaces (APIs) to provide applications access to the information.

Advantages

- Gaining value by collecting the offer of multimodal transport in a single point.
- Fostering public-private partnerships.
- Promoting transparency and transport data interoperability.

Description of the initiative

Developing a national portal that allows third parties to access medium- and long-distance regular passenger transport data based on the Open Transport Data Catalogue. Developing a set of APIs to provide third-party applications access to the data is also part of the plan.

The **actions** that need to be undertaken are listed below:

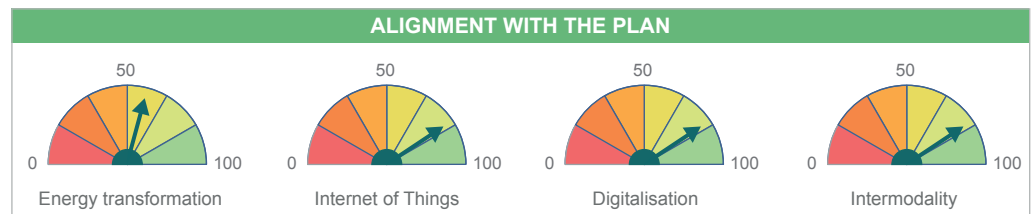
- Developing the National Transport Data Portal.
- Developing APIs to provide app developers access to the data catalogue.

BUDGET	
Development of the Portal	≈ €600,000
Development of APIs	≈ €100,000
TOTAL	≈ €700,000



MONITORING INDICATORS
1. The number of entries posted on the portal.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█	█	█	█	█	█	█		
Other stakeholders	Regional and local administrations, private companies									





New Data Sources

Initiatives

- Partnerships with companies that generate mobility data
- Application of social media data to mobility and transport
- Use of mobile telephony data to determine transport demand
- Integration of Galileo into the Fomento Group's applications

Axis 2

Context

The processes of planning and managing transport activities are undergoing a natural evolution due to the increased availability of mobility-related information.

The emergence of Big Data and of the processes associated with data science make it possible to process huge amounts of information and obtain value from the data.

Digital transformation is giving rise to the generation of a large amount of information that is associated with the geolocation of people, which is of great interest to be applied to transport. Some of the new data sources that are beginning to be used are:

- Data associated with mobile telephony events.
- Massive analysis of GPS positioning data.
- Geolocalised or unstructured information (such as text, pictures or videos) contained in social media.
- Other data sources, such as credit card usage records.

Analysis techniques have reached a sufficient degree of maturity for the said sources to be used in the standard processes of transport companies as well as in the public sector. This will lead to a better understanding of demand and, thus, to a better planning of the transport offer. In addition, the costs associated with market studies for demand estimation will be significantly reduced. The main stumbling block to the recurrent use of such sources of information is the availability of the data. Currently, the vast majority of data is owned by private operators, which are developing their own business units for the exploitation and sale thereof.

Data from new sources, conveniently grouped and anonymised, has enormous potential in the identification of mobility patterns and the estimation and forecast of transport demand.

Objectives

The initiatives included in this strategic line are aimed at the analysis and incorporation of new sources of data so as to obtain highly useful information for the transport system. Additionally, this analysis needs to pay attention to the role that the public sector should play in the regulation of public-private mechanisms for using this information, especially for acquiring and utilising it in the sphere of mobility.

The entry into operation of the Galileo system is aligned with the use of new data sources for identifying mobility patterns. This new positioning system will improve GPS performance and open up great possibilities for the development of new products and services.

E2L7-1 Partnerships with companies that generate mobility data

Objectives

- To enter into agreements with mobility data-generating companies such as phone companies, vehicle manufacturers and the like.
- To promote the public utility role of mobility data from sources of big data.
- To integrate sources of mobility big data into transport infrastructure planning and operation processes.

Advantages

- Having data that is of great interest for strategic, transport-related processes.
- Promoting long-term public-private partnerships for the provision of transport data.

Description of the initiative

Entering into agreements on the part of the Ministry of Public Works with companies that generate mobility big data. During their day-to-day operations these companies generate a large amount of mobility data, which they have turned into new business lines. This initiative pursues long-term partnerships for them to provide this data to the Ministry of Public Works such that it may be fed into in transport infrastructure planning and operation processes.

The **actions** that need to be undertaken are listed below:

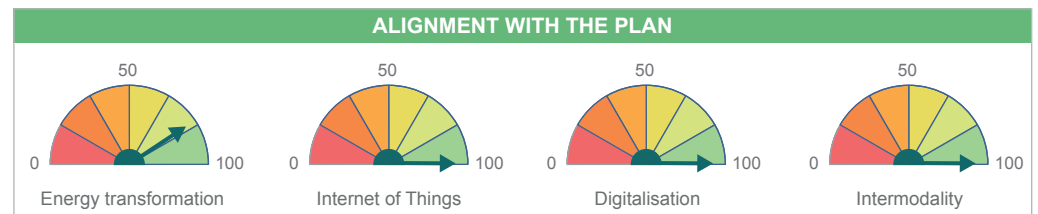
- Analysing the mobility data market and studying the public utility of mobility data.
- Setting up a round table with suppliers of mobility big data with the aim of striking long-term partnerships with them.
- Publishing mobility big data as open data as an incentive for the creation of new business lines.

BUDGET	
Item for the acquisition of mobility big data	≈ €1,000,000
TOTAL	≈ €1,000,000



MONITORING INDICATORS
1. The number of partnerships entered into.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Mobility data-generating companies									



Objectives

- To study the possibility of drawing mobility patterns from social media to see whether they can become new sources of transport data.
- To use social media data in mobility studies and to come up with origin-destination journey matrices.

Advantages

- Having new, low-cost, collaborative sources of mobility data.
- Pioneering the use of social media information.
- Providing the Group with visibility at an international level.

Description of the initiative

Developing an application for mining social media data and using it in mobility and transport studies. Information can be gleaned from both geolocalised data and the processing of natural language.

The **actions** that need to be undertaken are listed below:

- Analysing the availability of data via the APIs of the most popular social media, studying the possibility of using it to conduct mobility studies from both a technical and a legal point of view.
- Developing an application for drawing journey matrices from the data generated by social media.

BUDGET

Initial consultancy	≈ €100,000
Development of the Application	≈ €200,000
TOTAL	≈ €300,000

LEADERSHIP

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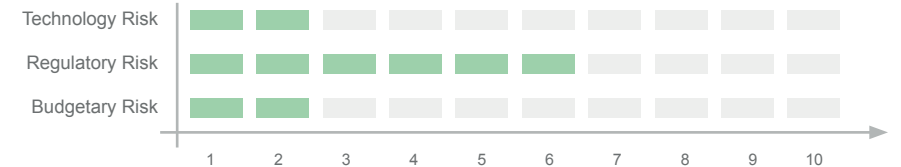
MONITORING INDICATORS

- The number of mobility studies conducted using social media data.

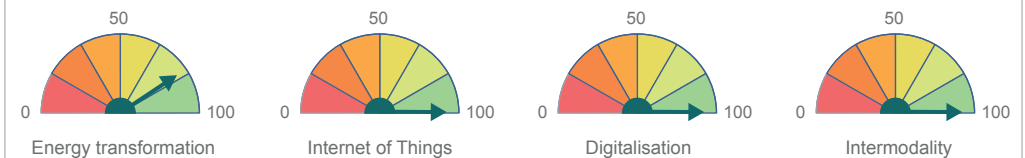
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Social media companies									

RISKS



ALIGNMENT WITH THE PLAN



E2L7-3 Using mobile telephony data to determine transport demand

Objectives

- To introduce new methodologies for estimating transport demand that replace traditional market surveys.
- To bring down the cost of market surveys for estimating travel demand.
- To increase the periodicity of the collection of data on transport demand.

Advantages

- Bringing down costs.
- Increasing the sample size and reducing the error.
- Increasing the periodicity of the collection of travel demand data.

Description of the initiative

Conducting an Inter-provincial Passenger and Freight Mobility Study using data from mobile telephony records and supporting the performance and processing of the permanent freight transport survey to prepare the Origin/Destination matrices. The implementation of a pilot project to allow the results from the demand study to be displayed in a geographic information system is also being contemplated.

The actions that need to be undertaken are listed below:

- Conducting an inter-provincial passenger mobility study to establish the origin-destination matrices from mobile telephony data, and processing the permanent survey to help calculate the demand for freight transport.
- Implementing a pilot project to display passenger mobility and freight transport demand in a georeferenced system.

BUDGET

Inter-provincial mobility study	≈ €350,000
Pilot project for displaying the results	≈ €150,000
TOTAL	≈ €500,000

LEADERSHIP



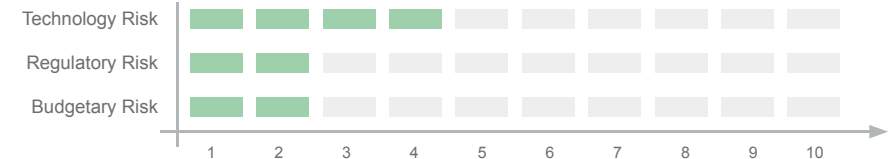
MONITORING INDICATORS

1. The number of studies that use this kind of data.
2. The number of queries made to O/D matrices.

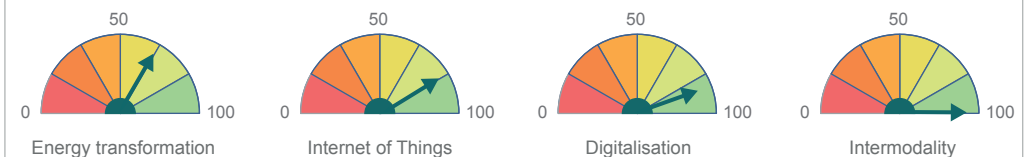
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█	█	█			█	█		
Other stakeholders	Public administrations, telecom companies.									

RISKS



ALIGNMENT WITH THE PLAN



E2L7-4 Integration of Galileo in the Fomento Group's applications

Objectives

- To adapt the Fomento Group's applications having geolocation functionalities to the new European Galileo system.
- To promote the use of Galileo in newly developed applications over or in combination with other systems.
- To evolve the Fomento Group's air, rail and maritime navigation systems to Galileo-based navigation and use them in road transport.

Advantages

- Giving European technology a boost.
- Improving the accuracy of geolocation applications.
- Improving the reliability and availability of positioning systems.
- Improving the performance of navigation systems.

Description of the initiative

Encouraging upgrades of key applications used in the Fomento Group's operation in order for the new Galileo positioning system to be integrated therein. On the other hand, fostering the use of Galileo in new developments, where it could provide a significant advantage, as well as in air, sea, rail and road transport.

The **actions** that need to be undertaken are listed below:

- Carrying out key application upgrade projects to integrate the new Galileo positioning system.
- Implementing pilot projects with new Galileo-related functionalities. For instance, replacing the telephone blocking on railway lines with low traffic density.
- Carrying out projects to develop Galileo-based systems for use in air navigation (GBAS, ARAIM...) and their performance monitors.
- Carrying out projects to develop systems that guarantee that the Galileo signal is protected against interferences.

BUDGET

5 upgrade projects	≈ €1,000,000
3 pilot projects on new applications	≈ €600,000
TOTAL	≈ €1,600,000

LEADERSHIP

ENAIRE 

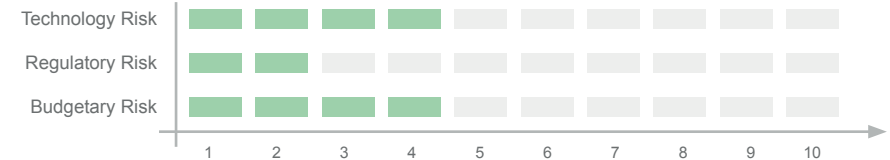
MONITORING INDICATORS

1. The number of applications that have been upgraded.
2. The number of newly developed applications.

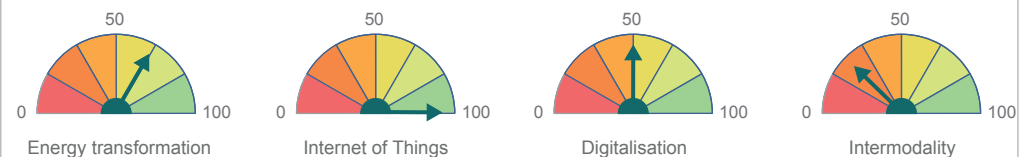
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█	█		█		█		█	
Other stakeholders	Public administrations									

RISKS



ALIGNMENT WITH THE PLAN



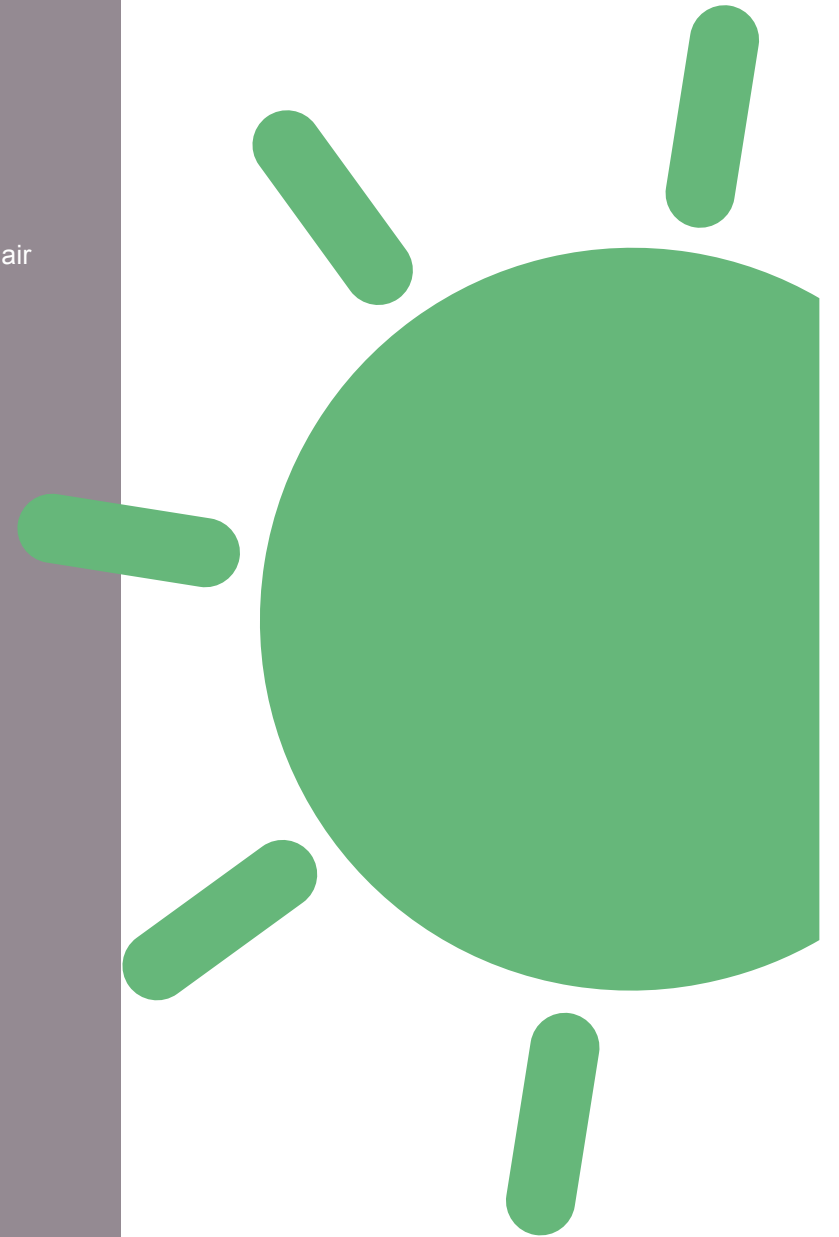
● E2L8 ●

Single Sky

Axis 2

Initiatives

- Smart Air Traffic Management (ATM)
- Unmanned aerial vehicle traffic management platform
- Introduction of Big Data techniques in air navigation services



Context

The **Single European Sky (SES)** is an initiative that was set in motion by the European Commission in 1999 with the aim of integrating and restructuring the European air traffic control system in order to improve both the operation of air traffic management and air navigation services. This initiative originated as a response to the delays caused by air navigation, which peaked in the late 1990s. This restructuring sought to increase both air traffic capacity to meet the expected future demand and the overall performance of European air traffic management.

The Single European Sky initiative set for itself the goal of **improving the Air Traffic Control (ATC) system** in terms of safety, capacity, profitability and the environment by 2020.

Improvements to be expected from the introduction of the SES

- **Improving QoS** whilst meeting the growing air demand that is expected.
- **Saving time and fuel** and improving the environmental impact of air travel owing to shorter routes.
- **Reducing flight delays and cancellations.**
- **Improving air transport efficiency.**

In order to achieve these objectives, the European Commission, the European Parliament, the member states and the rest of institutions must work together to reorganise the way in which ATC is structured and operates. Although this is a pan-European initiative, it is also open to neighbouring countries.

Although the initiatives promoted within the framework of the SES have been powerful and numerous, the complexity of the problem has led to a certain slowness in the taking of effective measures. Thus, measures need to be taken to drive and consolidate the achievement of the goals of the Single European Sky initiative.



This initiative aims to give a big boost to the evolution of air navigation towards interoperability and new paradigms, giving rise to national projects that can be exported internationally.

Objectives of the initiative

The Fomento Group has been promoting for the past few years many projects within the framework of the SES and hit important milestones in the improvement of air navigation management. This effort must continue, focusing those new trends and technologies that show enormous potential:

- The **optimisation of airspace, moving towards free routing** and increasing capacity in such a way as to be able to absorb increased demand. Some of the initiatives that are geared towards reaching this objective will be performance-based navigation and the reduction of aircraft space through smart management.
- The use of **Big Data architectures for smart air navigation management**, automating processes through the use of data science and machine learning.
- The development of **new management paradigms so as to allow Unmanned Aerial Vehicles (UAVs)** to be incorporated. The regulation of this kind of traffic will give a boost to the development of new business models based around these vehicles.

E2L8-1 Smart ATM. Smart Air Traffic Management

Objectives

- To modernise and upgrade air navigation systems by introducing new paradigms enabling airspace optimisation.
- To apply new technologies to air navigation.
- To improve and increase security in the exchange of information relating to air navigation and the aeronautical sector in general.

Advantages

- Boosting airspace capacity and safety with increased flexibility and efficiency.
- Upping security in the exchange of information used for aviation safety.
- Improving the response to traffic congestion episodes.
- Cutting flight times and fuel consumption.

Description of the initiative

Continuing developing projects within the framework of the SESAR programme with the aim of bringing the Single European Sky to fruition. Specifically, developing concepts and tools to support all agents involved in air traffic operations – pilots, air traffic controllers, network managers, etc. – so that they can be subsequently introduced.

The **actions** that need to be undertaken are listed below:

- Developing mechanisms for optimising and selecting optimal routes in real time as a solution to congestion problems.
- Managing air space in a dynamic and flexible manner (Dynamic Demand) as a solution to congestion problems. Improving military/civilian coordination.
- Applying performance-based navigation using new technologies.
- Achieving free routing using new controller support tools.
- Improving the way in which flight paths are calculated and managed.
- Narrowing the space between aircraft during approach and take off manoeuvres.
- Integrating airports in the European ATM network.
- Continuously measuring the performance of the system and identifying areas for improvement.

BUDGET

Smart ATM projects	≈ €26,000,000
TOTAL	≈ €26,000,000

LEADERSHIP



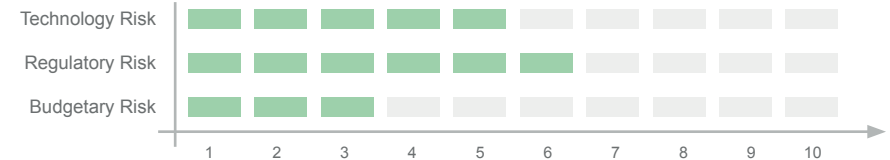
MONITORING INDICATORS

1. The capacity of the Spanish air space.

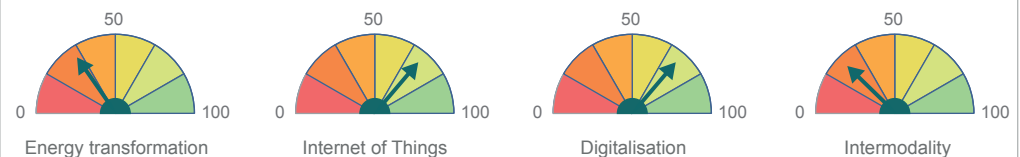
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations.									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To develop a platform for managing unmanned aerial vehicle traffic whose architecture allows a large number of these devices to be managed.
- To develop interfaces for communication among current air traffic management systems and future U-space systems.

Advantages

- Having a tool that allows unmanned aerial vehicles to be managed and linked to traditional air navigation.
- Having the capacity to develop Big Data architectures for lower airspace management.
- Increasing in the emergence of new business models associated with UAVs.

Description of the initiative

Developing a platform for managing unmanned aerial vehicle traffic that allows management and automatic management support verticals to be developed and integrated. Thus, the platform that are eventually developed must be adapted to Big Data architectures.

The **actions** that need to be undertaken are listed below:

- Analysing the needs and taking down the requirements through contacts with all agents involved in the drone (UAV) sector.
- Developing the unmanned aerial vehicle navigation support platform.
- Conducting a proof of concept in a real environment.

BUDGET

Analysis of the needs	≈ €100,000
Development of the Platform	≈ €400,000
Implementation of the pilot project	≈ €200,000
TOTAL	≈ €700,000

LEADERSHIP



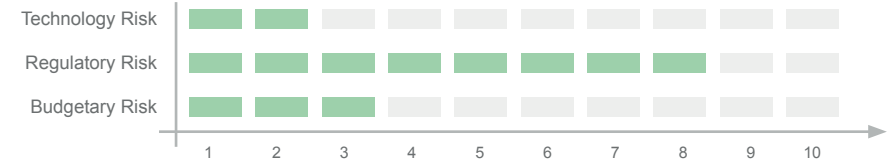
MONITORING INDICATORS

- The number of UAVs that are being managed by the Platform.

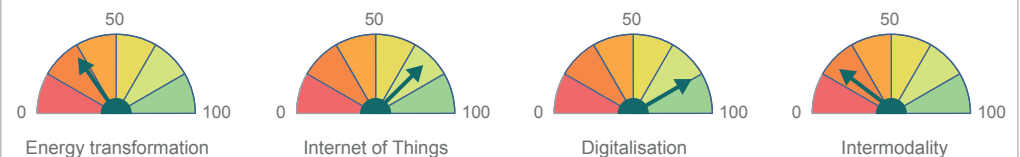
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crída	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations.									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To introduce Big Data architectures in air navigation management in order to improve efficiency.
- To automate air navigation processes through the development of predictive models or other models based on machine learning.

Advantages

- Improving the efficiency of the system's operation.
- Anticipating crisis situations, allowing the improvements to be made in the system to be better planned.
- Providing the Fomento Group with visibility at the international level as a driving force behind innovative paradigms.

Description of the initiative

Introducing developments and applications based on Big Data architectures to improve air navigation and process automation. The fundamental application will be the development of predictive models of system performance that allow contingency situations to be anticipated and mitigating measures to be automatically generated.

The **actions** that need to be undertaken are listed below:

- Developing predictive system performance models based on machine learning to run them in Big Data architectures.
- Creating simulation environments for system validation.

BUDGET

Development of the predictive flight path model	≈ €1,800,000
Simulation and test environment	≈ €200,000
TOTAL	≈ €2,000,000

LEADERSHIP



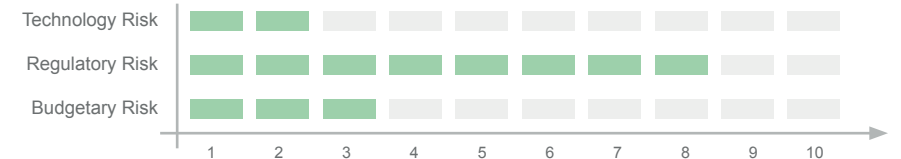
MONITORING INDICATORS

- The number of times the predictive air navigation system performance model has been introduced.

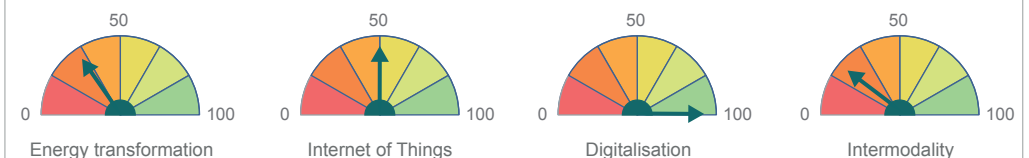
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crída	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations									

RISKS



ALIGNMENT WITH THE PLAN





● E2L9 ●

Smart Maritime Management

Axis 2

Initiatives

- Smart Maritime Traffic Management



Objective

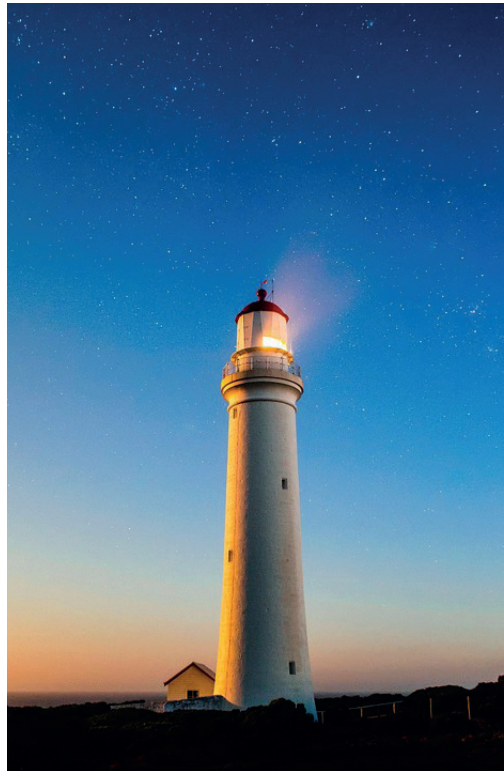
The purpose of this strategic line is to delve deeper into the smart management of maritime traffic, making progress along the lines of Sea Traffic Management (STM).

Sea Traffic Management

Sea Traffic Management (STM) is a concept inspired in the SESAR project for integrated air traffic management. In addition to promoting the Motorways of the Sea concept, STM intends for new maritime traffic management paradigms whose common axis is data integration and the flow of information to be developed.

The main goal of STM is to make the maritime sector safer, more efficient and environmentally friendlier. Its targets for 2030 are:

- **Safety:** a 50% reduction in the number of accidents.
- **Efficiency:** a 10% reduction in travel times and a 30% reduction in waiting times for docking.
- **The environment:** a 7% reduction in fuel consumption and a 7% decrease in greenhouse gas emissions.



Background: Monalisa 2.0

PROJECT MONALISA 2.0 (2012-EU-21007-S) was approved by means of Commission Decision C(2013)7588, of 5 November, granting EU financial aid to projects of common interest within the sphere of the trans-European transport network (TEN-T). The overall objective is to contribute to the development of Motorways of the Sea (MoS) within the EU, in line with EU maritime transport policies and the e-Maritime concept, and to boost efficiency, safety and environmental protection in maritime transport.

The Spanish Maritime Safety and Rescue Society (Sasemar) has participated in the MONALISA 2.0 Project as a beneficiary together with other public and private sector bodies from the following member states: Sweden, Italy, Germany, Spain, Greece, the UK, Denmark, Malta and Finland. The Swedish Maritime Administration is the project's coordinator. Sasemar takes part in Activity 1. "Maritime traffic management operations and tools" and has been commissioned to coordinate Activity 4. "Operational safety."



STM is the continuation of the Monalisa 2.0 project, which aims to digitise and standardise sea transport according to the Single Sky concept developed for air transport (CEF 2014).

Objectives

- To participate, through the Tarifa Rescue Co-ordination Centre (CCS), in the Mediterranean Test Bench to validate the STM concept and analyse the degree of improvement of the services and processes that have been defined.
- To take part, through the Jovellanos Centre Simulator, in the sole European Maritime Simulator Network (EMSN).

Advantages

- Digitalising Maritime Rescue Centres.
- Defining the improvement of services according to technological demand.
- Belonging to the EMSN.
- Improving the Maritime Traffic Services provided by the Fomento Group in terms of safety, efficiency and the environment.

Description of the initiative

Sea Traffic Management connects and updates the maritime world in real time thanks to an efficient exchange of information. By means of the exchange of data among ships, service providers and shipping companies, STM is giving rise to a new paradigm for the exchange of maritime information by the digital infrastructure of tomorrow for sea transport.

STM is the continuation of the Monalisa 2.0 project, which aims to digitise and standardise maritime transport based on the Single Sky concept developed for air transport (CEF 2014).

The **actions** that need to be undertaken are listed below:

- Developing the Med Test Bench at the Tarifa CCS.
- Creating a network of simulators.
- Carrying out training activities.

BUDGET	
Med Test Bench at the Tarifa CCS	≈ €400,000
Simulator network	≈ €510,000
Training activities	≈ €493,000
TOTAL	≈ €1,403,000

LEADERSHIP



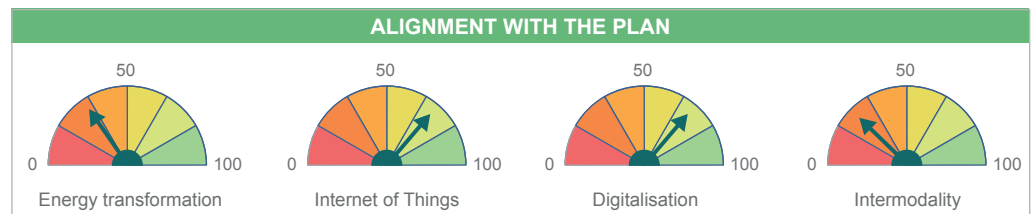
Salvamento Marítimo

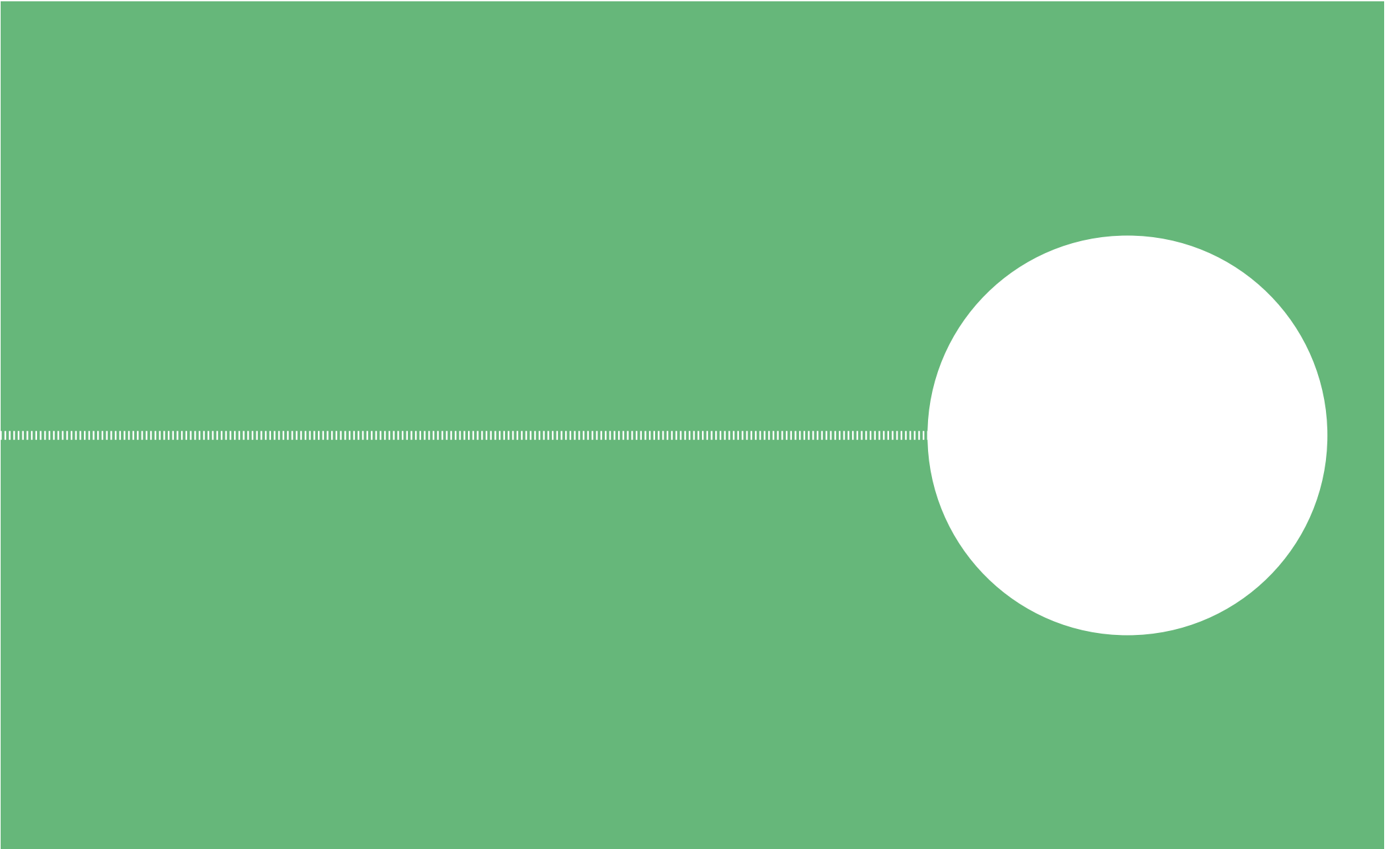
MONITORING INDICATORS

1. The evaluation of the Test Bench

STAKEHOLDERS

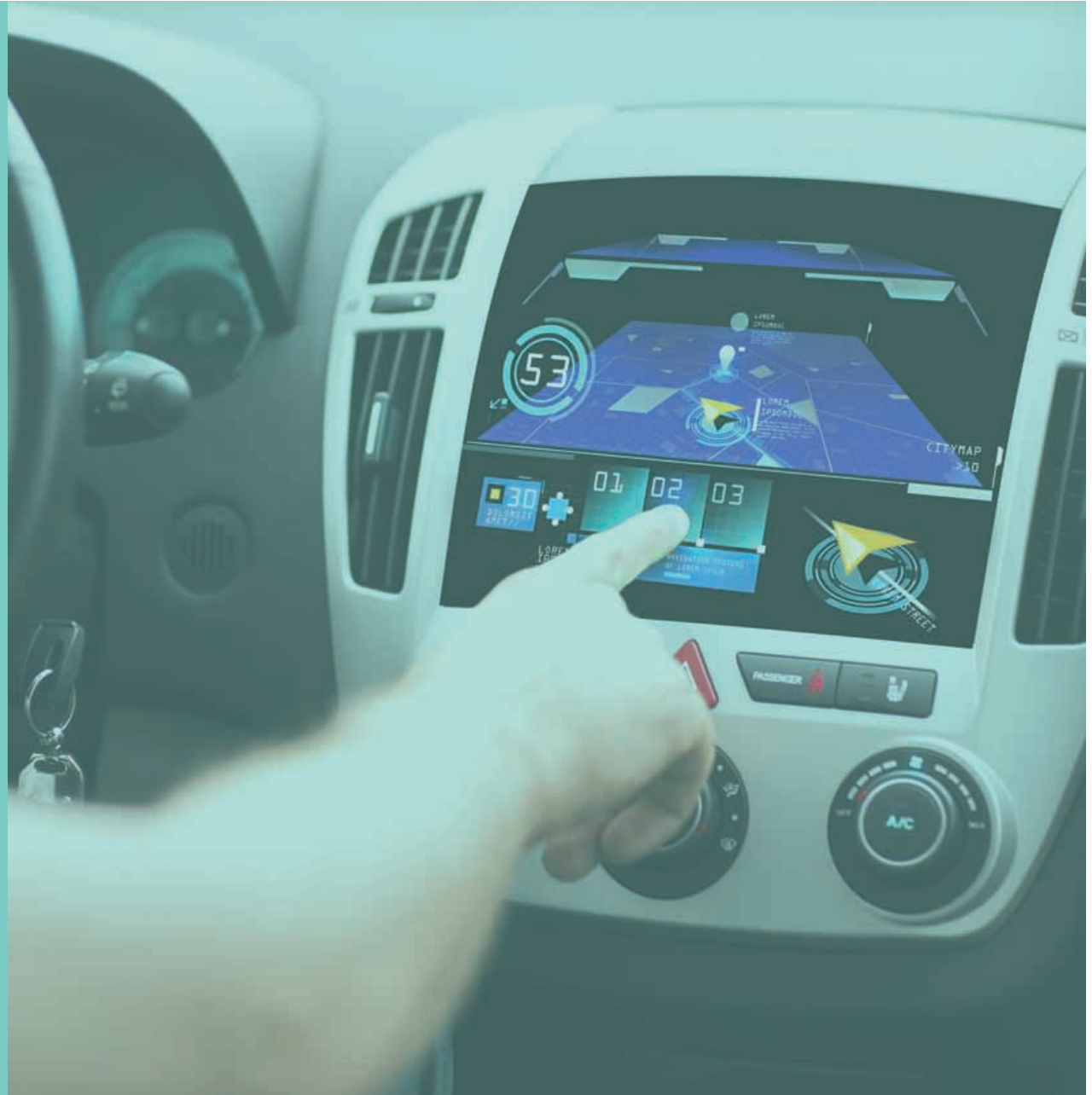
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations									





Axis 3

Smart Routes



The Smart Route concept outlined in this Plan covers aspects relating to the digitalisation of routes, the connection among vehicles, infrastructures and territories, and the prediction of mobility patterns in all modes in order to be able to improve the efficiency of the system by making the smartest possible decisions.

Strategic
Line 1

**Road and
Railway
Digitalisation**

Strategic
Line 2

**Modelling and
Forecasting**

Strategic
Line 3

**Smart
Territories**

Strategic
Line 4

**Logistics and
Freight**

Strategic
Line 5

**New
Transport
Paradigms**

E3L1

Road and Railway Digitalisation

Axis 3

Initiatives

- Standardisation of V2I and V2V communications
- Introduction of a predictive maintenance of transport infrastructures
- Positioning towards 5G networks.
- New security systems in railway infrastructures

Context

In an environment where all improvements are directed towards an increasingly connected world, transport and mobility constitute one of the backbones of the development of our cities, towns, regions and communities.

The development and introduction of connected vehicles will play a fundamental role, providing administrations and transport system managers with tools that will be essential to the exchange of information with users about the different factors that affect mobility and driving: incidents, weather, special events, emergency response, priorities, etc.

The Plan's strategy must focus on information coordination and communication operations through the development of standards and the necessary architecture and the application of wireless technologies permitting communication among vehicles (V2V), the infrastructure (vehicle-road) and devices.

Accordingly, this strategy must be aimed at supporting and promoting **connectivity** among vehicles, the infrastructure, organisations, systems and users in order to arrive at a transport network that is safer, more effective and more efficient.

Connected vehicles must play the role of sensors or monitoring devices of the road, which will have to be equipped with all necessary elements to allow, regulate and promote intercommunication among the infrastructure, vehicles and users.

Vehicle-to-vehicle communications based on **dedicated short-range communications (DSRC) systems**, which make it possible to send road safety messages to vehicles, **need to be regulated within the framework of innovation**. This should also be accompanied with special support for research and development and the implementation of pilot projects.

Likewise, other networks applied to **road-vehicle communication**, such as mobile telephony, Wi-Fi or satellite networks, require decisions to be made at a regulatory level. These communications must be based on the exchange of transport information, the exchange of resources and the laying down and standardisation of **rules of communication among them**. Proper communication between vehicles and roads brings potential benefits to mobility, such as:

Improved efficiency and mobility, as well as improved accessibility for disadvantaged groups.

Access by users as well as by transport administrations and managers to real-time data that assist in the planning and operation of transport systems.

Reduced environmental impact.

Increased safety and fewer accidents via channels for communicating factors affecting driving such as environmental aspects, road incidents or emergency situations.

This correct communication among the different elements has many direct applications in the management and control of traffic and road conditions.

Below are listed some **examples of application**:

- **Dynamic traffic control.** Vehicle speeds and accelerations and distances between vehicles can be dynamically suggested by the infrastructure depending on traffic conditions with a view to optimise overall emissions, fuel consumption, etc. Suggestions can be sent directly to drivers via their vehicles together with variable-message signs.
- **Dynamic signalling management.**
- **Early recognition** of road congestion conditions.
- **Automatic electronic toll collection**, permitting dynamic control based on various parameters such as congestion, pollution and vehicle type.
- **Driving suggestions for vehicles**, which may be directly integrated into vehicle control systems and implemented semi-automatically.
- **Improved interaction among vehicles**, thereby increasing safety, including the interaction among nearby vehicles. When two vehicles are in close proximity to each other, they can automatically link up and share information on their position, speed, distances, directions and so forth. Thus, the uncertainties about the decisions of other nearby vehicles will be drastically reduced, thereby allowing the system to make automatic decisions, issue warnings or take potential actions.
- **Safety** and assistance at slip roads, crossings and other road elements.
- **Assistance** at railway, tram and other level crossings.
- Priority **assignment** to emergency vehicles or law enforcement vehicles.

Railways must also take advantage of these new technologies in order for their performance to be enhanced. At present, their level of penetration in the railway sector is not substantial, so it is therefore necessary to promote the use thereof. Thanks to this, it will be possible to develop different applications and systems that increase safety, optimise maintenance operations, etc. Besides all of the above, pilot projects that allow these technologies to be validated must also be developed and implemented.

Unlike roads, **communication of railway infrastructures with trains** is something that, by its very nature, already occurs naturally and hence is not as decisive as in the case of vehicles on the road. However, it is indeed necessary to develop short-term solutions for certain aspects related to the safety of the railway system in order to allow:

- Train traffic security against internal and external threats to be improved.
- New technology applications to be developed so as to allow currently existing gaps to be bridged and the performance of this means of transport enhanced.
- The automation of certain types of inspection to be promoted.

By Railway Sector Act 39/2003 Port Authorities perform the functions of railway infrastructure managers with respect to the associated infrastructure present at their ports. Thus, the railway-related initiatives contained in this strategic line are also of interest to the Spanish port system.

E3L1-1 Standardisation of V2I and V2V communications

Objectives

- To lay down standards and regulations for regulating V2I communications, the key to the expansion of the autonomous vehicle.
- To ensure the system is interoperable.

Advantages

- Improving road security.
- Improving efficiency and bringing down emissions.
- Encouraging the development of business models related to V2V, V2I and I2I communications.

Description of the initiative

Defining, regulating and standardising communication protocols that allow systems of connected vehicles to be effectively deployed.

These activities affect hardware, software and firmware elements.

The **actions** that need to be undertaken are listed below:

- Creating a standardisation committee on the part of the Ministry of Public Works where all stakeholders are represented.
- Publishing the White Paper on Connected Vehicle Communications.

BUDGET

Standardisation Committee	≈ €250,000
White Paper	≈ €150,000
TOTAL	≈ €400,000

LEADERSHIP



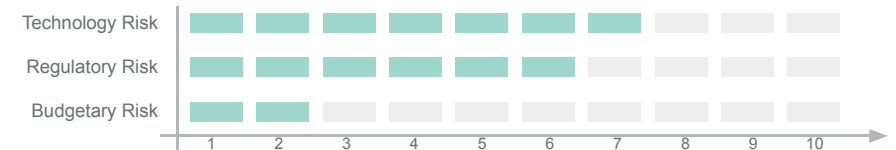
MONITORING INDICATORS

1. The number of standards promoted by the initiative.
2. The number of entities that have joined the White Paper.

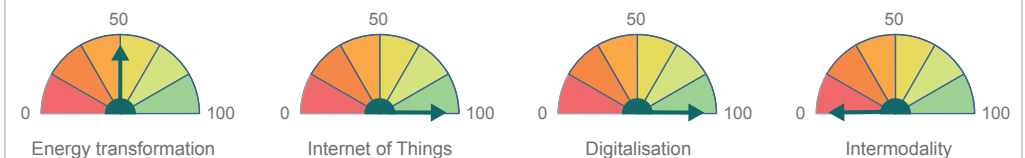
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█								█	
Other stakeholders	Public administrations, car manufacturers									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To develop predictive maintenance models for application in transport infrastructures.
- To make progress in the use of data science and predictive models in the infrastructure sphere.

Advantages

- Achieving the digital transformation of transport infrastructures.
- Optimising public investment in infrastructure maintenance.
- Increasing infrastructure safety.

Description of the initiative

Introducing predictive maintenance processes in transport infrastructures. Predictive maintenance is based on the knowledge of the state of infrastructure elements by monitoring some of their geometric or mechanical parameters. It is thus possible to know the behaviour of a given element in relation to external variables, thereby allowing models that predict its degradation or failure to be developed.

The **actions** that need to be undertaken are listed below:

- Developing predictive machine learning models that are trained using available information.
- Monitoring key infrastructure parameters by means of sensors or other systems.
- Setting in motion pilot projects for predictive maintenance of transport infrastructures.

BUDGET

4 predictive models	≈ €400,000
4 pilot projects	≈ €800,000
TOTAL	≈ €1,200,000

LEADERSHIP



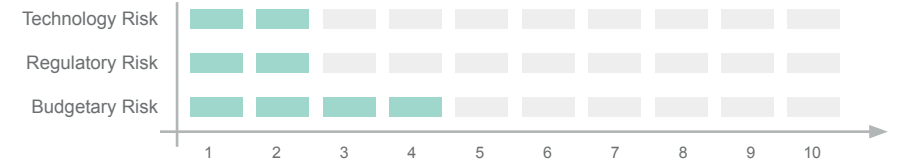
MONITORING INDICATORS

1. The maintenance cost savings achieved in the studied infrastructures.

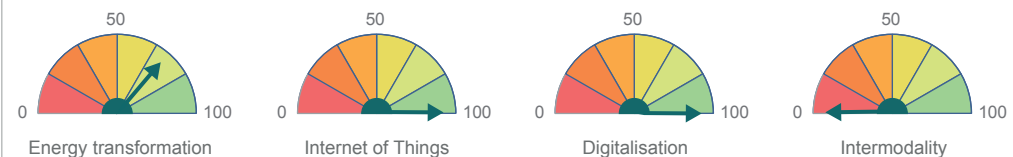
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations									

RISKS



ALIGNMENT WITH THE PLAN



E3L1-3 Positioning towards 5G networks

Objectives

- To plan the introduction of 5G networks in transport infrastructures.
- To identify problems arising from the introduction of 5G networks.
- To optimise the infrastructure and the introduction costs.

Advantages

- Achieving the digital transformation of transport infrastructures.
- Planning the deployment of 5G networks whilst preventing the oversizing of the infrastructures.
- Encouraging the creation of enterprises around 5G connectivity.

Description of the initiative

Setting up a Working Group in charge of planning the deployment of 5G networks, which should play a fundamental role in the future of the transport system and be the foundation for the ecosystem of connected vehicles. The Working Group will plan the deployment of the networks in the transport infrastructures in such a way as to not hinder the development of innovative business models.

The **actions** that need to be undertaken are listed below:

- Setting up a cross-sectoral Working Group.
- Drawing up a 5G Network Migration Plan that sets forth the actions for the correct introduction of 5G connectivity based on the needs of the country and on relevant international initiatives.

BUDGET

Consultancy and Experts Group	≈ €200,000
Drawing up of the Plan	≈ €300,000
TOTAL	≈ €500,000

LEADERSHIP



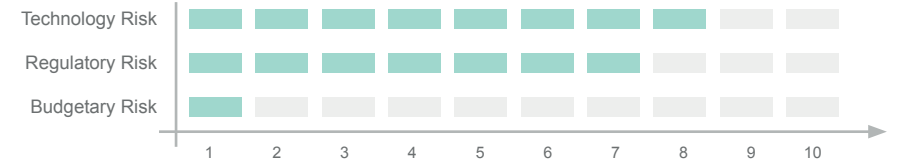
MONITORING INDICATORS

1. The number of initiatives that have been launched based on the Migration Plan.

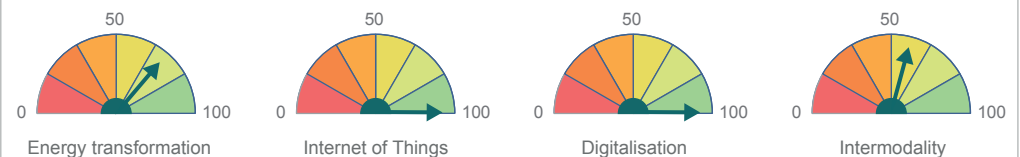
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations Telecom companies									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To develop and test technologies allowing different dangerous situations in the rail infrastructure to be detected.
- To subsequently introduce the most efficient technology regarding reliability, cost and maintainability.

Advantages

- Increasing rail traffic safety.
- Achieving the Fomento Group's technological positioning in a field where there are hardly any commercial products of this nature.

Description of the initiative

The initiative considers the development of three technological systems that are directly related to rail traffic safety:

The **actions** that need to be undertaken are listed below:

- A static, broken-rail detection system (in the infrastructure).
- A system for preventative slope collapse detection, possibly including the additional detection of rocks and other elements on the track.
- A system for detecting the presence of intruders in the vicinity of railway line tracks.

In all cases the use and testing of different types of technology will be encouraged.

BUDGET

Static detection system	≈ €200,000
Intruder detection system	≈ €300,000
TOTAL	≈ €500,000

LEADERSHIP



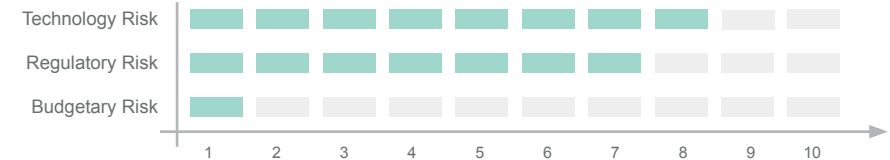
MONITORING INDICATORS

1. Kilometres of track where smart systems have been installed.

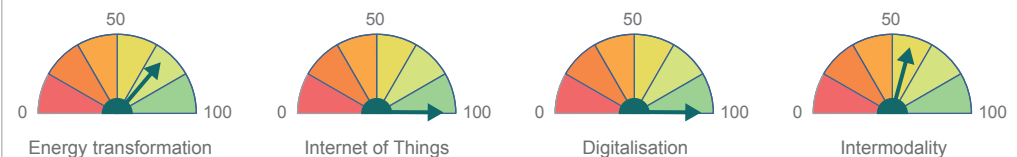
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Universities, private companies									

RISKS



ALIGNMENT WITH THE PLAN



E3L1-5 Deployment of the ERTMS in the Spanish rail network

Objectives

- To plan the deployment of the ERTMS throughout the Spanish rail network.
- To develop low-cost ERTMS applications and their associated specifications.
- To raise the Spanish rail network's safety integrity level to SIL-4.

Advantages

- Transforming the Spanish rail network into a safer, fully interoperable system.
- Positioning Spain as a leader in the development of low-cost ERTMS applications.
- Devising a Migration Plan for the Spanish rail network that could serve as a model for other European countries.

Description of the initiative

By EU mandate, all European countries must begin dismantling their national signalling systems (Asfa in Spain) as soon as possible with a view to completing the migration to the ERTMS in all member countries within a reasonable period of time. In this sense, conducting a technical study to analyse the possibilities of installing low-cost variations of the ERTMS, so that the migration process is financially feasible, is necessary and essential.

The initiative consists of two types of **actions**, which could be concretised in the corresponding associated projects:

1. The setting up of a working group of a technical nature to analyse and study in detail all possible options within the ERTMS that would allow this system to be deployed in the conventional network and in low-traffic lines at an affordable cost. To this end, different options, such as a decentralised ERTMS with mini-LEUs associated with signals, an ERTMS in Limited Supervision mode, the use of Galileo, cutting back on ERTMS functionalities, etc., would have to be studied.
2. The setting up of a working group which can develop, on the basis of the technical conclusions of the above group, a technically and financially realistic plan for the deployment of the ERTMS across the entire network, as mandated by the EU.

BUDGET

Technical evaluation of low-cost ERTMS options	≈ €200,000
Drawing up of a deployment plan	≈ €150,000
TOTAL	≈ €350,000

LEADERSHIP



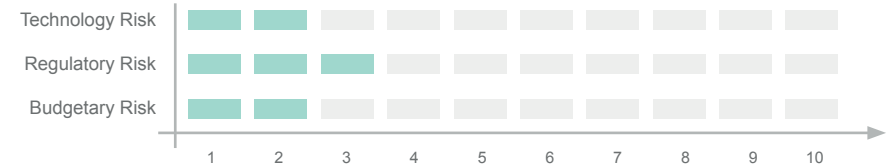
MONITORING INDICATORS

1. The cost saving analysis with the proposed solutions.
2. The completion of a realistic, financially feasible deployment plan.

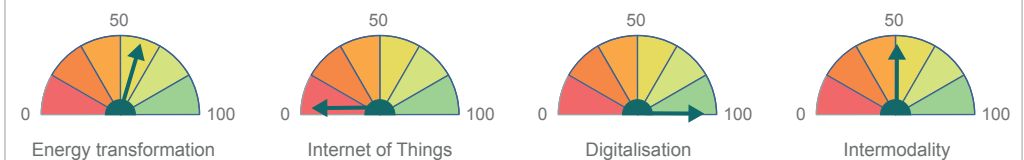
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To integrate BIM methodologies in linear structure management.
- To develop the specific methodology for developing BIM models relating to linear infrastructures.
- To establish procedures that allow the BIM models that are eventually developed to be verified.
- To develop procedures that facilitate the inventorying of the elements of linear infrastructures using innovative techniques.

Advantages

- Extending the BIM methodology to the infrastructure sector, an aspect that is currently underdeveloped worldwide.
- Positioning the Fomento Group as the driving force behind the introduction of the BIM methodology in infrastructure management.
- Integrating BIM models into GIS tools in order to have a single centralised source of information.

Description of the initiative

The integration of the BIM methodology in the design and construction, as well as the subsequent operation and maintenance, of linear infrastructures has been envisaged.

The following **actions** have been envisaged to achieve this:

- Analysing current workflows and optimising them by means of the automation and generation of BIM workflows in design, construction, operation and maintenance processes.
- Digitally inventorying road infrastructures with the aim of improving management and maintenance processes.

BUDGET

Development of the methodology	≈ €150,000
Digital inventorying	≈ €100,000
TOTAL	≈ €250,000

LEADERSHIP



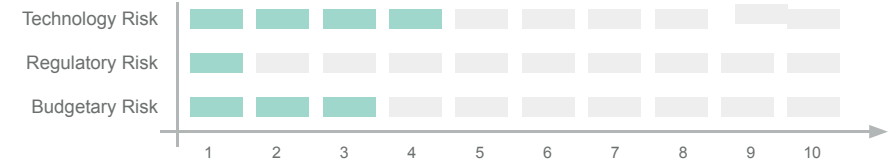
MONITORING INDICATORS

1. The number of BIM-integrated design/construction processes.
2. The number of BIM-integrated maintenance/operation processes.

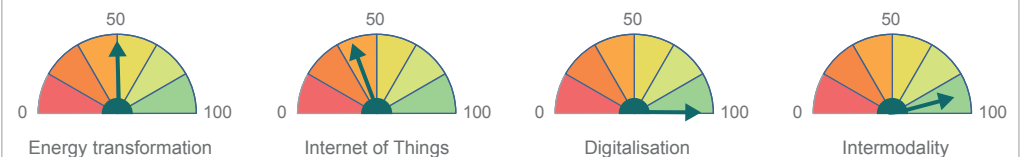
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations									

RISKS



ALIGNMENT WITH THE PLAN

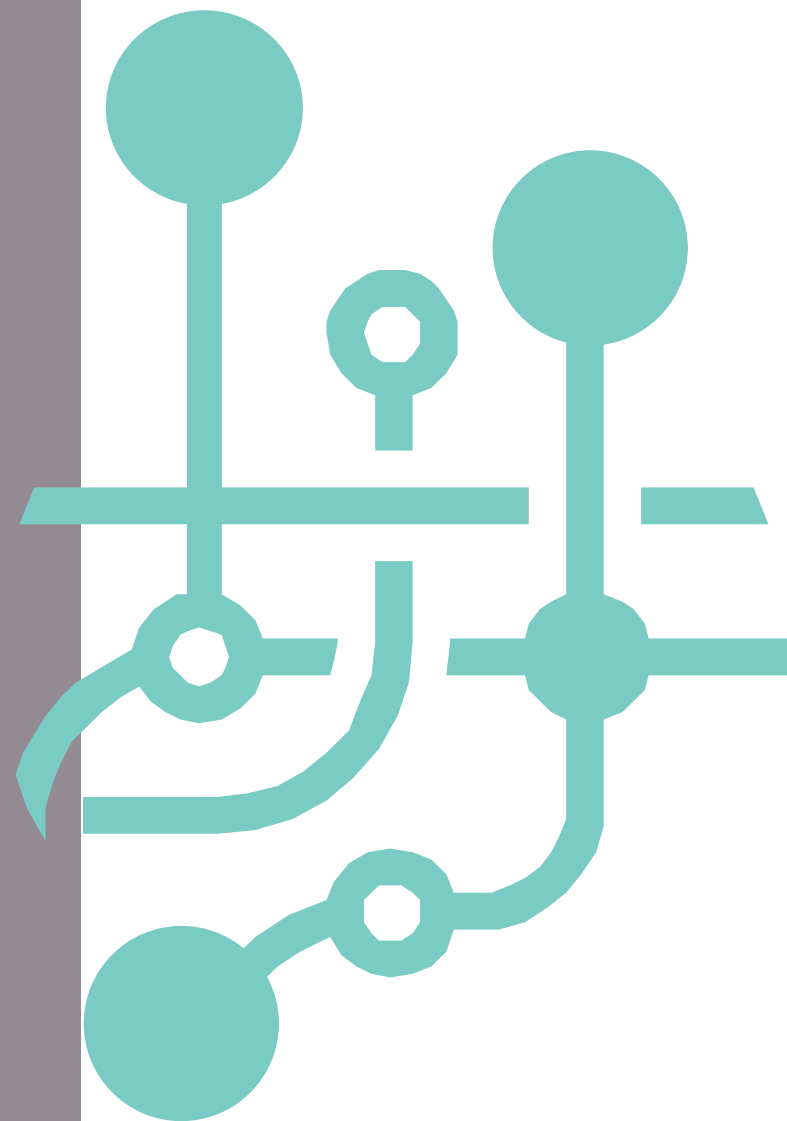


Modelling and Forecasting

Axis 3

Initiatives

- Development of a National Passenger and Freight Multimodal Transport Model
- Pilot project on a predictive transport demand model



Transport modelling is a discipline that aims to simplify the representation of transport systems using mathematical expressions. These models are used worldwide as valuable tools for assisting in the decision-making process associated with transport planning as well as with management and operation. The use of models would allow the impact of changes on the transport system to be assessed in multiple scenarios without using a lot of financial resources. Otherwise the decisions would be very hard and costly to make.

As in many other disciplines, the increase in the amount of information that is available has led to a revolution in the field of modelling, not only with regard to the precision and quality of the models but also to their structure.

This strategic line strives for the development of modelling tools that are suited to the new technological reality and around which the global planning of the Spanish transport system may be articulated. In this respect, all transport models that are eventually developed will be closely associated with the User Platform and the Freight Platform, which will have all necessary information to properly calibrate and validate the former for use in the decision-making process.

These models will allow an up-to-date repository of both passenger and freight transport costs to be created that may be used by public and private stakeholders to optimise their operations. Moreover, the modelling tools that are developed within the framework of this strategic line will serve as the foundation for other initiatives included in the Plan, such as the planning of transport routes or the monitoring of traffic.

Having a National Transport Model within the Fomento Group will allow all stakeholders to have a tool with unified, up-to-date information.

This will allow all decisions that are made within the framework of the transport system by each agent and in each mode to be aligned with and to arise from homogeneous information whilst simultaneously optimising costs, thus precluding each company from developing its own particular tools for analysing and forecasting the evolution of the network. Further along these lines, and in view of successful international experiences, it is considered particularly relevant to analyse the possibilities of turning the National Transport Model into a basic tool to be used, by means of accreditation and licensing mechanisms, in public tenders to conduct studies whenever the changes that are expected to take place in the Spanish transport system need to be analysed. Thus, managers, administrations and public and private companies would have a tool to guarantee the unification of the criteria and the homogenisation of the data used by the strategic decision-making tools of the Spanish transport system.

On the other hand, this strategic line contemplates the development of **new transport modelling methodologies** based on Big Data Architectures and Machine Learning that may replace traditional processes in the future.



E3L2-1 Development of a National Passenger and Freight Multimodal Transport Model

Objectives

- To have an integrated multimodal tool that allows passenger and freight transport projects and policies to be planned and evaluated.
- To have a basic tool for planning and optimising multimodal routes.

Advantages

- Evaluating plans, programmes and projects, as well as any transport policy, in a comprehensive, multimodal manner.
- Upgrading the methods of calibration and adjustment of transport models through the massive use of data.
- Having a tool that cross cuts the Plan and affects multiple strategic lines.

Description of the initiative

Building and calibrating a National Transport Model as a project and policy planning and evaluation tool. The model will be developed following industry trends, which will require the use of big data sources that integrate the information of the Spanish transport system in a complete, up-to-date manner: data from linear and nodal infrastructures with their attributes, segmented and georeferenced pursuant to the standards set by the EU that allow them to be compatible and added to the Trans-European Transport Network (TEN-T), as well as to be consolidated in the future HERMES system (a multimodal, cross-cutting corporate technology platform that will integrate the general interest transport network information in Spain in a complete, up-to-date and accessible manner from any online device); data on the characteristics of the offer of services; and data about national and international mobility linked to the activity of the territories and the population and to land use, among other things.

The actions that need to be undertaken are listed below:

- Building, calibrating and validating the National Transport Model according to the most advanced techniques.
- Using multiple functionalities and integrating them in the model: strategic planning, corridor planning, service and route optimisation, environmental assessments related to plans and projects, etc.
- Analysing the possibilities of applying the National Transport Model as a basic tool to be used, by means of accreditation and licensing mechanisms, in public tenders.
- Integrating the smart and service platforms as information sources for the model.

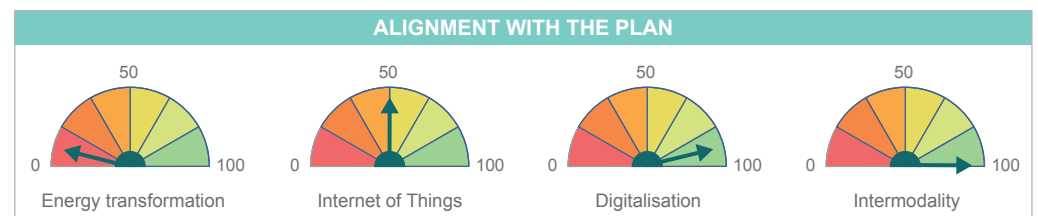
BUDGET	
Building of the NTM	≈ €950,000
Integration with platforms	≈ €200,000
TOTAL	≈ €1,150,000

LEADERSHIP



MONITORING INDICATORS
1. The number of applications, uses and studies arising from the National Transport Model.

STAKEHOLDERS																															
	<table border="1"> <thead> <tr> <th>Ministry of PW</th> <th>Adif</th> <th>Renfe</th> <th>Aena</th> <th>Enaire</th> <th>Crida</th> <th>Puertos del Estado</th> <th>Ineco</th> <th>Cedex</th> <th>Sasemar</th> </tr> </thead> <tbody> <tr> <td>Stakeholders</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Other stakeholders</td> <td colspan="9">Public administrations, telecom companies</td> </tr> </tbody> </table>	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar	Stakeholders										Other stakeholders	Public administrations, telecom companies								
Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar																						
Stakeholders																															
Other stakeholders	Public administrations, telecom companies																														



E3L2-2 Pilot project on a predictive transport demand model

Objectives

- To improve the processes for estimating the demand for transport in the short term.
- To generate value from the information collected in the User Platform and the Freight Platform.

Advantages

- Improving the precision in the forecasting of the short-term transport demand.
- Obtaining value from the existing information.
- Optimising traffic management and automating processes.

Description of the initiative

Implementing a pilot project for short-term demand estimation based on machine learning processes. It will thus be possible to use short-term demand forecasting in multiple traffic management applications.

The **actions** that need to be undertaken within the framework of the initiative are as follows:

- Analysing machine learning techniques and their suitability for traffic demand modelling.
- Obtaining historical data of demand in a real environment.
- Developing, calibrating and evaluating a predictive transport demand model and implementing it in a real environment.

BUDGET

Development of the predictive model	≈ €300,000
Pilot project	≈ €200,000
TOTAL	≈ €500,000

LEADERSHIP



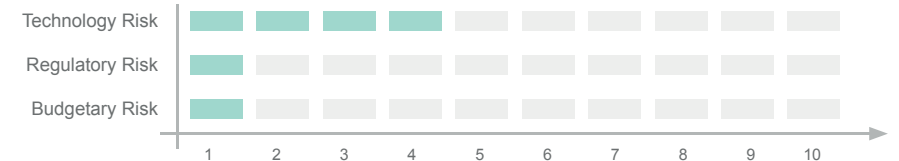
MONITORING INDICATORS

1. The number of applications, uses and studies arising from the predictive model.
2. The appraisal of the pilot project.

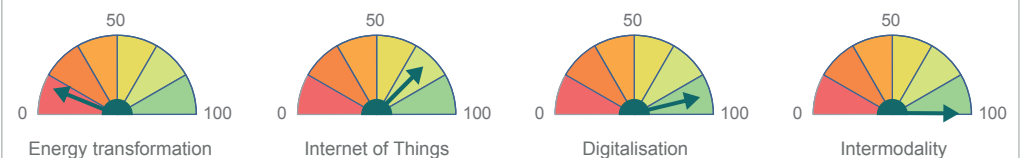
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations									

RISKS



ALIGNMENT WITH THE PLAN



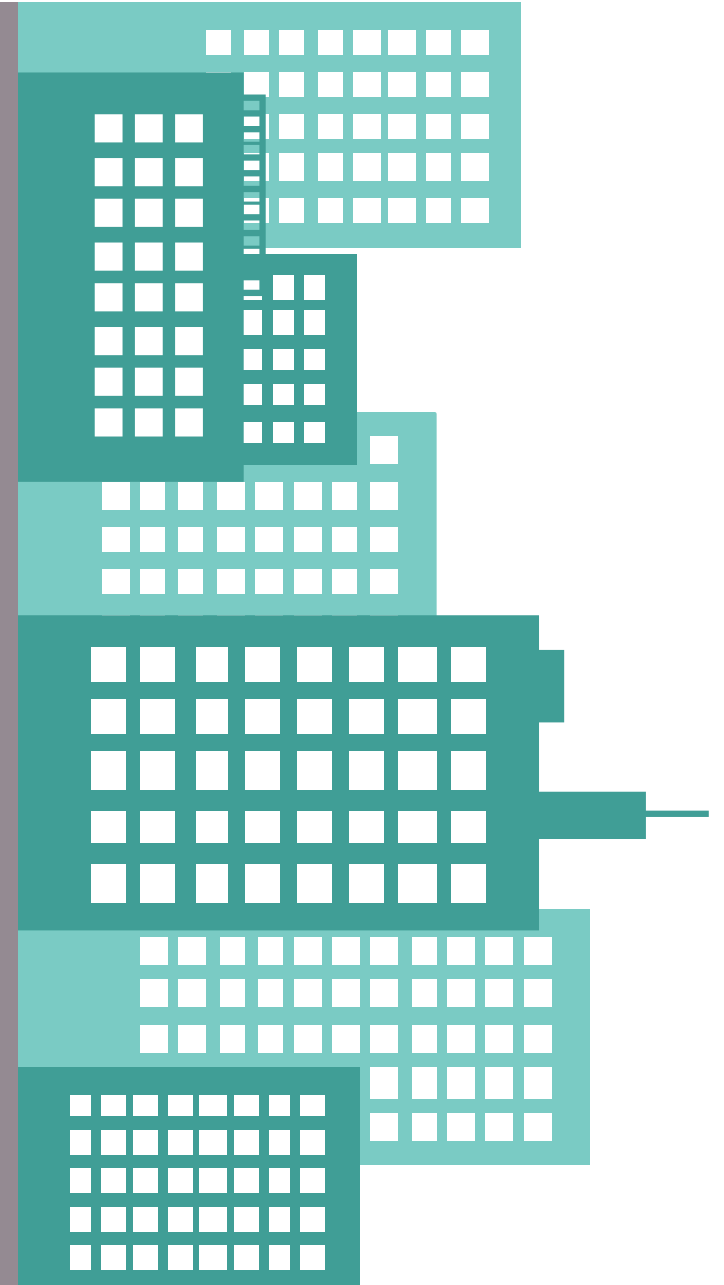
● E3L3 ●

Smart Territories

Axis 3

Initiatives

- On-demand transport system in rural areas
- Pilot project on dynamic public transport routes



Context

The outset of the 21st century and the increase in the number of challenges linked to globalisation have made it necessary at a global level to reconsider development strategies and to break with traditional territory management models.

According to the United Nations, the high population concentration in cities (according to the latest figures from the UN, 58% of the world's population presently lives in cities, a figure that goes all the way up to 75% in the case of Europe), the high demand for resources by its inhabitants (60-80% of energy consumption) and the huge generation of emissions (75% of carbon emissions) are some of the growing problems that cities face. However, not only cities demand attention. Rural municipalities also have an endless number of needs, which are much more accentuated due to the difficulties inherent to these territories: deficiencies in the provision of basic services and lack of technological infrastructures, low economic productivity, demographic dispersion, etc. These are some of the consequences the scant attention that has been traditionally paid to these territories has had. Islands have shortages similar to those of rural areas, and sometimes they are usually less well served by development policies.

In view of these widespread problems, it is necessary to take advantage of the strengths of each territory,

to efficiently manage the concentration of its population, to establish a better connection among territories (such as access to public services, efficient transport, reliable energy networks and broadband internet connection) and to develop a cooperation strategy. Thus, a functional approach to the integrated development of territories will be promoted through this Plan, giving rise to Smart Territories.

A **Smart Territory** is capable of addressing the common issues affecting its population regardless of the territorial organisation it belongs to. Therefore, Smart Territories need a joint development model that enables their cities, rural areas and islands to develop a sustainable economic structure and have efficient infrastructures and public services whilst

remaining committed to the environment. All of this without forgoing the use of ICT tools to boost their productivity and competitiveness in order to achieve their main objective: to improve the quality of life of their citizens.

From the point of view of mobility and transport, the rural environment has the problems of accessibility to infrastructures and the widespread use of low-occupancy private vehicles. This results in the inefficient use of infrastructures and unsustainable mobility.

Objectives

This Plan propounds developing innovative initiatives for the **dynamic planning of services** in both rural and urban settings.

This type of solution is currently being developed and researched by means of pilot tests in different cities and countries, which can be taken as a point of reference to start developing one or more pilot projects entailing both the design of new applications and their integration with smart platforms, as well as conducting tests on the vehicles that would provide these services and which would also have to be adapted by means of the appropriate technology.

E3L3-1 On-demand transport system in rural settings

Objectives

- To promote an efficient rural transport system adapted to passenger demand.
- To improve the accessibility of the rural population, especially seniors, to a universal transport system.

Advantages

- Having a more efficient and sustainable public transport.
- Improving the accessibility of the rural population.
- Optimising the running costs associated with public transport in rural settings.

Description of the initiative

Developing an on-demand transport management system and introducing it in rural environments. The system would be designed taking into account previous experiences and with the aim of being introduced across the Spanish territory – something which would be required in concession specifications.

The **actions** that need to be undertaken within the framework of the initiative are as follows:

- Analysing prior national and international experiences and the requirements of the system.
- Designing the architecture of the system and drawing up a plan for introducing it.
- Developing and implementing a pilot project.

BUDGET

Preliminary consultancy and design of the system	≈ €200,000
Development of the system and the pilot project	≈ €600,000
TOTAL	≈ €800,000

LEADERSHIP



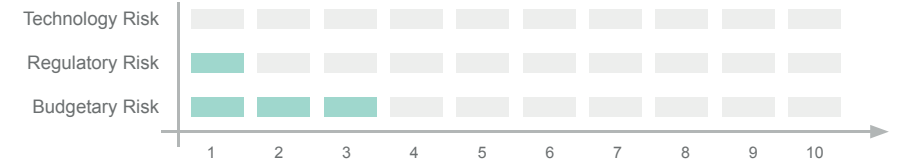
MONITORING INDICATORS

1. The number of public transport routes that are running with the system.
2. The decrease in the running costs to passengers ratio.

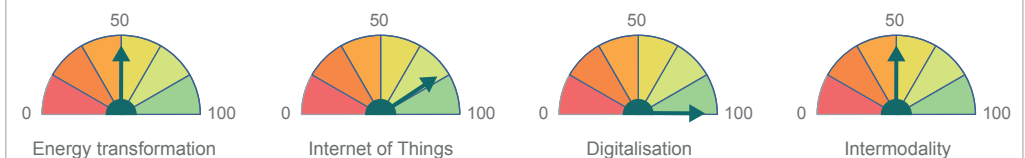
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█							█		
Other stakeholders	Public administrations, transport operators									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To increase accessibility in peri-urban areas with low population density.
- To analyse the operation of a pilot project on a dynamic bus route whose route and stops are adapted to match the demand.

Advantages

- Improving the mobility and accessibility conditions of the citizenry.
- Improving the efficiency of the public transport system.
- Incorporating more technology into the efficient management of bus transit.

Description of the initiative

Implementing a pilot project on a dynamic bus route whose route and stops are adapted to match the users' needs. The system will be designed taking into account international experiences and adapted to match the needs of Spanish users.

Whether the pilot project can be implemented in some of the concessions of the Ministry of Public Works or whether it will be necessary to set up some form of collaboration with another Administration will be analysed.

The **main actions** that need to be undertaken are listed below:

- Analysing prior national and international experiences and the requirements of the system.
- Designing the system and implementing the pilot project.

BUDGET

Preliminary consultancy	≈ €150,000
Pilot project	≈ €250,000
TOTAL	≈ €400,000

LEADERSHIP



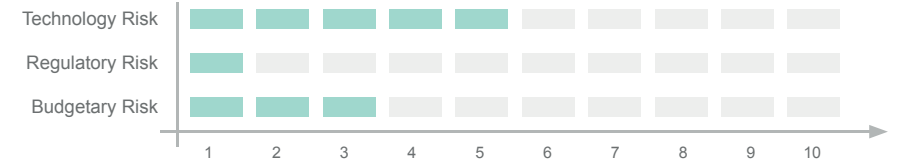
MONITORING INDICATORS

1. The users' opinion of the new system.
2. Passenger demand.

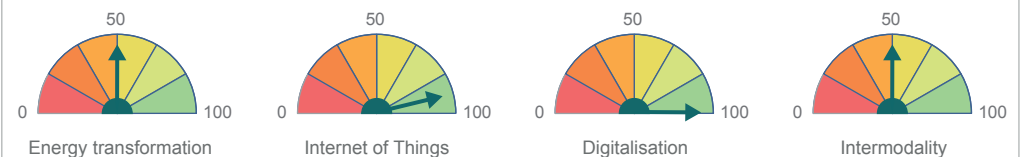
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations, transport operators									

RISKS



ALIGNMENT WITH THE PLAN



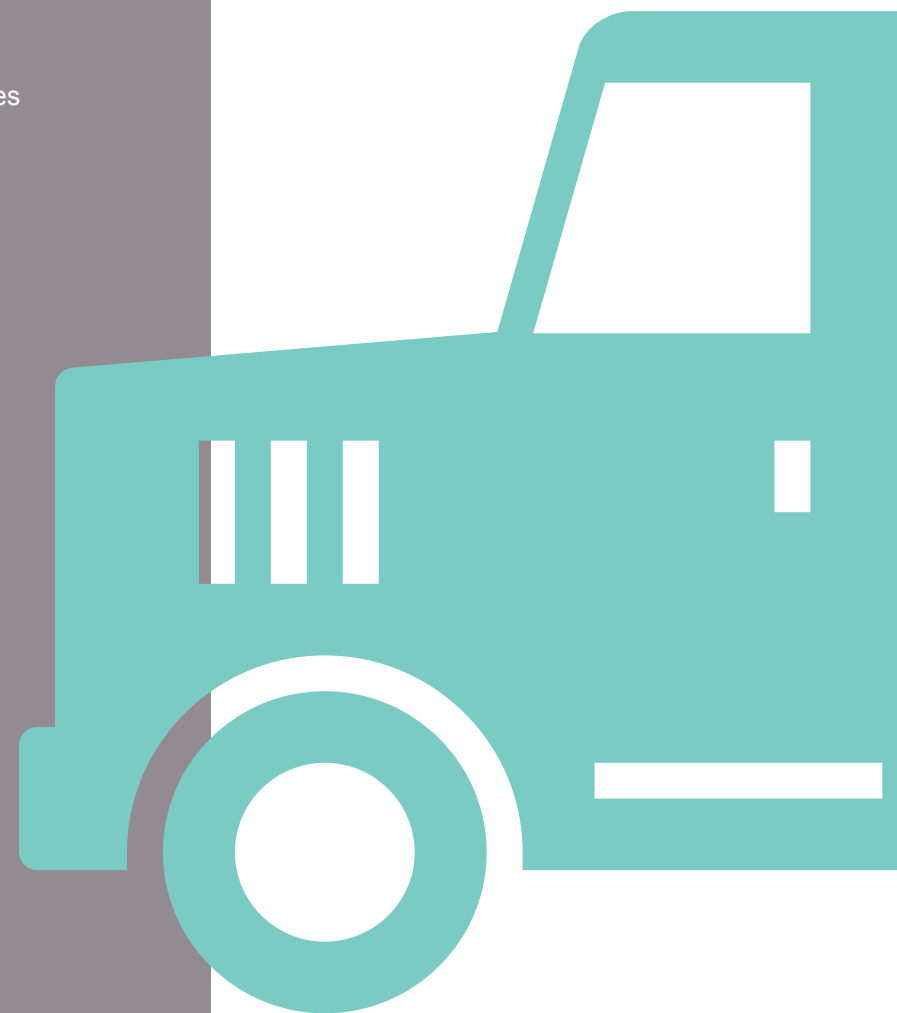
● E3L4 ●

Logistics and Freight

Axis 3

Initiatives

- All-inclusive transport cost observatory
- Intermodality without barriers
- Introduction of last mile services at the Fomento Group



Context

Freight transport is a fundamental aspect in modern economies, and the optimisation and proper management of transport flows is a differentiating factor in competitiveness. Intermodality, articulated through the logistics chain, allows resources to be optimised, with the resulting economic and environmental benefits.

The future of this field lies in optimising the logistics chain further by using information properly and **removing barriers** from intermodal interfaces. This is why it is essential for this sector to make progress in transparency and the integration of data that will allow the logistics chain to be comprehensively managed.

Within this Innovation Plan, setting up an **all-inclusive observatory of freight transport data** that allows optimal routes to be planned according to different parameters, such as time, cost, emissions and consumption, is deemed essential.

On the other hand, the Fomento Group must position itself adequately in a sector of such enormous potential as that of **last mile distribution**. The Plan puts forward an initiative aimed at establishing rail services that encompass the last mile, thereby constituting a new door-to-door intermodal solution.

On the other hand, the impact that Big Data and advanced data analysis might have on demand forecasting must be taken into account from the point of view of service organisation and optimisation.

Freight transport intermodality can be transformed by means of the introduction of more sustainable, competitive and efficient logistics chains.



E3L4-1 Freight transport cost observatory

Objectives

- To set up a freight cost observatory that allows the main cost elements of each mode of transport to be easily identified.
- To allow the cost of transport to be modelled according to certain parameter, such that it may be possible to compare the costs of the different modes of transport.
- To coordinate this observatory with the Freight Platform that will be developed under Axis 2 - Smart Platforms.

Advantages

- Centralising transport cost information.
- Having the possibility to use costs as a variable for route optimisation and efficiency improvement.
- Reducing polluting emissions from freight transport.

Description of the initiative

The initiative consists in setting up a freight transport cost observatory that allows costs to be modelled using all available information from each mode of transport.

The **main actions** that need to be undertaken are listed below:

- Defining cost parameters and indicators on the part of a committee of experts
- Integrating this cost observatory into the Transport and Logistics Observatory of the Ministry of Public Works.
- Coming up with a model that allows costs to be aggregated and utilised jointly with the Freight Platform.

BUDGET

Preliminary consultancy	≈ €150,000
Development of the portal and integration	≈ €550,000
TOTAL	≈ €700,000

LEADERSHIP



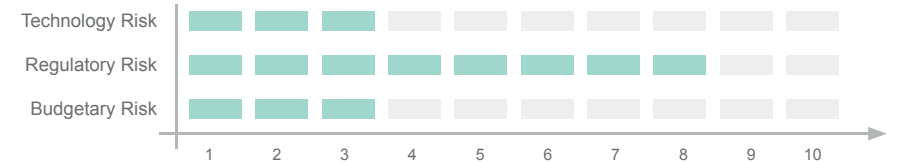
MONITORING INDICATORS

1. The number of accesses to the observatory.

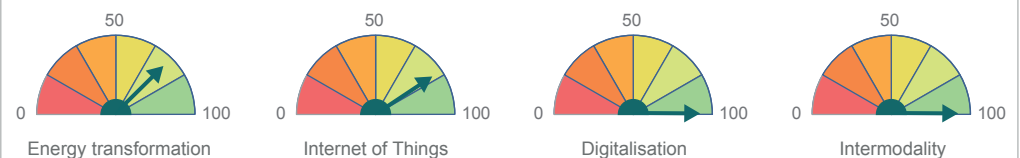
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█	█	█	█	█	█	█	█	█
Other stakeholders	Regional and local administrations, private companies									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To improve the productivity, competitiveness and efficiency of the different multimodal freight transport sectors and agents.
- To harmonise and simplify administrative procedures in modal changes and standardise intermodal transport documents.
- To reuse information along the logistics and transport chain.
- To interconnect the public administration and the private sector in order to facilitate trade and transport at the Spanish, European and international levels.
- To integrate data and be able to share it on the future SIMPLE (SIMplification of Processes for a Logistic Enhancement) technology platform.

Advantages

- Facilitating and anticipating the exchange of electronic data among the different actors.
- Enhancing the capability to plan operations in modal interchanges.
- Knowing in real time the traceability of the means of transport and the goods transported by them along the intermodal transport chain.
- Facilitating the job of the control and inspection services of the different administrations.

Description of the initiative

Developing a comprehensive, collaborative management system, among the different modes and nodes of the transport chain, for the digitisation of the flows of information and documents associated with multimodal freight transport so as to facilitate the exchange of information among the different stakeholders (SIMPLE). This system would be part of the Freight Platform developed under Axis 2 of this Plan.

This initiative will be carried out under the aegis of a collaboration agreement among the Secretary of State for Infrastructure, Transport and Housing, Puertos del Estado, Renfe and Adif.

The main actions that need to be undertaken are listed below:

- Getting guidance on how to lay down the functional and technological bases of the future SIMPLE system in a Master Plan (this has been done already).
- Developing the SIMPLE system defined in the Master Plan.
- Introducing the system.
- Carrying out the initial operation and maintenance of the system.

BUDGET

Development of the SIMPLE platform	≈ €3,290,000
Introduction of the system	≈ €970,000
Operation and maintenance	≈ €1,000,000
TOTAL	≈ €5,260,000

LEADERSHIP



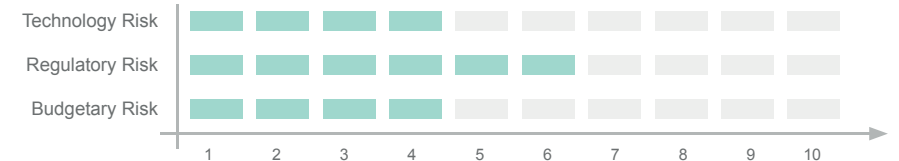
MONITORING INDICATORS

- The decrease in the average time spent doing paperwork.
- The stakeholders' opinion of the system.

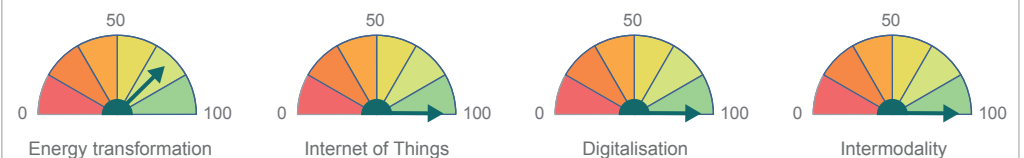
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations, transport operators									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To create door-to-door freight services, incorporating last mile delivery into the standard products.
- To develop new business lines related to rail freight transport.
- To participate in a market of such enormous economic potential as that of last mile distribution.

Advantages

- Expanding the Fomento Group's traditional business lines.
- Entering markets with huge economic potential.
- Increasing the modal share of railways in freight transport.

Description of the initiative

Developing a freight transport service that combines the rail mode with last mile distribution and markets them together.

To this end it will be necessary to seek a partnership with a distribution company and launch a pilot project to analyse its operation.

The **main actions** that need to be undertaken are listed below:

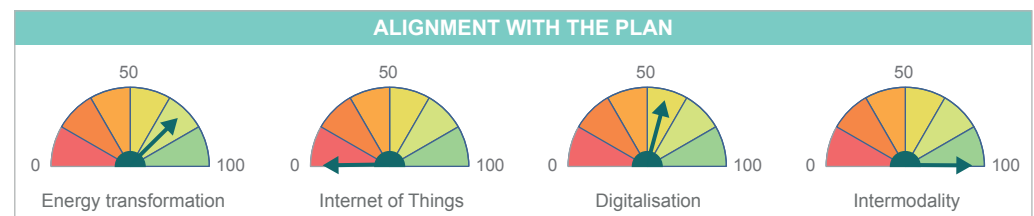
- Entering into a rail freight operation partnership with a last mile distribution company.
- Launching a pilot experience on the commercialisation of the service and evaluating it.

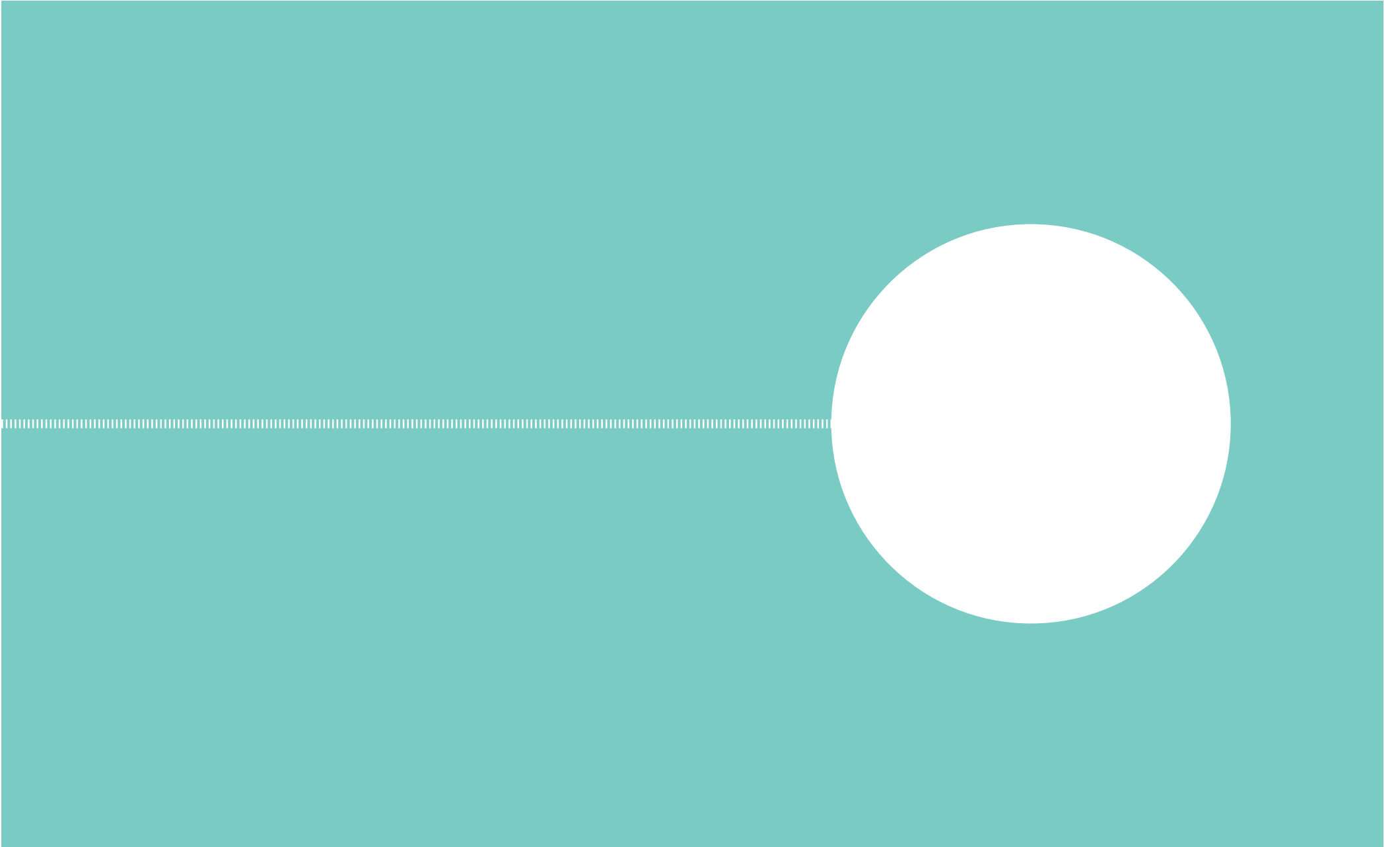
BUDGET	
Commissioning of the multimodal service	≈ €300,000
TOTAL	≈ €300,000



MONITORING INDICATORS
1. The turnover of the new service.
2. The number of new customers.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators									





E3L5

New Transport Paradigms

Axis 3

Initiatives

- Technology Watch Group
- Hyperloop Strategy
- Unmanned Aerial Vehicle Lab

Context

Global transport and mobility systems are already immersed in a **process of ongoing transformation and adaptation** to the new technological paradigms that have emerged in the sector.

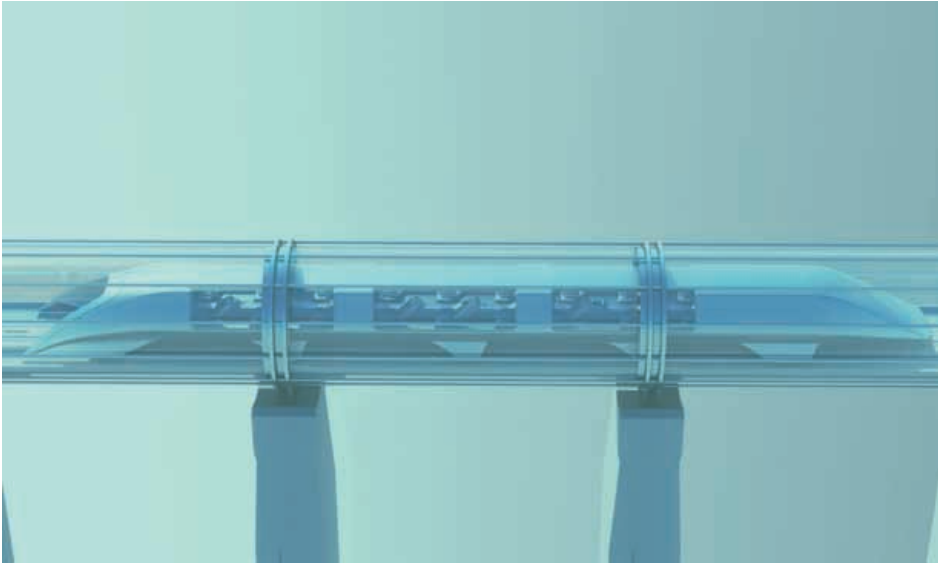
This transformation process will have an even greater impact when the new **disruptive technology** that is emerging in terms of mobility, transport and communication, and entails **new personal mobility options**, as well as **new business models** and strategies for all stakeholders involved in the sector, is taken into consideration.

Objectives

- To identify the R&D lines that will allow the viability of these new paradigms to be determined.
- To support the establishment of a legal framework that defines and regulates the potential implementation of these paradigms.
- To encourage open innovation among the Group's companies and other organisations so as to allow pilot projects that help in making decisions about and speed up the sector's transformation process to be developed.

What is it all about?

This transition and transformation process requires social, legislative, regulatory, economic and environmental adaptation whilst at the same time requiring new models of collaboration that must be taken into account in order to effectively transition towards the **new transport model**.



HYPERLOOP

The new transport system created by **Elon Musk**, which could transport people and cargo inside vacuum tubes at a speed of 1,200 km/h, is taking its first steps towards becoming a reality that will revolutionise mobility and become an alternative to ships, planes, cars and trains.

This system, which is based on the use of **pressurised capsules that will travel through reduced-pressure tubes** and float on a cushion of air, will allow these capsules to be economically propelled by means of linear induction motors and air compressors.

Elon Musk is not pursuing the project on his own but has instead promoted it from two angles:

- On the one hand, by **organising competitions** in which teams of university students and professionals from all over the world have taken part to come up with the capsule's specific design.
- On the other, by **starting up two pioneering companies** – Hyperloop One and Hyperloop Transportation Technologies (HTT) – which are looking to bring on board different professionals and associations in the sector and **to enter into agreements with the governments** of different countries to introduce the new transport system in their territories for the very first time.

DRONES

Continued progress in the field of drones and other unmanned aerial vehicles is leading to a swift increase in their use, opening up new possibilities in the field of parcel distribution and delivery and improving accessibility to isolated, hard-to-reach places or to sparsely populated areas. At the global level, major international shipping and distribution companies, among others, have gradually begun to

employ drones in their activities. After years of testing in which the different advantages (such as speed, the ability to reach isolated locations or new delivery possibilities within specific time ranges in rural areas, among others) as well and limitations (vulnerability to meteorology, load restrictions, autonomy limitations, etc.) of drones have been shown, one of the great challenges to the evolution of the use of drones is

the regulation of this use and the setting of all the regulations and standards that must be laid down in order to be able to use drones in day-to-day operations.

E3L5-1 Setting up of the Technology Watch Group

Objectives

- Setting up a Working Group that is dedicated to transport technology watch.
- Defining technology watch-related processes within the Fomento Group.
- Coordinating technology watch efforts at the Fomento Group, taking advantage of synergies and creating cross-cutting products.

Advantages

- Setting up a Working Group that is dedicated to transport technology watch.
- Defining technology watch-related processes within the Fomento Group.
- Coordinating technology watch efforts at the Fomento Group, taking advantage of synergies and creating cross-cutting products.

Description of the initiative

Setting up a working group to be in charge of technology watch tasks at the Fomento Group. The group will first define the processes that will govern technology watch at the Group and then coordinate them with the people who are responsible for innovation at the different entities.

The **actions** that need to be set in motion are as follows:

- Forming the working group with experts in different transport sectors and delimiting its scope of responsibilities and where it will fit within the Group's organisation chart.
- Developing the Fomento Group's Technology Watch processes.

BUDGET

Setting up of the Working Group	≈ €280,000
TOTAL	≈ €280,000

LEADERSHIP



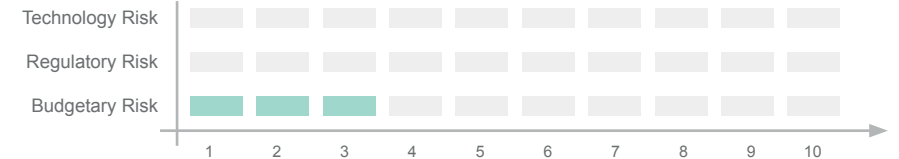
MONITORING INDICATORS

1. The number of corporate technology watch processes that have been approved.

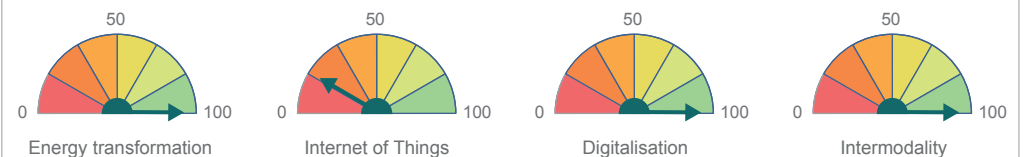
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders										

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To define Spain's position on Hyperloop. To analyse the opportunities, challenges and risks associated with the implementation of Hyperloop.
- To analyse the legal framework for Hyperloop deployment.
- To look for new opportunities of involvement in the Hyperloop project for Spanish companies.

Advantages

- Gaining international visibility to attract new business opportunities.
- Conducting an analysis of Hyperloop's implications for transport in order to allow the Spanish strategy towards this new mode of transport to be laid down.
- Encouraging public-private collaboration.

Description of the initiative

Hyperloop is a new transport system that is undergoing development and could revolutionise intercity mobility thanks to its novel concept of passenger and freight transport. The underlying idea is to provide on-demand mobility in a fast (speeds of up to 1,200 km/h), efficient (solar panels along the routes to provide most of the energy needed by the system) and safe way. Teams from all over the world are already working on the new concept, including the Spanish PrimeX team, which was a finalist in the European Hyperloop One competition that took place in September 2017 with a project for travelling between Madrid and Tangier in 38 minutes. This new concept creates many opportunities and raises a few challenges and questions that have yet to be answered, such as its technical feasibility in some fields, operational aspects and its legal and regulatory framework, all of which are essential to the system's actual implementation in a territory.

The **main action** that needs to be undertaken is the setting up of a Hyperloop Commission that will be coordinated by the Ministry of Public Works and tasked with:

- Monitoring international Hyperloop-related initiatives and analyses.
- Encouraging public-private initiatives for analysing the feasibility of this new mode of transport.
- Exploring the legal framework needed to regulate Hyperloop.
- Monitoring new technologies that might arise as a result of Hyperloop's innovation programmes and be applicable to other modes of transport.
- Publishing a Spanish consultation document summarising the Hyperloop-related work carried out up to that moment that may serve as a document of reference at the international level and create business opportunities.

BUDGET

Setting up of the Hyperloop Commission and performance of the associated studies	≈ €90,000
TOTAL	≈ €90,000

LEADERSHIP



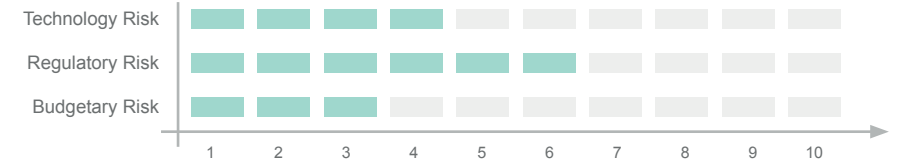
MONITORING INDICATORS

1. The number of feasibility studies that have been conducted.
2. The publication of the Spanish consultation document.

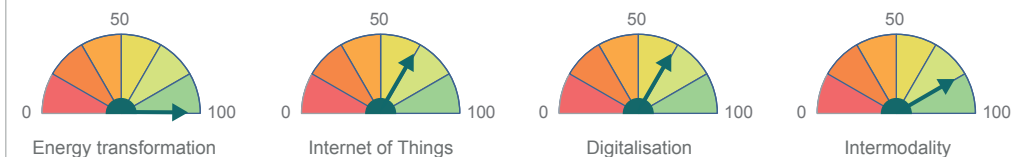
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Public administrations, private companies, universities, innovation hubs									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To develop new business models using Unmanned Aerial Vehicles.
- To perform proofs of concept using disruptive models.
- To create business opportunities that have a big impact for the Fomento Group.

Advantages

- Creating new big-impact business opportunities on the part of the Fomento Group.
- Positioning the Fomento Group in a sector with huge economic potential.
- Providing the Group with visibility at an international level.

Description of the initiative

Setting up a Laboratory that will be in charge of developing new business models related to Unmanned Aerial Vehicles. The Laboratory's job will be to generate ideas and to test them by means of proofs of concept and simple pilot projects for assessing their potential.

The **immediate actions** that need to be undertaken are:

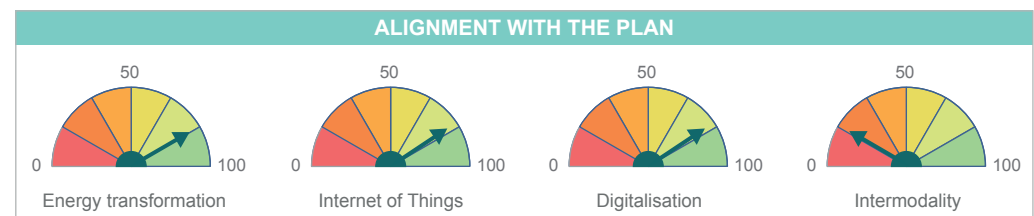
- Setting up the lab and assigning a budget and staff to it. Documentation laying down the responsibilities and competencies and work plans will be prepared.
- Implementing pilot projects or proofs of concept based on the ideas generated at the Laboratory.

BUDGET	
Setting up of the Laboratory	≈ €300,000
TOTAL	≈ €300,000



MONITORING INDICATORS
1. The number of pilot projects that have been set in motion.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders										



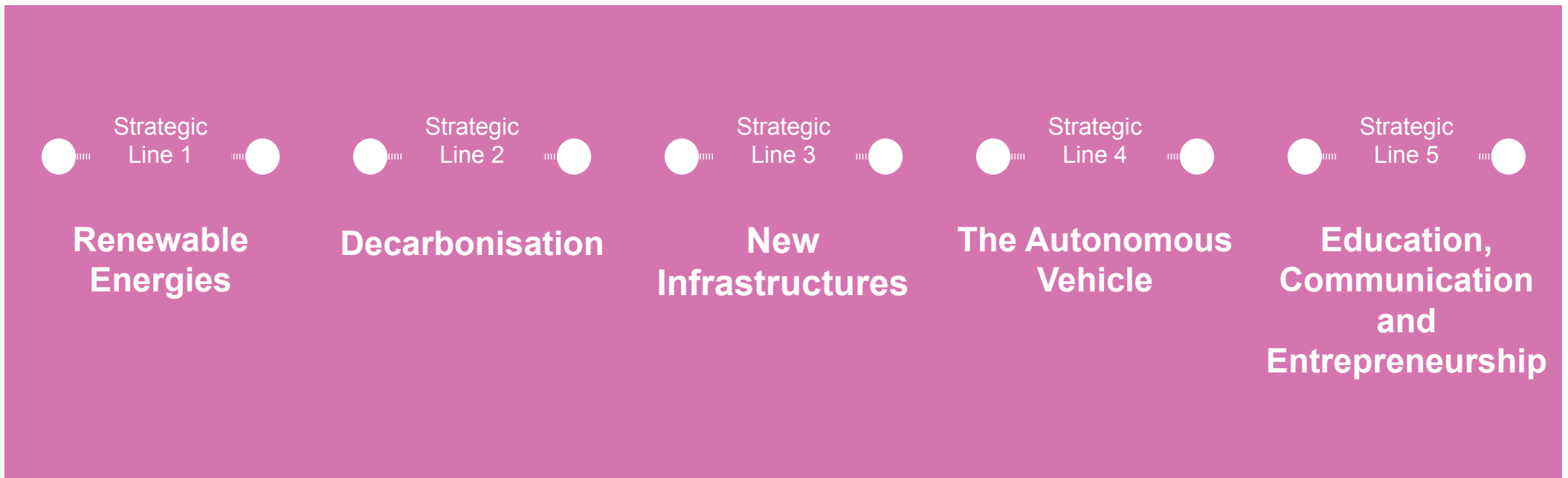


Axis 4

**Energy
Efficiency and
Sustainability**



Transitioning towards a sustainable, energy-efficient transport system is an urgent necessity in order to bring about a reduction in greenhouse gas emissions, rationalising the use of fossil fuels and facilitating the switch to new technologies such as e.g. electric and autonomous vehicles. In turn, this transition requires improving overall efficiency, thereby bringing transport costs down and thus improving the competitiveness of the country as a whole.



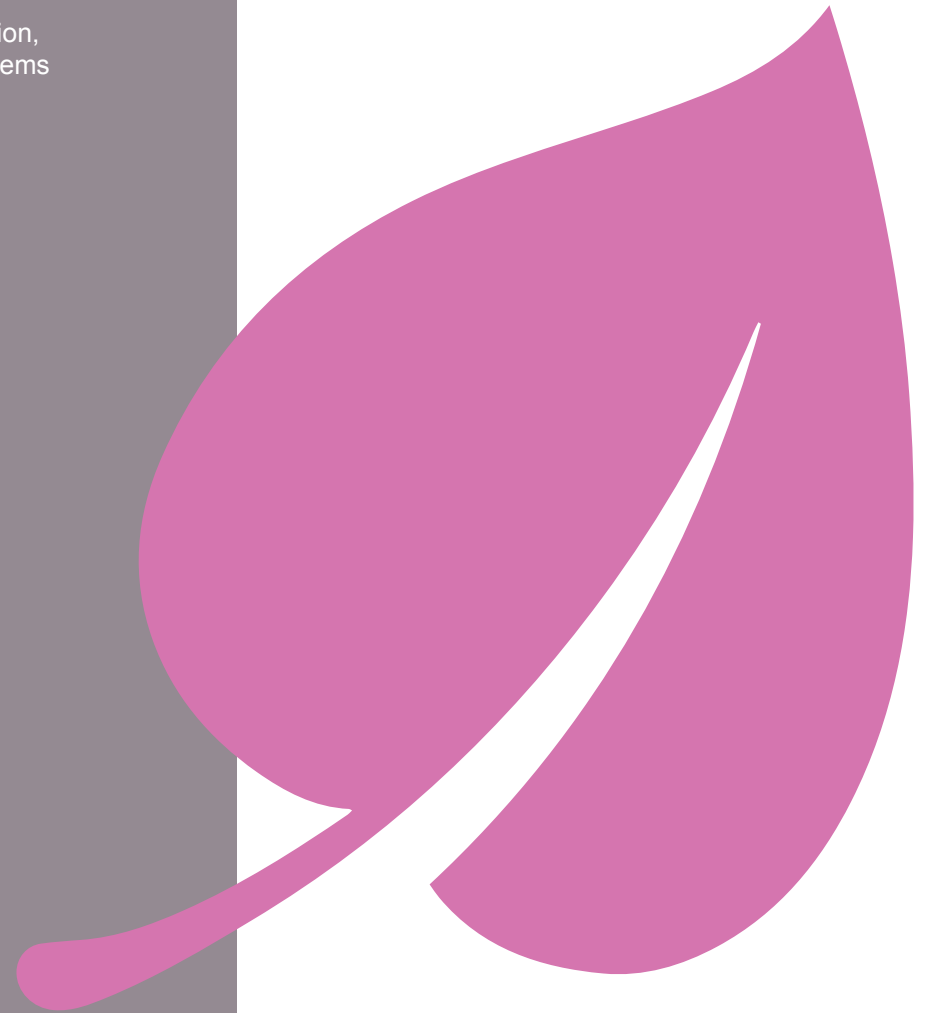
● E4L1 ●

Renewable Energies

Initiatives

- Promotion of power generation, storage and distribution systems

Axis 4



Context

Energy efficiency and sustainability in transport entails making progress in the use of renewable energies for self-consumption and in the utilisation of the power generated by the infrastructure itself and its redistribution to the grid and the smart city platform.

Providing infrastructures with renewable energy generation systems and with systems for storing the power generated and redistributing it to the grid will make it possible to turn them into energy independent and, hence, more sustainable transport networks. Although many elements that are necessary for the management of renewable energies in transport have already been tested and are in service, new fields and lines of research aimed at developing new systems are emerging that deserve attention – in any case, pursuant to applicable energy sector regulations.

Moving towards the use of renewable energies and the storage and redistribution to the grid of the energy generated by the transport network, such as e.g. the energy produced during the train braking process, will lead to a more sustainable, energy efficient transport system.

Advantages

This evolution towards renewable energy generation and surplus energy storage and distribution systems has many economic and social benefits such as the promotion of energy saving, the achievement of European and national environmental objectives and the reduction of transport costs.



Objectives

- To increase the use of renewable energy generation systems and systems for storing and redistributing surplus energy for self-consumption or for feeding it back to the grid.
- To utilise the energy re-generated during the train braking process. To reuse the energy in the energy generation infrastructure proper or feed it back to the external power supply grid.
- To achieve the transformation of the infrastructures according to a sustainable, energy independent model.

Advantages

- Managing energy in an efficient manner. Saving energy.
- Cutting energy costs.
- Contributing to meeting greenhouse gas emission reduction goals.

Description of the initiative

Developing and implementing systems for the generation of renewable energy (photovoltaic, wind, solar, etc.), the storage of braking energy and the distribution of surplus energy to the Smart City Platform or the different infrastructure elements (to trains by on-track induction, airport facilities, port facilities...).

The **main actions** that need to be undertaken are listed below:

- Conducting a study of the present energy generation capacity and of the renewable energy storage systems that are available today.
- Installing renewable energy generation systems (photovoltaic, wind, solar, wave...) in trains, stations, airports and ports.
- Developing systems for storing the energy generated during the train braking process and feeding it back to the grid (*this is connected to the E4L2-2 initiative through the "Last Green Mile" project*).
- Developing on-board energy storage systems and charging technologies that allow energy to be redistributed based on demand.
- Integrating these energy distribution systems and technologies into the Smart City Platform.
- Implementing pilot projects.

BUDGET

Studies and projects	≈ €800,000
Pilot projects	≈ €600,000
TOTAL	≈ €1,400,000

LEADERSHIP



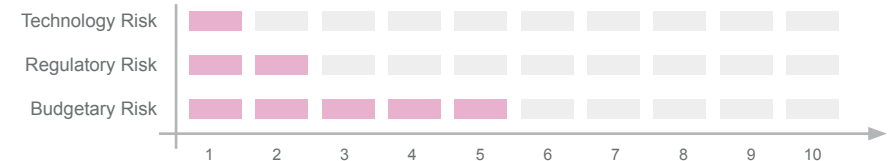
MONITORING INDICATORS

1. The decrease in the consumption of electrical energy at the border point.
2. The percentage of all the electricity consumed that comes from sustainable, renewable sources.
3. The volume of energy that has been redistributed.

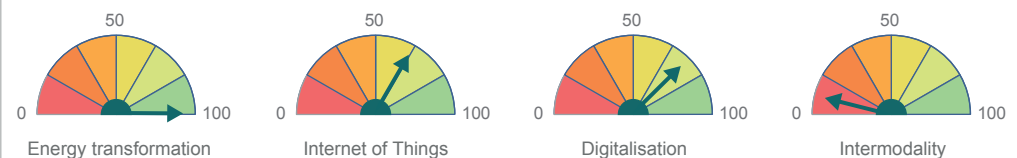
STAKEHOLDERS

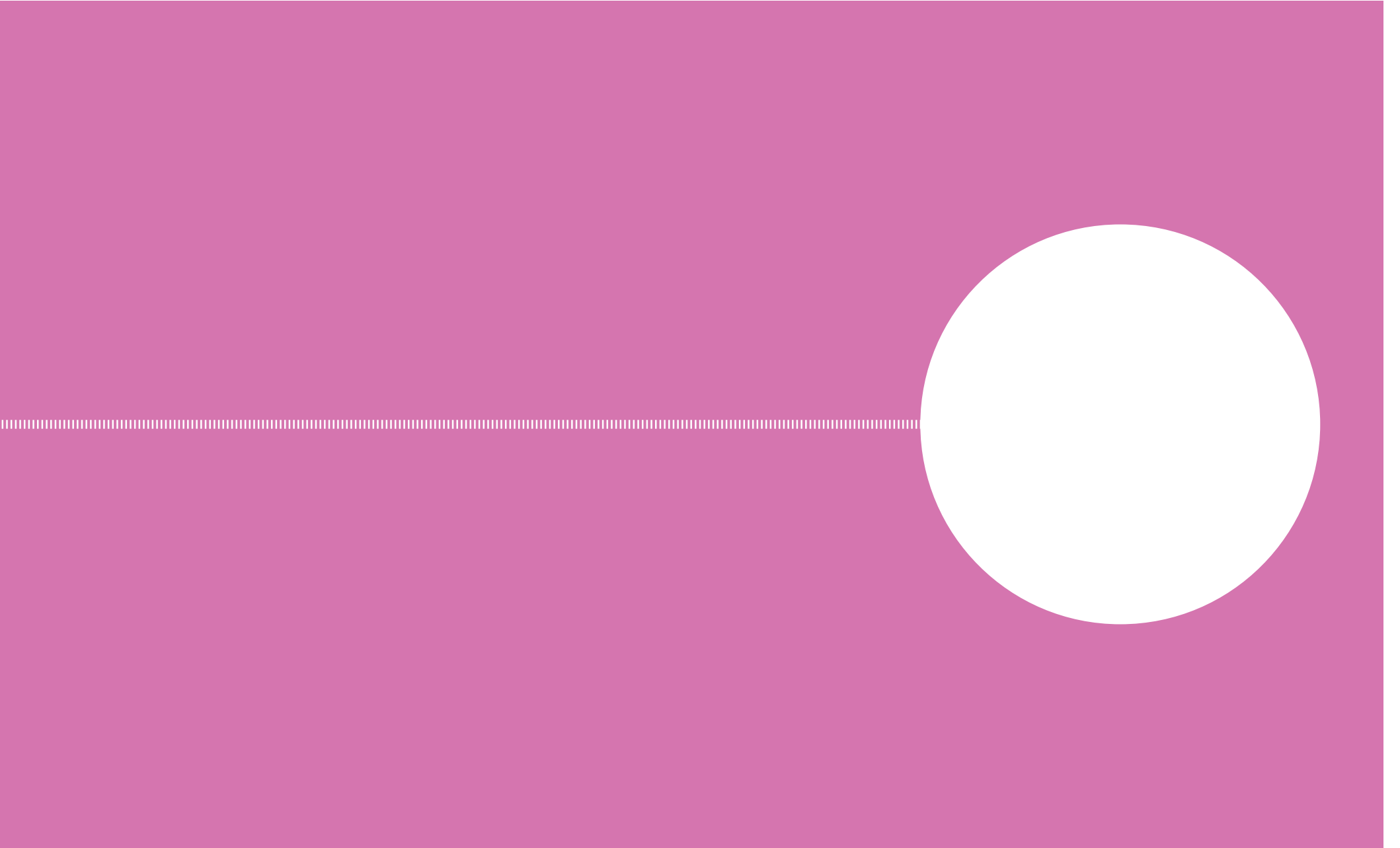
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	The Ministry of Industry, car manufacturers, universities, energy agencies									

RISKS



ALIGNMENT WITH THE PLAN





E4L2

Decarbonisation

Axis 4

Initiatives

- Encouragement of the development of the National Action Framework for Alternative Energies in Transport
- National Infrastructure Plan for Electric Vehicles and other Alternative Fuel Vehicles
- Introduction of efficient combined-transport services
- Intermodal portal for tracking and monitoring environmental indicators and objectives
- Application of photocatalytic technologies to transport infrastructures
- The bicycle as the axis of urban mobility



Context

In recent years Spain has committed to limit or reduce its emissions of greenhouse gases (GHGs) within the scope of both the United Nations Framework Convention on Climate Change, and its Kyoto Protocol, and the European Union.

According to Spain's March 2017 National Greenhouse Gas Inventory, Spain emitted 335.6 million tons of CO₂-eq in 2015. This amounts to a 3.5% increase in GHG emissions with regard to 2014. Therefore, 2015 was the second year in a row in which Spain experienced an increase of its interannual variation in emissions.

The transport sector is under the obligation to actively contribute to reducing emissions by giving a strong boost to decarbonisation, which is key to achieving emission reduction goals.

Transport – of both goods and passengers – is a sector that is crucial to the decarbonisation process. This is one of Spain's economic sectors that generates the highest GHG emissions: in 2015 the transport sector emitted 83,385 CO₂ equivalents (KTPA), which amount to 25% of all GHG emissions from the Spanish economy and a 3.9% increase with respect to the year before.

Similarly, GHG emissions from transport in the European Union have increased by 13% over the last 15 years. In this context, in 2011 the European Commission issued a communication on a roadmap for moving to a competitive low carbon economy in 2050, which sets out the key elements for achieving an 80% reduction in GHG emissions compared to 1990 levels and sets specific contributions for each sector through non-binding goals and expected emission reductions which are both technically viable and economically feasible.

In the case of the transport sector, it determined that in 2050 emissions could be down by more than 60% with regard to 1990. The roadmap recommends focusing short-term efforts on petrol and diesel engines with the aim of making them more fuel efficient. In the medium and long terms the achievement of large emission reductions revolves around hybrid and electric vehicles and vehicles running on other alternative energy sources and around the use of biofuels in aviation and road transport.

In this sense, the expansion of our cities and the need to interconnect all local, regional, national and international points make the current mobility model highly dependent on the car as a means of transport. This dependence has led to congestion problems in transport networks, has had important implications for road safety and has generated high concentrations of pollutants such as NO_x, SO_x, CO and particles. Other activities, such as ship docking in ports, and sectors such as the aeronautical, also generate significant GHG emissions.

Objectives

As far as these work areas are concerned, the initiatives included in this strategic line are directed towards working on a more efficient and sustainable model by searching for alternative energies for transport, encouraging the deployment of more sustainable combined-transport services, researching further into environmental decontamination techniques, such as photocatalytic technologies, and encouraging the integration of bicycles into our transport networks.



On account of their public nature, the Fomento Group and the rest of Spanish administrations must support, strengthen and face up to the challenge of setting ambitious objectives in order to hit the emission reduction targets set within the framework of international commitments that are in line with the guidelines set by the EU.

Objectives

- To improve energy efficiency in transport through the search for alternative propulsion methods for the different vehicles and public transport installations and services.
- To promote the use of alternative fuel vehicles (AFVs) in the transport sector.
- To reduce energy consumption and CO₂ emissions.

Advantages

- Facilitating the achievement of the climate and energy objectives set by the EU for 2020 and 2050.
- Improving environmental quality by fostering the development and use of clean (Eco) and zero-emissions vehicles (ZEVs).
- Cutting transport costs.
- Improving the Fomento Group's corporate reputation in terms of environmental matters.

Description of the initiative

The Spanish National Action Framework (MAN) for Alternative Energy in Transport, approved on 9 December 2016, involves taking actions of a fundamentally structural nature but also calls for there being continuity in the promotion of measures that support, encourage and materialise all the actions that need to be taken in the various modes of transport.

The **main actions** that need to be undertaken under this initiative are as follows:

- Analysing existing propulsion systems and comparing them with current alternative propulsion methods as well as with those which are under development.
- Studying alternative propulsion methods and introducing them in non-electrified railway lines (H₂, LNG).
- Supplying liquefied natural gas (LNG) as a fuel in the maritime transport sector and its associated services at ports. Puertos del Estado is currently leading the execution of the *CORE LNGas Hive* Project, with a total investment of €33m (2016-2020).
- Analysing aircraft powered by alternative energies (algaenergy, biofuel, LNG, wind, solar, electric, etc.).
- Applying alternative methods to transport infrastructures and its associated services (railway stations, bus stations and hubs, airports, ports...).
- Conducting tests in pilot projects.

BUDGET

Research projects	≈ €1,000,000
Pilot projects	≈ €1,000,000
TOTAL	≈ €2,000,000

LEADERSHIP



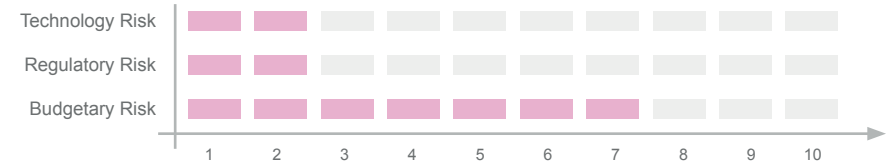
MONITORING INDICATORS

1. The ratio of AFVs to the total number of vehicles in the fleet.
2. The vehicle and infrastructure models that are available with each technology.
3. The energy that has been consumed. The reduction of the fuel budget for the Fomento Group's fleet of vehicles.

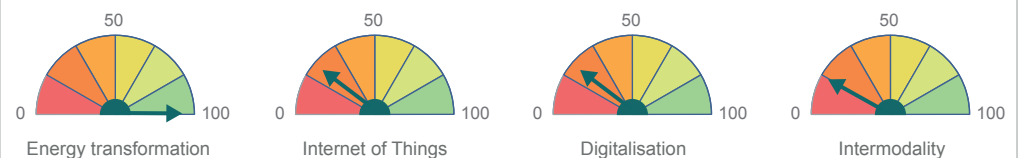
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	The Ministry of Industry, transport operators, service providers, regasification companies, renewable energy distributors, etc.									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To define and design the infrastructure network that is necessary for the deployment of electric vehicles (EVs) and other vehicles running on alternative fuels (AFVs) within the scope of the Fomento Group and in accordance with the guidelines set by the Ministry of Energy, Tourism and the Digital Agenda.
- To encourage the use of EVs and AFVs in both public and private transport networks.
- To improve energy efficiency in transport.

Advantages

- Promoting intermodality between public transport and private vehicles by installing recharging points at major transport hubs.
- Reducing CO₂ emissions and noise pollution.
- Positioning the Fomento Group at the leading edge of the deployment of EVs and AFVs.

Description of the initiative

Drawing up on the part of the Fomento Group of a Plan on the Infrastructure for Electric Vehicles and Other Alternative Fuel Vehicles analysing the needs and opportunities arising from the use of EVs and AFVs and laying down an action plan.

The **main actions** that need to be undertaken within the framework of drawing up the Plan are as follows:

- Designing the recharging points network within the Group's sphere of competence. Standardising the recharging network. Establishing the requirements and needs.
- Looking to enter into strategic partnerships with companies and stakeholders in this sector.
- Creating *Last Green Mile* spaces for recharging points at stations utilising regenerative train braking energy supplied by the traction network. The project for the study, feasibility and design of the implementation of the network of recharging points at the different stations of the Spanish rail system will be conducted using the knowledge gained in the Ferrolinera 3.0 Project that was carried out by Adif.
- Disseminating and communicating the Plan.

BUDGET

Drafting of the Plan	≈ €800,000
Last Green Mile Project	≈ €500,000
TOTAL	≈ €1,300,000

LEADERSHIP



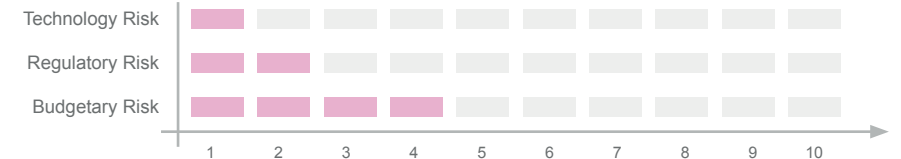
MONITORING INDICATORS

- Number of recharging points installed within the Fomento Group's sphere
- The decrease in GHG emissions.
- The number of VEs and AFVs in the Fomento Group's fleet of vehicles.

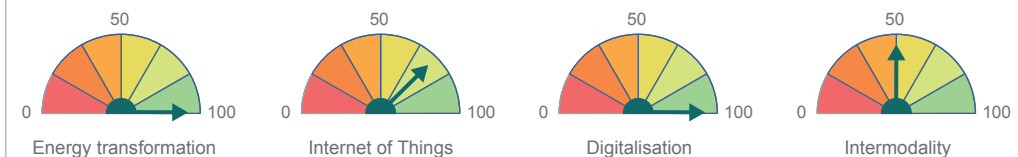
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Ministries, public administrations, the General Directorate of Roads, the General Directorate of Traffic, state security forces, technology companies, manufacturers									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To increase the use of combined-transport systems such as Rolling Motorways and Motorways of the Sea.
- To reduce the traffic of heavy vehicles by road.
- To reduce the emissions generated by freight transport.

Advantages

- Decreasing the traffic of heavy vehicles.
- Bringing down emissions.
- Cutting costs in the logistics chain.

Description of the initiative

The initiative consists in carrying out actions which are aimed at introducing efficient combined-transport services and increasing the use thereof.

The **main actions** that need to be undertaken are listed below:

- Establishing combined maritime-rail services: Incentive and aid programmes. Mechanisms for overcoming current barriers in the infrastructure, operability, competitive distance, legal and regulatory distances and the like.
- Introducing new Rolling Motorway services: giving a public boost to these services with the possibility of providing funding or incentives thereto. Analysing the determining technologies of the rolling stock and the characteristics of terminals to choose the RoLa system, Modalohr wagons, ladle trucks, etc. Analysing the feasibility of the light rolling motorway for the transport of vans (which could also be electric) on high-speed or conventional lines.
- Introducing new Motorways of the Sea services: Establishing public-private associations for managing the services. Creating measures for the 'Single Market' that permits the European single point of contact. Strategies for simplifying procedures for and restrictions to market access.
- Optimising logistics chains through the use of the Freight Platform (*Strategic Axis 2 - Smart Platforms, Strategic Line E2L5*).

BUDGET

3 projects to be implemented	≈ €1,000,000
TOTAL	≈ €1,000,000

LEADERSHIP



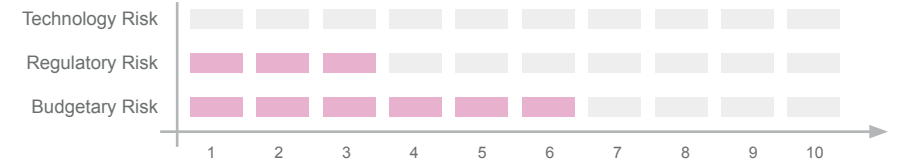
MONITORING INDICATORS

1. The interannual percentage variation of the combined modes in the modal share.
2. The number of combined-transport initiatives.

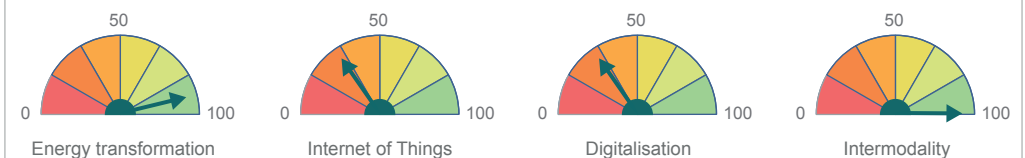
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators									

RISKS



ALIGNMENT WITH THE PLAN



E4L2-4 Intermodal portal for tracking and monitoring environmental indicators and objectives

Objectives

- To monitor the emissions generated by passenger and freight transport and use the resulting data in the decision-making process.
- To have a centralised technology platform that allows environmental indicators and objectives related to the transport sector to be tracked.
- To take joint action by means of the development of the National Multimodal Transport Model (*initiative E3L2-1 within Axis 3 - Smart Routes*) that serves as an information feedback portal for the establishment of optimal routes that are committed to environmental objectives.

Advantages

- Strengthening the social responsibility policy by monitoring environmental indicators.
- Providing the Fomento Group with international visibility and improving its environmental commitment.

Description of the initiative

Developing an intermodal portal for tracking and monitoring environmental indicators.

The **main actions** that need to be undertaken are listed below:

- Creating a multimodal portal to participate in automatic indicator measurement processes and to generate information to be applied in the definition of optimal transport routes.
- Monitoring key parameters of the transport sector's environmental objectives via sensors or other systems of the different transport networks and infrastructures.

BUDGET

Design of indicators and setting of objectives	≈ €200,000
Development of the intermodal portal	≈ €500,000
TOTAL	≈ €700,000

LEADERSHIP



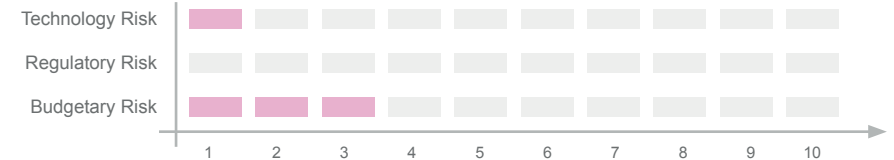
MONITORING INDICATORS

1. The number of entities in the transport sector that have joined the intermodal portal.
2. The number of monitored environmental indicators and objectives.

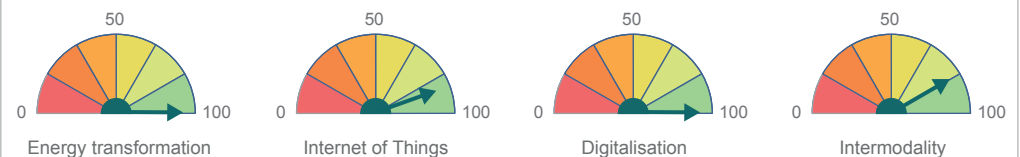
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	The Ministry of Energy, Tourism and the Digital Agenda, the Ministry of Agriculture, Fishing and the Environment, public administrations, transport operators									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To analyse the potential of use of photocatalytic materials in buildings and transport infrastructures with the aim of reducing urban pollution.

Advantages

- Reducing air pollution.
- Bringing down infrastructure maintenance costs.
- Contributing to meeting Spanish and European environmental goals.
- Improving the transport sector's public image thanks to its commitment to the environment.

Description of the initiative

Photocatalysis is capable of removing pollutants that are typically present in the atmosphere (such as NOx, SOx and VOCs) via a solar energy-triggered oxidation process. In Spain, where a large part of the final consumption of energy goes to the transport sector, it is necessary to evaluate the possibilities offered by technologies such as photocatalysis to help in decontaminating our cities through their application in large transport infrastructures.

In alignment with the *LIFE MINOX-STREET* project (*Monitoring and modelling NOx removal efficiency of photocatalytic materials: A STRategy for urban air quality managEmEnT*) (2013-2017) coordinated by Ineco together with the Ciemat Research Centre, Cedex and the Alcobendas City Council, the **main actions** to be undertaken under this initiative seek to analyse the real possibilities of application of these technologies in transport networks:

- Studying the viability of using draining bituminous pavements percolated with photocatalytic cement at terminals, stations, airports and large transport hubs. Using photocatalytic sprays and slabs to pave transport infrastructure streets and pavements.
- Analysing the potential of cladding façades with ceramic materials or photocatalytic mortars at hubs, stations, airports, Fomento Group buildings and so forth.
- Developing the 'photocatalytic island' concept.
- Implementing pilot projects on the application of the project and the assessment of its repercussions (technical, environmental and socio-economic).

BUDGET

Analysis and feasibility project	≈ €100,000
Pilot projects and assessment	≈ €500,000
TOTAL	≈ €600,000

LEADERSHIP



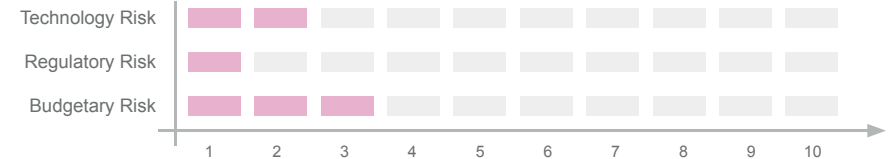
MONITORING INDICATORS

- The number of pilot projects that have been implemented.
- The degree of improvement in air quality thanks to the use of photocatalytic materials and systems.

STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█	█					█		█	
Other stakeholders	Private companies, innovation hubs, universities									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To provide transport networks with all necessary infrastructure for the bicycle to coexist with the other modes of transport and position it as a true means of transport within urban mobility.
- To decrease motorisation.

Advantages

- Reducing urban pollution and improving mobility.
- Improving the perception of the quality of the public transport service as a result of the fact that cycling to get to the transport network is an efficient way to increase access and dispersion distances with relatively low investments.
- Improving the image of the Fomento Group's transport networks and companies as to their commitment to the environment.

Description of the initiative

Making the bicycle a key element to mobility in cities by integrating it in the transport networks.

The **main actions** that need to be undertaken under this initiative are as follows:

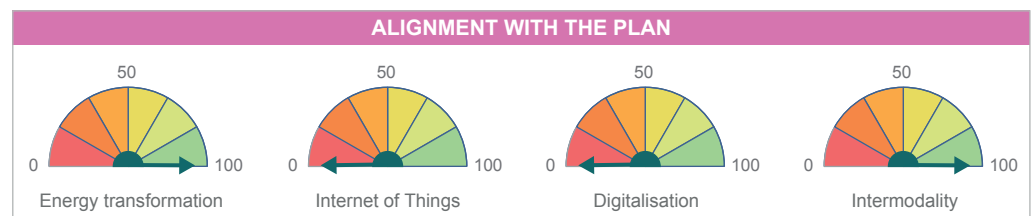
- Determining which stations and transport hubs are susceptible to the introduction of infrastructures and services for bicycles according to their type, size and potential for intermodal passenger transport.
- Setting minimum quality standards and designing the minimum number of equipment to ensure users can swap bicycle for train in a fast, fluid and comfortable manner. Providing a basic number of bicycle racks and a limited number of rental lockers whilst studying the possibility of building covered parking areas at large stations, setting opening hours for secure bicycle storage points, and providing other potential services for bicycles and their users such as the sale of accessories, bicycle pumps, reserved toilets, etc.
- Analysing the possibility of sponsoring bicycle rentals at stations or reaching agreements with city councils to integrate the bicycle service at stations, transport hubs and the buildings and facilities of the Fomento Group.
- Establishing public-private funding mechanisms for the deployment of bicycle-related infrastructures and services.

BUDGET	
Design and definition project	≈ €200,000
TOTAL	≈ €200,000



MONITORING INDICATORS	
1.	The number of stations and transport hubs that have the necessary infrastructure for intermodal transfer with bicycles.
2.	The degree of user satisfaction with the intermodal transport offer.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	City councils and other public administrations, private companies									



E4L3

New Infrastructures

Axis 4

Initiatives

- Optimisation of transport elements and adaptation thereof to more efficient and sustainable models
- Smart energy management systems in transport infrastructures
- Development of smart networks for decision-making
- Identification of flight inefficiencies in terms of consumption, cost and emissions
- New noise and soil pollution control techniques



Context

Turning our networks into a sustainable transport model involves not only incorporating new energy paradigms into the system but also adapting the existing infrastructures to more energy-efficient models.

Objectives

Actions such as providing our stations, airports and other transport hubs with the necessary ICT technology to introduce advanced energy management systems will make it possible to have smart electricity grids. These systems will allow energy management to be optimised and significant electricity consumption savings obtained.

Other initiatives that fall within this strategic line focus on actions aimed at increasing the capacity of our transport networks and optimising our infrastructures in order to reduce consumption and increase competitiveness. Developing smart systems to automate the decision-making process allows the service life of infrastructures to be optimised, thereby reducing consumptions and emissions.

All these actions have diverse benefits for both managers and users and give rise to more efficient transport models whilst cutting transport costs.



Energy transformation in transport entails, in addition to working on developing new non-polluting vehicles that are efficiently propelled, making the infrastructure itself more efficient.

Objectives

- To increase transport capacity through the optimisation of infrastructures towards more sustainable and efficient models.
- To optimise and transform the infrastructures to reduce consumptions.

Advantages

- Cutting transport costs.
- Increasing competitiveness.
- Expanding the product portfolio.

Description of the initiative

The main purpose of the actions that fall within this initiative is to reduce running costs by improving and optimising transport infrastructures towards more energy-efficient models.

The **main actions** that need to be undertaken touch on several aspects of the different transport modes:

- Reducing vehicle tare weights and making the rail sector more flexible in order to reduce energy consumption and lifecycle costs, thus promoting interoperability and the adaptation of loads to current needs. Studying the transport capacity and demand. Adjusting the volume of every consignment to the sustainable minimum. Transforming the material for freight transport.
- Optimising water distribution infrastructures at ports.
- Optimising power infrastructures at ports.
- Optimising energy efficiency in both air navigation buildings and installations.

BUDGET

3 optimisation projects	≈ €1,000,000
TOTAL	≈ €1,000,000

LEADERSHIP

Puertos del Estado



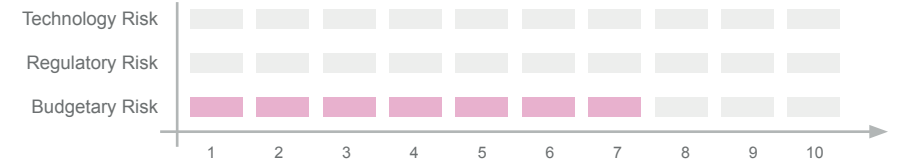
MONITORING INDICATORS

1. The number of vehicles that have been transformed.
2. The number of infrastructures that have been optimised.

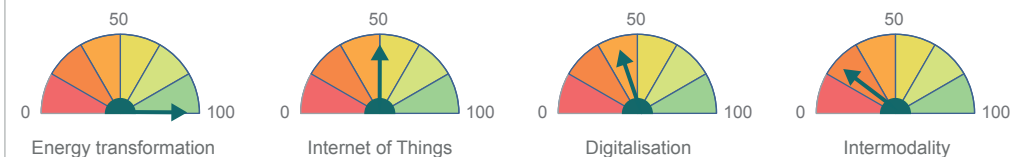
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Private companies, manufacturers, distributors									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To introduce smart energy management systems at all consumption points of the electrical grid.
- To reduce energy consumption.
- To create smart electrical grids.

Advantages

- Promoting an efficient management of energy.
- Monitoring consumptions and analysing all associated information.
- Optimising energy management by forecasting.
- Avoiding charges owing to reactive energy in transport networks.

Description of the initiative

Providing transport infrastructures with the ICT technology that is necessary for the introduction of smart energy management systems.

The **main actions** that need to be undertaken are listed below:

- Developing a smart management system on the part of the Fomento Group to meet the needs of all stakeholders.
- Identifying monitoring parameters: power demand, contracted power, historical maximums and minimums, tariff periods, control of subsystems, atypical behaviours, etc.
- Adapting and installing data acquisition systems that are tailored to each transport infrastructure at the points of consumption of the electrical grid.
- Implementing pilot projects, including fully deploying the energy management system and all elements that are necessary for monitoring electricity consumption parameters (telemetry points, communications with the system...).

BUDGET

Development of the energy management system	≈ €300,000
1 pilot project	≈ €800,000
TOTAL	≈ €1,100,000

LEADERSHIP



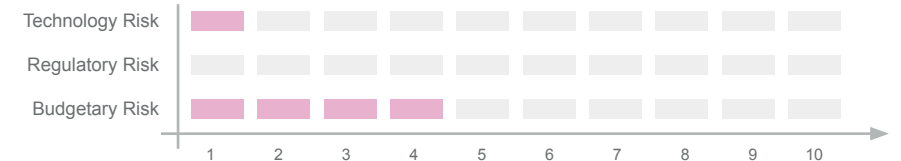
MONITORING INDICATORS

1. The electrical energy that has been consumed.
2. The number of transport infrastructures with a smart energy management system.
3. The decrease in the consumption of electrical energy at the border point.

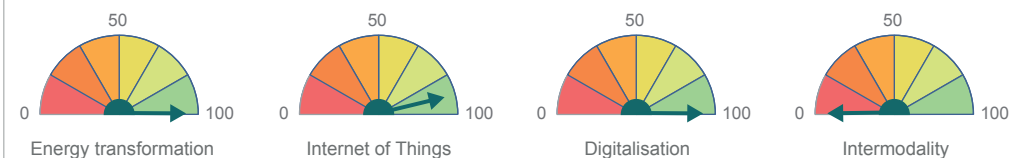
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	The Ministry of Energy, Tourism and the Digital Agenda									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To provide smart communication infrastructures so as to allow information to be exchanged with the different energy management tools and systems.
- To automate the decision-making process through the infrastructure’s own network to achieve energy optimisation and make the networks sustainable.

Advantages

- Knowing the state of the assets and optimising their useful life.
- Optimising the running of the systems.
- Reducing consumptions.
- Cutting emissions.

Description of the initiative

Developing smart infrastructure-communication systems to achieve greater automation, integration and coordination of all network elements.

The **main actions** that need to be undertaken are listed below:

- Contacting the Remote Energy Control Operator for it to recommend sustainable connection types from the points of view of consumption and operation.
- Establishing communications with traffic planning and control tools as well as with trains, given that they are the main electrical loads in the system.
- Installing information processing equipment in trains to enable commands to be exchanged with trackside systems.
- Implementing pilot projects to test the different smart systems that are eventually developed.

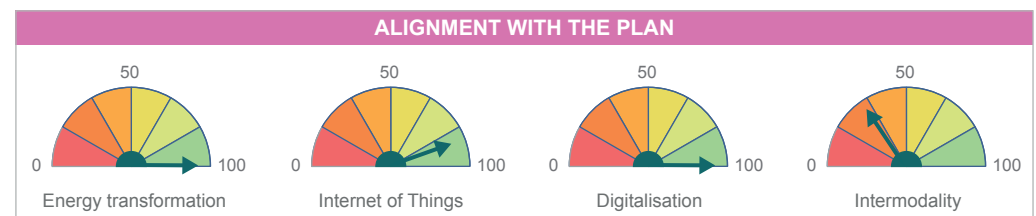
BUDGET	
3 development projects	≈ €350,000
3 pilot projects	≈ €300,000
TOTAL	≈ €650,000



MONITORING INDICATORS	
1.	The energy that has been consumed.
2.	The assessment of the pilot projects.

STAKEHOLDERS										
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders										

RISKS										
Technology Risk	■	■								
Regulatory Risk	■									
Budgetary Risk	■	■	■	■	■					
	1	2	3	4	5	6	7	8	9	10



Objectives

- To identify flight inefficiency areas in order to optimise flight routes and procedures in terms of energy efficiency.
- To optimally manage flight routes.

Advantages

- Saving on energy costs.
- Reducing delays due to flight inefficiencies.
- Making decisions in advance both at airports and when following flight procedures.
- Reducing charges.
- Improving the actual needs of airlines.
- Reducing the impact of flight inefficiencies in the surrounding area.
- Cutting emissions.

Description of the initiative

Introducing procedures for monitoring flight inefficiencies during ascent, en route and descent and their impact on the management and execution of operations in the airport, the terminal area and the route. Identifying and monitoring the critical parameters that have a bearing on the development of forecasting models for preventing inefficiencies so as to achieve the optimisation of the above operations from the points of view of energy consumption, costs and emissions.

The **main actions** that need to be undertaken are listed below:

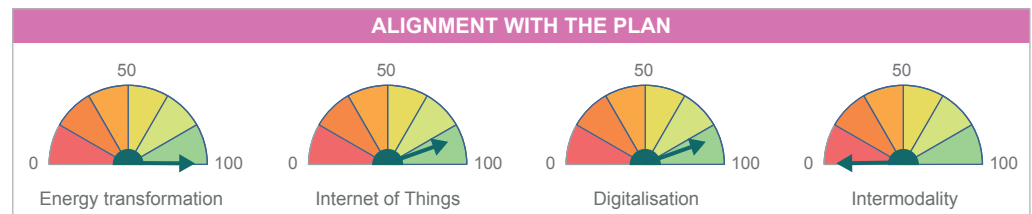
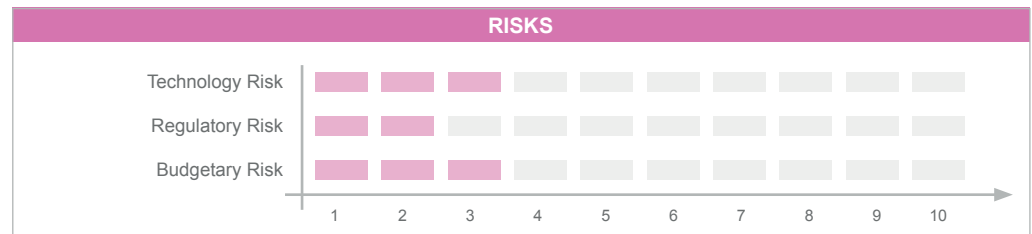
- Introducing procedures for the automatic detection of flight inefficiencies by monitoring flight management parameters.
- Developing predictive models based on the available information and history.
- Predicting inefficiencies in order to reduce consumptions, costs and emissions.
- Launching a pilot project on the quantification, assessment and prediction of flight inefficiencies and the assessment of repercussions.

BUDGET	
Inefficiency quantification and forecasting	≈ €200,000
Pilot project	≈ €200,000
TOTAL	≈ €400,000



- | MONITORING INDICATORS | |
|-----------------------|--|
| 1. | The number of inefficiencies that have been detected. |
| 2. | The savings in fuel consumption. |
| 3. | The savings in costs arising from flight inefficiencies. |

STAKEHOLDERS		Ministry of PW	Adif	Renfe	Aena	Enaire	Crída	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders											
Other stakeholders	Airlines										



Objectives

- To develop new noise and soil pollution control technologies in order to reduce the environmental impact of the means of transport.

Advantages

- Reducing environmental pollution.
- Detecting pollution in a fast, automatic manner.
- Improving the quality of life of users.
- Contributing to complying with the environmental commitments that were entered into at the Spanish and European levels.

Description of the initiative

The purpose of the actions included in this initiative is to analyse and develop new noise and soil pollution control techniques. This initiative is aligned with the “Balanced Approach” concept promoted by the International Civil Aviation Organisation (ICAO), which is currently the most important international guideline for taking noise reduction measures in the areas surrounding airports. Likewise, the initiative envisages the development of new technologies to control the pollution of soils and groundwater at airports and other transport centres, through the analysis of the risks associated with soil pollution, and the decontamination of any soils and groundwater that might have been found to be contaminated.

The **main actions** that need to be undertaken are listed below:

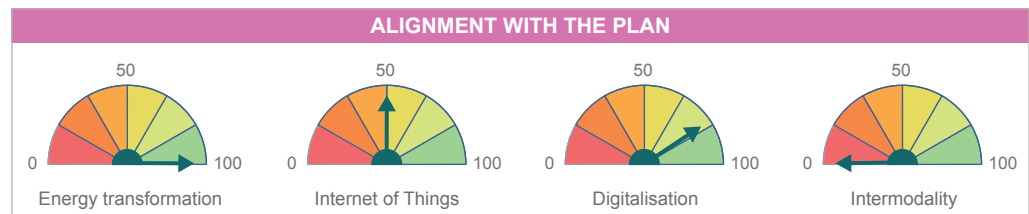
- Analysing and studying noise monitoring systems for detecting and measuring the noise generated and matching it up to the different means of transport. Providing monitoring information by means of a control system that allows the noise generated in strategic areas in its vicinity to be detected, measured and matched (under development).
- Analysing new technologies for controlling the pollution of soils and groundwater at airports and other transport centres (assisted phytoextraction, phytostabilisation, nanotechnology...).
- Implementing pilot projects and evaluating their results by means of new techniques.

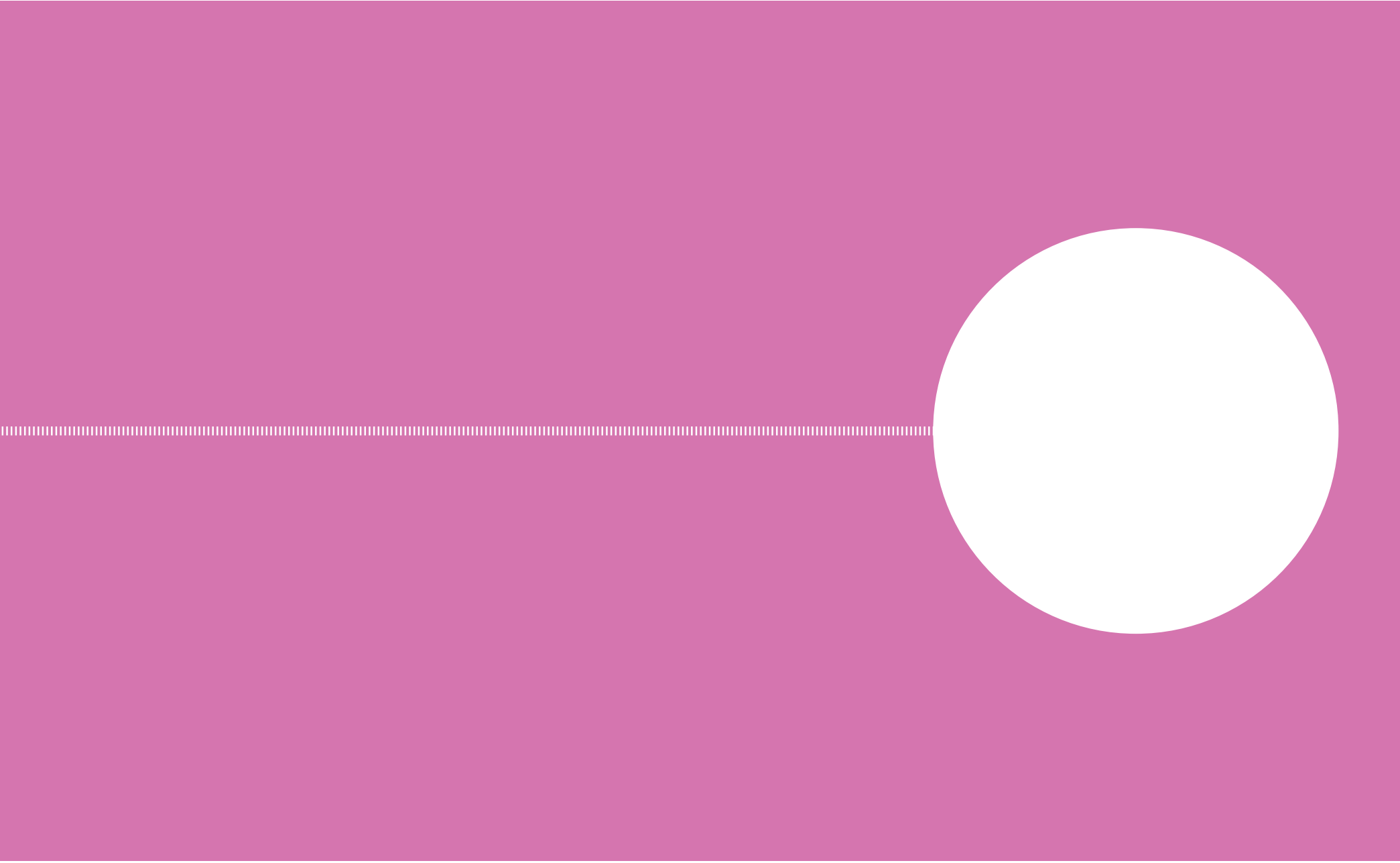
BUDGET	
Analysis of new technologies	≈ €200,000
2 pilot projects	≈ €200,000
TOTAL	≈ €400,000



- | MONITORING INDICATORS |
|--|
| 1. The number of techniques that have been assessed. |
| 2. The degree of decontamination that has been achieved. |

STAKEHOLDERS											
	<table border="1"> <tr> <td>Ministry of PW</td> <td>Adif</td> <td>Renfe</td> <td>Aena</td> <td>Enaire</td> <td>Crida</td> <td>Puertos del Estado</td> <td>Ineco</td> <td>Cedex</td> <td>Sasemar</td> </tr> </table>	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar		
Stakeholders	<table border="1"> <tr> <td>Ministry of PW</td> <td>Adif</td> <td>Renfe</td> <td>Aena</td> <td>Enaire</td> <td>Crida</td> <td>Puertos del Estado</td> <td>Ineco</td> <td>Cedex</td> <td>Sasemar</td> </tr> </table>	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar		
Other stakeholders	Universities, innovation hubs										





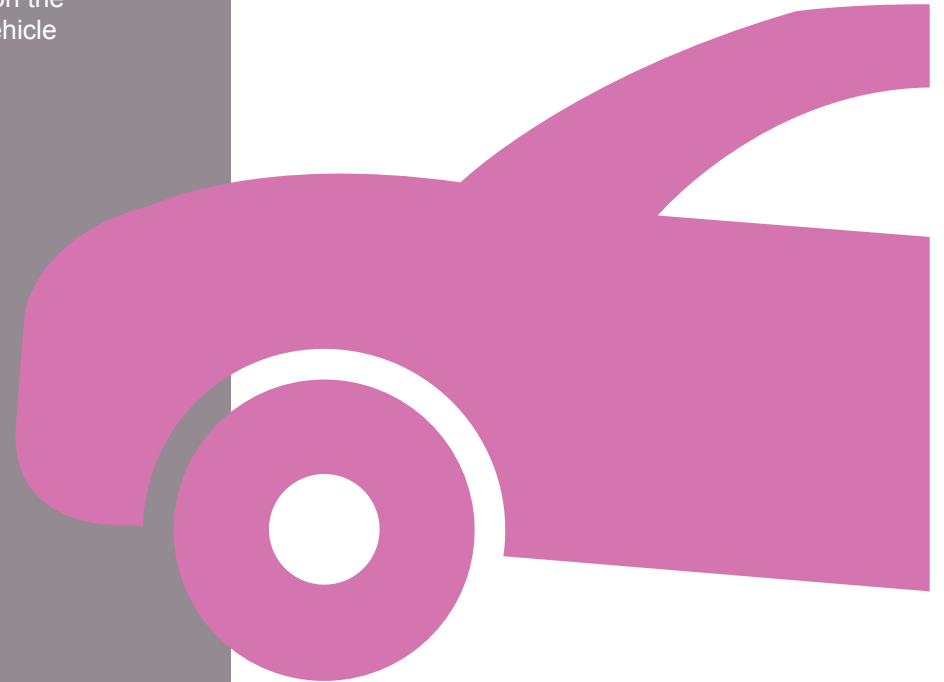
● E4L4 ●

The Autonomous Vehicle

Initiatives

- Technical standardisation for the development of the Legal framework of the Autonomous Vehicle
- Drafting of the White Paper on the Ethics of the Autonomous Vehicle

Axis 4



Context

The technological transformation that has taken place in the automotive industry is about to trigger unprecedented changes in mobility and road transport. The deployment of fully autonomous vehicles is expected to have benefits in fields as diverse as safety or efficiency, but also to give rise to transformations in personal mobility and to afford disadvantaged and isolated individuals and communities the possibility of having global accessibility.

Advantages

Even though some of the technology behind autonomous vehicles is still in the development and testing stages, the arrival on the scene of such vehicles is expected to have diverse benefits in terms of mobility, safety, congestion, energy use, environmental pollution and land use, such as:

- **Improved safety through a reduction in the number of accidents and their severity.** Safer journeys thanks to the absence of human error in autonomous driving as well as to the continuous monitoring of the road by the autonomous vehicle in search of other vehicles, bicycles, pedestrians and potential threats. Less aggressive driving. Optimised freight traceability processes, with an intermodal approach.
- **A more integrated and efficient transport** by means of the integration of autonomous vehicles with large transport hubs and those areas which are not covered by public transport networks.
- **Improved accessibility to transport networks** for people with disabilities and the elderly.
- **Less congestion and shorter travel times.** Thanks to sensors and autonomous driving, vehicles will be capable of driving more homogeneously, safely and efficiently in their interrelationship among them, thereby allowing travel times to be shortened and road congestion reduced.
- **Cleaner vehicles with lower emissions.** Policies and regulations should be directed towards the use of this type of vehicle being in line with energy efficiency and environmental quality goals, thus ensuring they make an efficient, environmentally friendly use of energy.

The scenario in which autonomous vehicles will pick up passengers at the starting point of their journey and take them to their destination through urban networks, streets, roads, main roads and motorways, whilst reacting to the different obstacles and unforeseen events that crop up, is not very far away. Much of the technology behind this new vision of mobility is already installed in a wide variety of vehicles without their drivers being fully aware of it. Although initially the race to develop and implement autonomous vehicles was led by well-known companies that already have the first models in operation, today almost all major automakers are developing this type of vehicle.

Challenges

Apart from these potential benefits and new possibilities, the autonomous vehicle also raises many questions and uncertainties that need to be addressed before it is deployed. Questions arise as to whether they will completely replace human driving, the limits of the ethical and moral decisions that the autonomous vehicle will have to make in the face of the various circumstances of the road, the implications it will have for privacy as we now know it or the socio-economic impacts these drastic changes in mobility may have for society.

Many of these issues will have to be resolved in the longer term and will require dialogue and consensus from international governments, administrations, the industry, private companies and users. The public nature of the Fomento Group and the rest of Spanish administrations demands they meet the challenge of taking the first steps to lay the foundation and the legal context on which future actions and decisions with respect to the autonomous vehicle will be based.

E4L4-1 Technical standardisation for the development of the Legal framework of the Autonomous Vehicle

Objectives

- To set the standards and regulations that are needed to regulate the introduction of the Autonomous Vehicle (AV).
- To ensure system interoperability.
- To provide manufacturers and users with a guide that, together with other measures, such as the promotion of pilot projects in Spain, will help position Spain as a country of reference in this sector, opening new markets and creating new business opportunities.

Advantages

- Improving safety and bringing down the accident rate.
- Encouraging the development of autonomous vehicle-related business models.
- Improving mobility and travel times. Reducing congestion.
- Giving the elderly, the young and the disabled people global access to transport.
- Cutting freight transport costs.

Description of the initiative

The deployment of the AV in the transport sector requires a major regulatory change to ensure the introduction of this new technology takes place under safe conditions. The actions of this initiative are aimed at technical standardisation and the establishment of the necessary requirements for defining the legal framework for the full deployment of autonomous vehicles.

The **main actions** that need to be undertaken are listed below:

- Creating a standardisation committee on the part of the Ministry of Public Works where all stakeholders are represented.
- Developing technical standards and imposing requirements on manufacturers. Providing regulation and certifications.
- Standardising processes for the regulation that is needed in all areas: road rules and driving regulations, and liability and insurance regulation.
- Standardising procedures to lay the foundation for the regulation ensuring data privacy in the exchange of information among AVs and connected systems.
- Laying down standards and requirement for pilot tests.

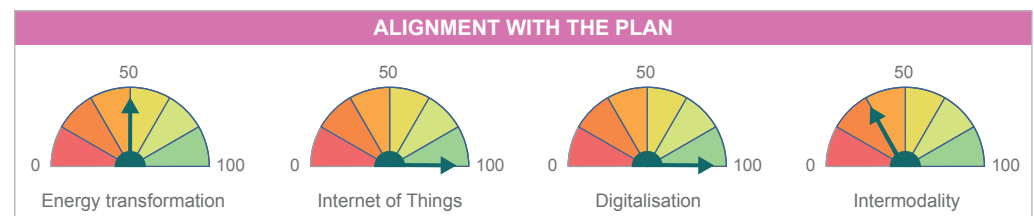
BUDGET	
Setting up of the standardisation committee and definition of standards	≈ €400,000
TOTAL	≈ €400,000



- ### MONITORING INDICATORS
1. The number of standards that have been promoted by the Committee.
 2. The number of entities that have joined the Committee.

STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█									
Other stakeholders	The Ministry of the Interior, public administrations, car manufacturers, universities, insurance companies...									



Objectives

- To regulate and standardise the line of action of the moral and safety-related decisions the autonomous vehicle must make to be allowed on the road.
- To draft the White Paper on the Ethics of the Autonomous Vehicle.
- To set the minimum safety standards that are necessary for autonomous vehicles to be allowed on the road.

Advantages

- Homogenising the basic ethics and delimiting the liability of autonomous vehicles.
- Making the decision-making process of autonomous vehicles transparent on the part of manufacturers.
- Positioning Spain as a country of reference in the regulation of the ethics of autonomous vehicles that may lead the necessary international standardisation thereof if they are to be able to cross borders safely.
- Creating new enterprises in the autonomous vehicle sector as a result of this positioning in the legal framework sphere, in which little progress has been made on an international level.

Description of the initiative

The most complex challenge the autonomous vehicle faces is that relating ethics and its behaviour when it comes to making decisions. These decisions will be defined through the programming of rules of conduct and machine learning procedures and, in many cases, they will have legal implications and ethical dimensions.

The **main actions** that need to be undertaken are listed below:

- Setting up a standardisation committee on the part of the Ministry of Public Works where public administrations, manufacturers, drivers, passengers and other entities in the sector are represented to ensure this type of vehicle makes its decisions within common consensus and the frameworks of safety, legality, responsibility and ethics.
- Publishing the White Paper on the Ethics of the Autonomous Vehicle.

BUDGET

Setting up of the Standardisation Committee and publication of the White Paper	≈ €800,000
TOTAL	≈ €800,000

LEADERSHIP



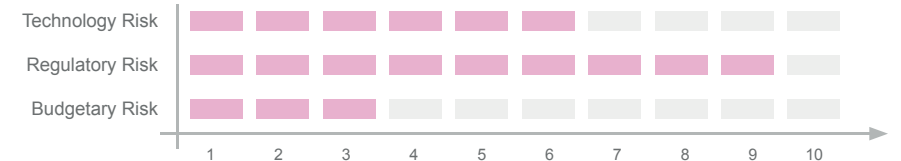
MONITORING INDICATORS

1. The publication of the White Paper.
2. The number of entities that have joined the White Paper.

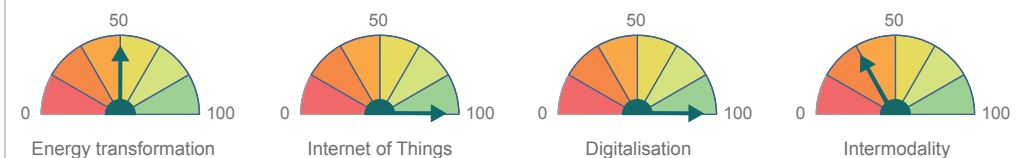
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders	█									
Other stakeholders	The Ministry of Interior, public administrations, car manufacturers, drivers, universities, innovation hubs...									

RISKS



ALIGNMENT WITH THE PLAN



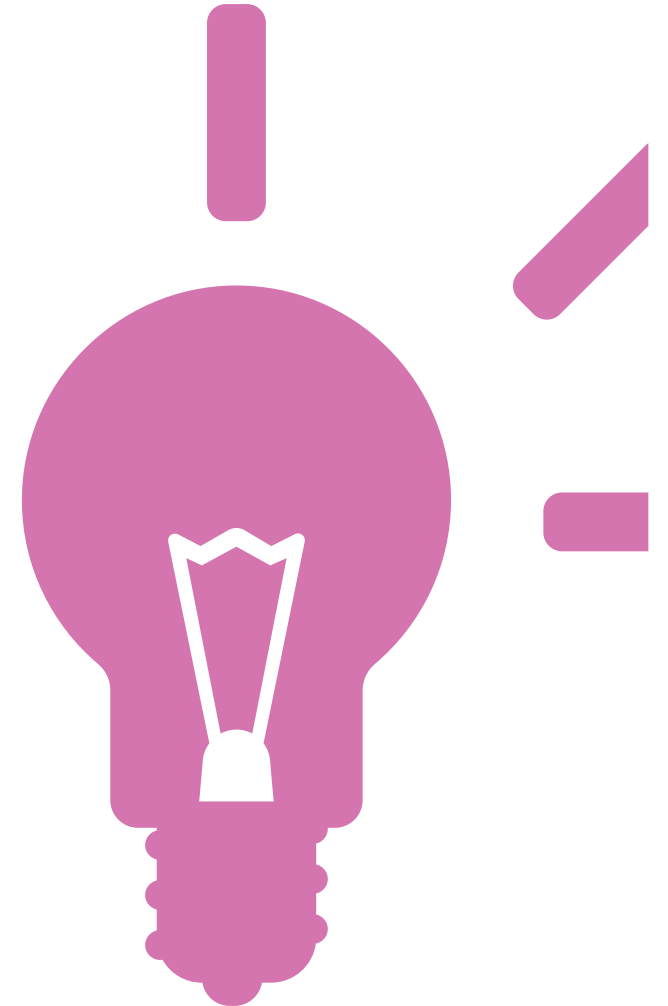
● **E4L5** ●

**Education,
Communication
and
Entrepreneurship**

Axis 4

Initiatives

- Education, communication and training activities
- Co-working space options



Context

This **Transport and Infrastructure Innovation Plan** proposes making a change in the innovation culture of the different companies that make up the Fomento Group and, by extension, in society.

All stakeholders involved in the sector, from infrastructure managers, transport operators, companies, workers to users, must be generally encouraged to undergo this change, which will affect the Spanish transport and mobility model as a whole.

Objectives

The actions that fall within this initiative aim, on the one hand, to promote and support the use of new efficient, sustainable transport models among professionals and users.

The important changes that the transport sector needs to undertake to move towards a more efficient, sustainable model require an important social adaptation and learning effort. The new challenges in the path to energy transformation, the Internet of Things, digitalisation, and intermodality require a series of training and dissemination activities be carried out to facilitate the management and acceptance of the change at all levels, from the employees of the different companies that make up the Fomento Group to private companies and citizens.

On the other hand, the other purpose of this initiative is to facilitate open innovation and the creation of startup companies in the sphere of transport innovation through the repurposing of unused spaces at terminals as startup workspaces where synergies can be generated with both the startups and the managers of these spaces.



“Innovation is the ability to see change as an opportunity – not a threat.” Steve Jobs

Objectives

- To promote and support the training of (passengers and freight) transport professionals and users in the use of new efficient, sustainable transport models and to encourage the use of the latter.
- To carry out communication and dissemination actions to promote the new models.
- To draft an innovation and cultural change management training plan.

Advantages

- Having more knowledge about and apprising corporate cultures of the new challenges to innovation in transport, mobility and infrastructure.
- Improving the corporate image and the work environment.
- Having more qualified professionals that are aligned with the new innovation challenges. Potentially increasing the number of innovation projects.
- Raising social awareness and managing the cultural change.

Description of the initiative

Innovation within the framework of the transport, mobility and infrastructure sectors poses new adaptation, learning and social awareness challenges which will end up driving change towards more sustainable models. It is necessary to create a culture of innovation that is shared by all Fomento Group stakeholders and based on creativity and the acceptance of change and to set common innovation objectives that allow the expectations of all stakeholders to be unified. The idea is to manage cultural change, encouraging participation, collaboration and innovation, and to implement it in the transport sector in a gradual manner.

The purpose of this initiative is to draw up a training plan on innovation and cultural change management involving the following **main actions**:

- Setting up a commission with representatives from all stakeholders to define the training plan.
- Carrying out training activities pertaining to digitalisation.
- Devising training plans on BIM culture.
- Supporting education and training activities for companies and entities pioneering the incorporation of fleets of electric vehicles and alternative fuel vehicles (AFVs).
- Identifying, designing and carrying out communication campaigns to promote energy efficiency and sustainability in transport.

BUDGET

Design of the Training Plan	≈ €70,000
TOTAL	≈ €70,000

LEADERSHIP

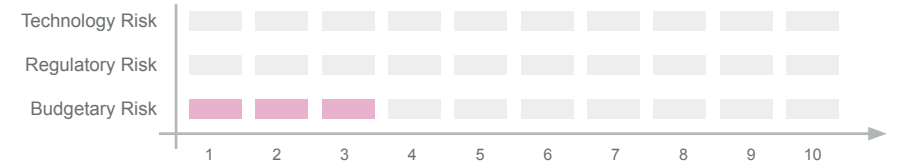
MONITORING INDICATORS

- The number of training actions that have been carried out.
- The number of stakeholders that have been the recipients of training actions.

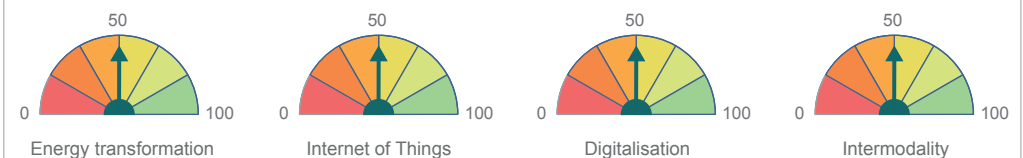
STAKEHOLDERS

	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Transport operators, citizens, companies									

RISKS



ALIGNMENT WITH THE PLAN



Objectives

- To repurpose unused, underused or unprofitable spaces inside transport terminals as workspaces for startups in the field of innovation and energy efficiency in transport.

Advantages

- Introducing new services at stations and terminals that add value to the range of services already on offer.
- Utilising spaces in terminals for innovation.
- Promoting innovation in transport.
- Encouraging the creation of startups that focus on innovation and energy efficiency in transport.
- Generating knowledge by entering into collaboration agreements with the startups that end up using these spaces.

Description of the initiative

Transport terminals mean large spaces, some of which are sometimes underused due to the relocation or new location of services. The purpose of this initiative is to come up with mechanisms for the creation of workspaces for startups, with zero investment on the part of the space managers (transfer to co-working companies that will adapt the spaces by installing all necessary utilities; possibility of low or no rent in exchange for collaboration agreements on innovation projects...).

The **main actions** that need to be undertaken within the framework of this initiative are as follows:

- Repurposing unused spaces in terminals and transport hubs as workspaces or co-working spaces aimed at startups whose activity is associated with innovation in transport, whereby it is possible to create synergies with both the startups and the management agents of these spaces.

BUDGET

Analysis and creation of co-working space mechanisms and agreements on the management of the generated knowledge	≈ €20,000
TOTAL	≈ €20,000

LEADERSHIP



MONITORING INDICATORS

- The surface area allocated to co-working spaces.
- The number of collaboration agreements entered into with startups with no investment costs for the managers of the spaces.

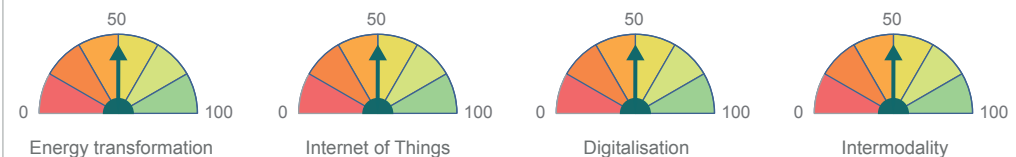
STAKEHOLDERS

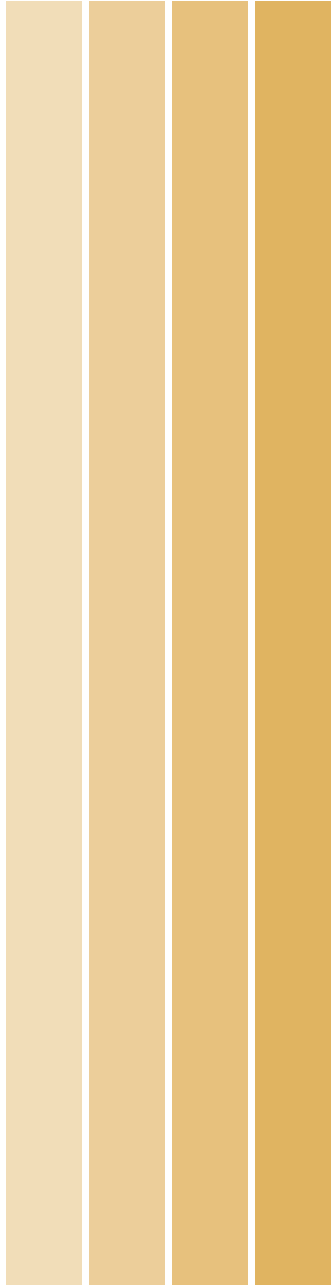
	Ministry of PW	Adif	Renfe	Aena	Enaire	Crida	Puertos del Estado	Ineco	Cedex	Sasemar
Stakeholders										
Other stakeholders	Startups									

RISKS

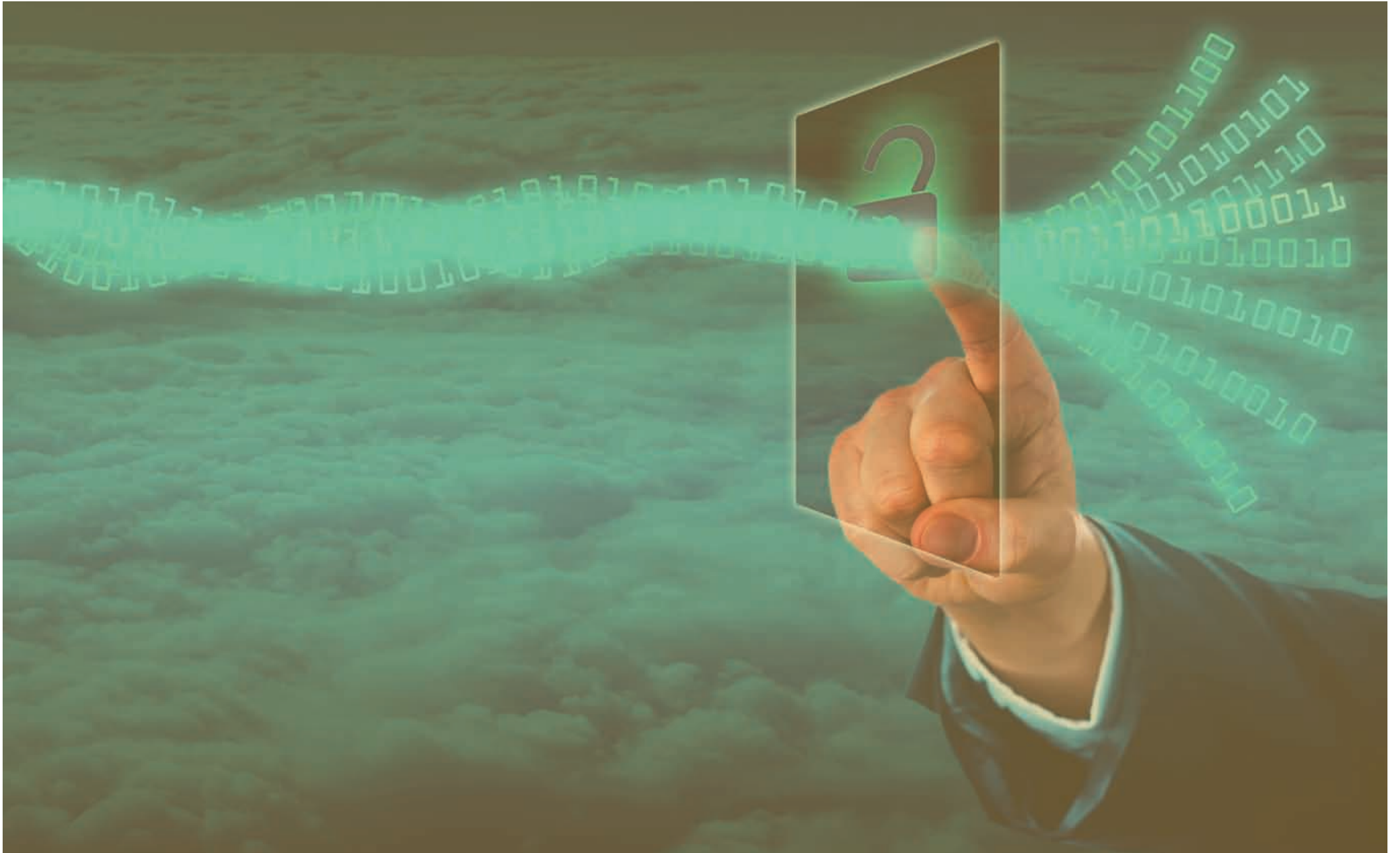
Technology Risk	█	█	█	█	█	█	█	█	█	█
Regulatory Risk	█	█	█	█	█	█	█	█	█	█
Budgetary Risk	█	█	█	█	█	█	█	█	█	█
	1	2	3	4	5	6	7	8	9	10

ALIGNMENT WITH THE PLAN





4
**Open innovation:
The railway
innovation hub and
its relations with
startups**



Public institutions cannot forget about their responsibility in promoting innovation among the different public companies and institutions, as well as in the private sector, and about the need to do so in order to come up with and develop new ideas that allow them to compete effectively in the market.

This Plan articulates a series of initiatives that provide for a new model of innovation, the aim of which is to combine in-house knowledge with external knowledge, actuating levers, such as open innovation, to speed up and make more efficient the implementation of these initiatives.

The Railway Innovation Hub

Spain has a good international reputation in terms of transport and infrastructures, and its companies are currently executing a multitude of projects worldwide.

The idea is to create a railway innovation hub with the aim of boosting the international projection of our railway ecosystem and turning Spain into an attractive place as regards innovation. Its main mission will be to promote the technology and know-how of the railway sector at an international level through the development of collaborative R&D projects, the commercialisation of technology and know-how, the encouragement of entrepreneurship and the provision of specialised services.

At the European level, there is the European Railway Clusters Initiative (ERCI), which brings together the eleven main railway hubs in the European Union, including the Spanish Railgrup cluster, which was founded in 2002, which is based in Barcelona and was sponsored by the then Ministry of Industry, Energy and Tourism.

The railway innovation hub will take advantage of and give a boost to the Railway Technology Centre (CTF) located in the Andalucía Technology Park, 13 km from City of Malaga's centre. The CTF was created in November 2010 as the result of various collaboration agreements among the Ministries of Public Works, Economy, Finance, and Science and Innovation, the Regional Government of Andalusia and the Universities of Seville and Malaga. It is an open space for the promotion of innovation

and business collaboration aimed at developing railway technology where leading companies at the forefront of technology have already settled. It currently supports 37 companies, 14 of which maintain a continuous presence in its premises. The centre potentially has room for up to 50 companies and more than 200 researchers and/or entrepreneurs in its facilities, so it is a wonderful environment for business incubators and startup accelerators and a space for co-working. In addition to its headquarters, the CTF houses five specialised laboratories for testing, project development and technology validation. These laboratories are: the Information and Communication Technologies Laboratory (Laptic), the GSM-R/ERTMS Laboratory, the Station Laboratory, the Catenary Element Testing Laboratory, and the Electromagnetic Compatibility Laboratory.

The main activities that will be carried out at the rail innovation hub are:

Management of knowledge and commercialisation of technologies

- Managing the partners' technology portfolios.
- Making commercial evaluations.
- Devising IP strategies and financially appraising intangibles.
- Commercialising and negotiating assets in multiple sectors (licensing, sale, business partnerships...).

R&D project office

- Identifying calls for R&D projects and postulating consortium projects.
- Accessing privileged funding (local, regional, national and international).

Entrepreneurship and acceleration

- Designing entrepreneurship and acceleration programmes to attract talent and innovative companies.
- Maintaining relations with universities and research groups worldwide. Acting as an advanced knowledge centre for the sector.
- Acting as a co-working and high performance centre for universities, companies, SMEs and entrepreneurs encompassing the sector's entire value chain.

International point of railway consultation

Unified access to queries about public and/or private needs of the railway sector and its value chain.

- Access to specialised contractors.
- Access to market intelligence about worldwide needs in this sector.

Promotion of services and training

- Keeping an integrated catalogue of the metrology, calibration and testing capabilities of all partners.
- Keeping an integrated catalogue of specialised technical training for public and private entities at the international level.

Promotion of turnkey projects

- Developing turnkey projects and providing consultancy services specialised in rail infrastructure construction, operation and maintenance projects.

International events

- Detecting the holding of internationally renowned, high quality events and congresses to promote the involvement of the partners.

These activities aim to multiply business opportunities and improve Spain's global positioning in the railway innovation sector, which will enable the railway innovation hub to:

- Take advantage of the collaborations and synergies that take place in the CTF's ecosystem.
- Improve the quality and effectiveness of R&D projects (faster and more focused on real market needs).
- Give the partners better access to regional, national and international funding lines.
- Act as a single point of contact for accessing the supply and demand of the railway sector worldwide as well as the sector's administrations across the world.
- Guarantee a return on R&D investments through the commercial exploitation of the partners' technologies.
- Position the partners in the rail sector at the world level.

Relations with *Startups*

In order to be able to evolve at the desired rate, we must take advantage of the knowledge and opportunities that are generated by the private sector, startups included, and create an innovative network.

Startups are technology companies with a high potential for growth that, thanks to the new technologies, are capable of providing disruptive solutions to the problems of the transport and infrastructure sector. The railway system needs to develop an open innovation model that combines external and internal knowledge to carry out innovation projects under a collective intelligence approach. This commitment to open innovation will make the introduction of the innovation model speedier and more effective, especially in the digital field, around which a large portion of the innovation challenges are expected to revolve.

In addition to driving the digital transformation of the sectors covered by this Plan, the collaboration of the Fomento Group's companies and institutions with startups will result in the application of an advanced management of knowledge and the institution of an entrepreneurial culture at each of the former and help them to identify, analyse and promote diversity in innovation and in-house talent as well as to speed up the decision-making process. On the other hand, startups

will gain access to a wide portfolio of clients, the channels of communication established with them and financial support.

The Ministry of Public Works is providing, through the Renfe Group, a series of services for startups/entrepreneurs, including consultancy, logistics, laboratory, business incubator and startup accelerator, and search for funding and even investing in companies. This innovation process must result in internal, external and joint developments and allow ideas, projects and new enterprises to be tested. Renfe Operadora's "Comprehensive Innovation Service: Business Incubation and Startup Acceleration" was created for this purpose. This service envisages obtaining external support from an innovation service management company that will give help in the incubation of businesses and the acceleration of startups in the digital sphere by providing a new methodology and knowledge for promoting business initiatives in their very early stages (startups in the pre-seed, seed or growth phase), entrepreneurs and teams – and which may also be used by other Group companies.

As far as the airport sector is concerned, Aena included open innovation in its 2017 strategic plan. The external innovation model to be followed involves commissioning suppliers to develop innovative projects, creating an accelerator of startups and entrepreneurs that focuses on their strategic lines and setting up an external advisory board on airport innovation wherein a group of external consultants will bolster their internal management bodies.

At the European level there are startup accelerators aimed at researching mobility solutions that will boost the different modes of transport, create new services for customers and develop innovative ideas for products and services, such as DB's Mindbox programme (Germany) and the SNCF's Startup Programme (France), including the collaborations that have sprung between companies from different countries and startups, such as the Beyond1435 innovation platform, among others.

The railway innovation hub's relations with startups will also be encouraged by means of international conferences and events where entrepreneurs, companies and public institutions can build relationships within the open innovation ecosystem.



Innovative Public Procurement

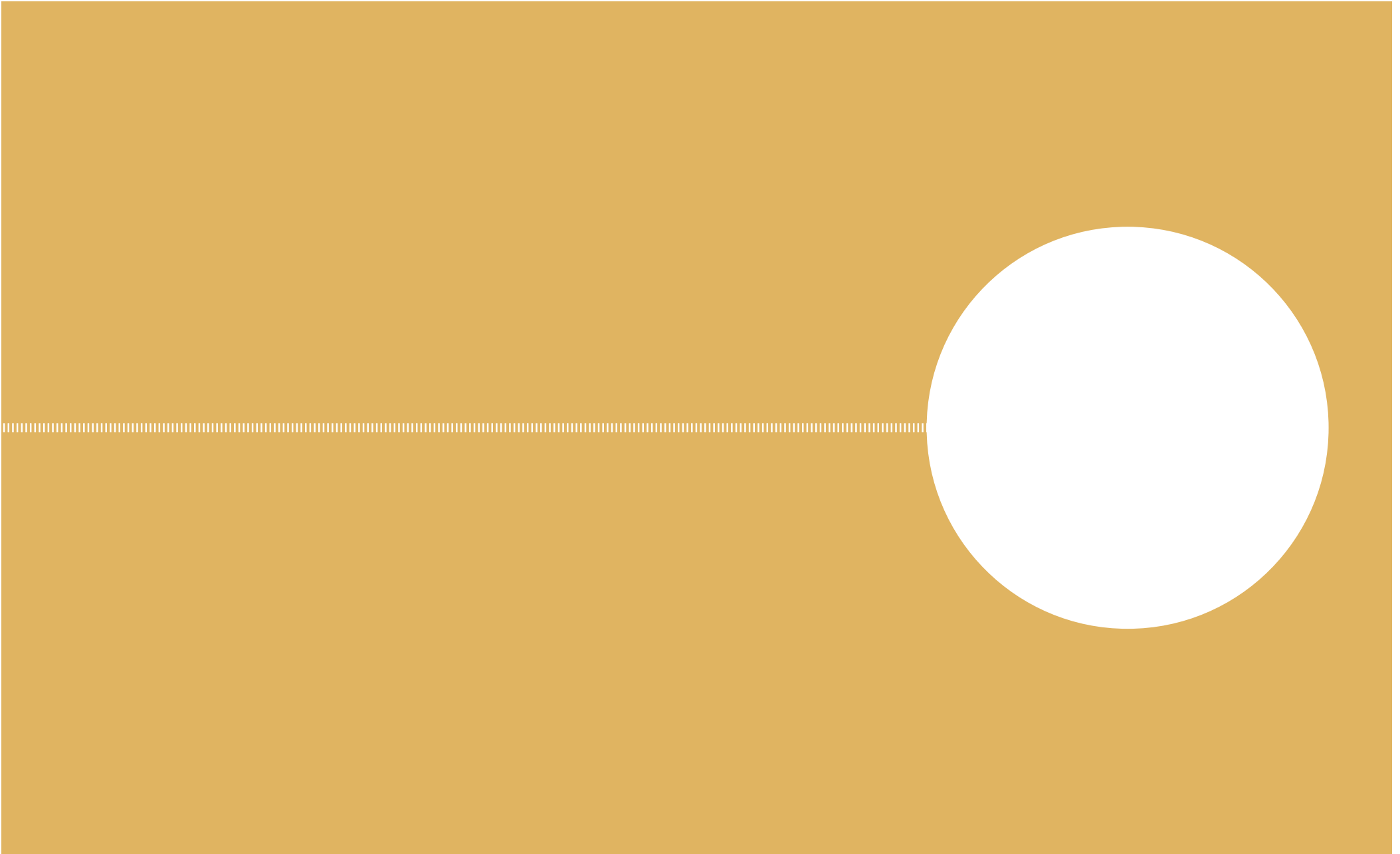
Innovative Public Procurement (IPP) is another tool which the Plan can help to make the most out of. This tool is an administrative action for encouraging innovation which centres around promoting the development of innovative solutions from the demand side through public procurement. IPP will be put into practice from both the demand side, i.e. the public managers that put innovative public procurement contracts out to tender, and the supply side, i.e. the companies that bid in public tenders, by helping them to take part and submit innovative bids.

IPP has, among others, the following goals:

- Improving public services through the incorporation of innovative goods and services.
- Promoting business innovation.
- Encouraging the internationalisation of innovation by using the Spanish public market as a springboard or client of reference.

IPP has two modes of action:

- Public procurement of innovative technology (PPIT), which consists in the public purchase of a good or service that does not exist at the time of procurement but can be developed in a reasonable amount of time. This type of procurement requires new or improved technology to be developed so as to be able to meet the purchaser's requirements.
- Pre-commercial procurement (PCP), which consists in the hiring of R&D services that are fully paid for by the contracting entity and is characterised by the fact that the public procurer does not keep the results of R&D for its own exclusive use but instead shares with the companies the risks and benefits of the R&D that is necessary to develop innovative solutions that better those available on the market at that time.





5
**Management
plan: Tools and
capabilities**

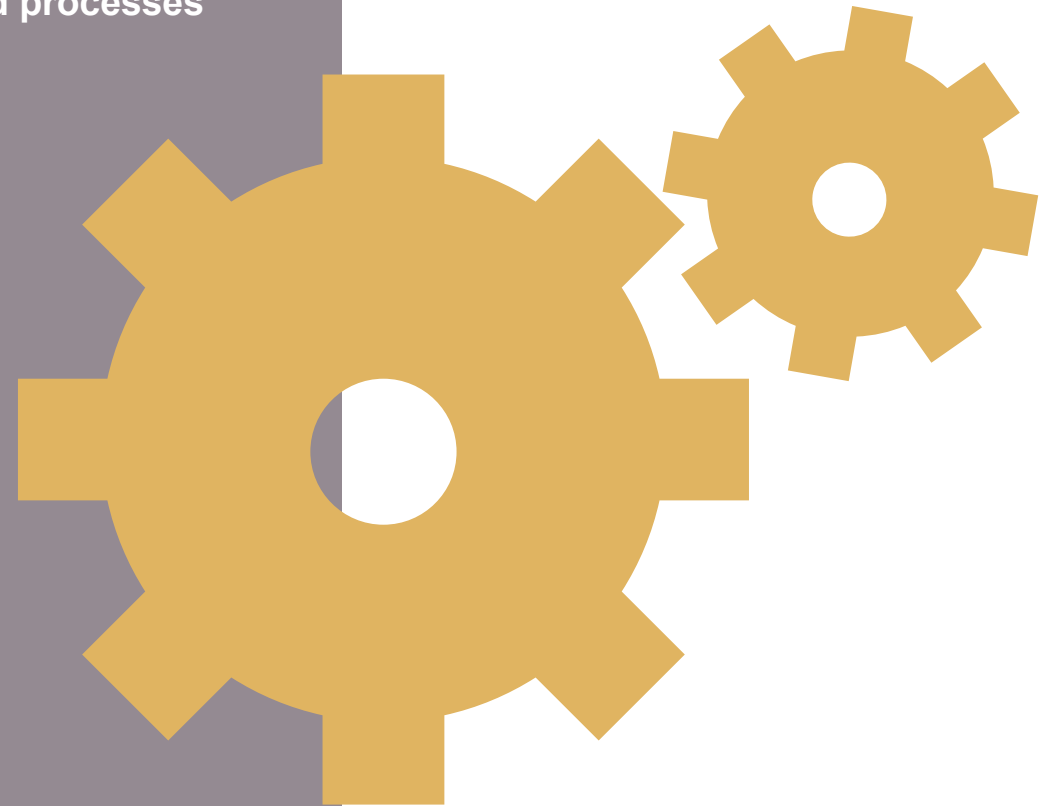
Management Model

Principles

Organisational Model

Main associated processes

Scorecard



The Fomento Group's **Transport and Infrastructure Innovation Plan**, which consists of a multitude of different initiatives, needs to be provided with effective tools and mechanisms to allow it to achieve its goals.

Being a Plan that involves the entire Ministry, with all its companies and institutions, it is essential for all the activities that are associated with the initiatives discussed in the foregoing chapter to be coordinated.

Elements that comprise the Management Plan:



5.2

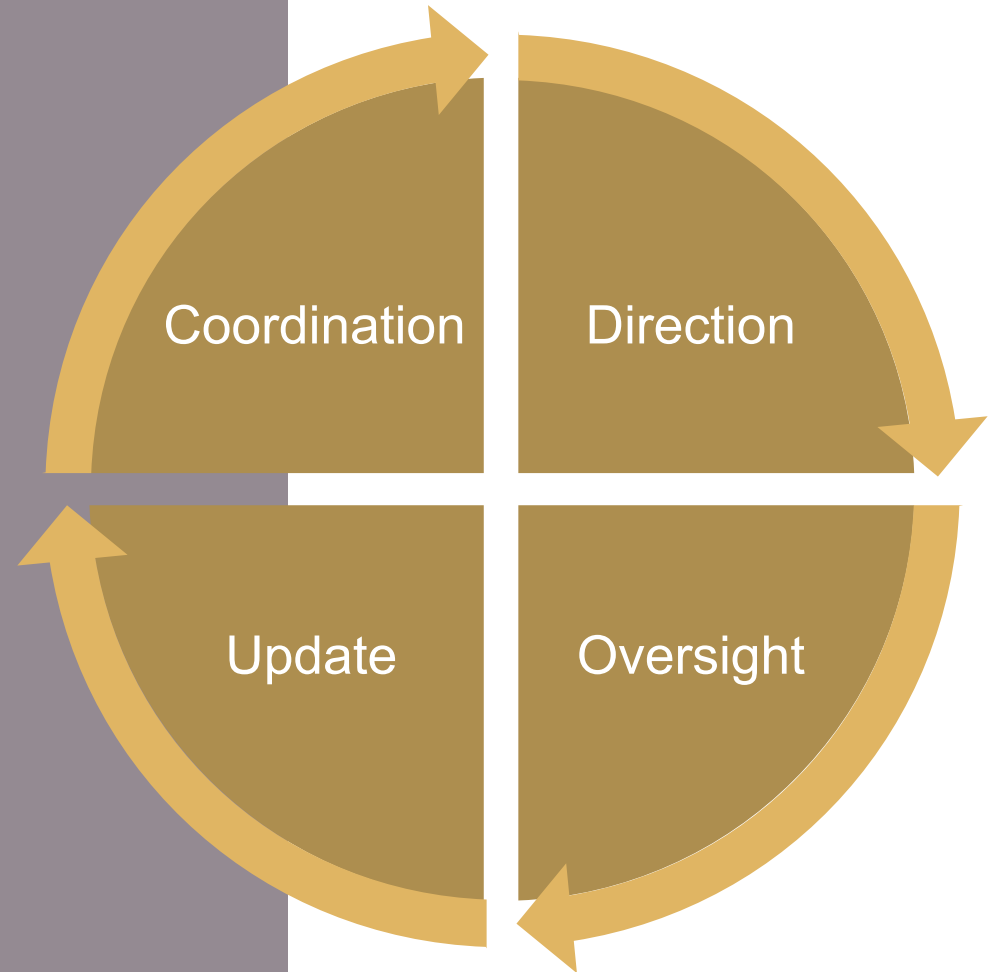
**Principles
of the
Management
Plan**

Coordination

Direction

Oversight

Update



The **Transport and Infrastructure Innovation Plan** comprises both a long-term and a short-term vision such that it also constitutes the Ministry of Public Works' Action Plan for achieving a closer and more open, innovative and results-orientated administration. The Plan runs from 2018 to 2020, whereas the duration of the coordination and management of its initiatives will depend on the length of the latter.

The management model is based on the following principles:

Coordination

The Ministry of Public Works as a sole, coordinated entity

First of all, the Transport and Infrastructure Innovation Plan is a cross-cutting plan and, as such, affects the entire Ministry of Public Works. This means that its actions will not only have an effect on all companies and institutions that fall under the umbrella of the Ministry of Public Works but also that all of the latter will have to get involved in order for the objectives that have been set to be achieved.

A set of mechanisms will be made available to allow the actions of the different companies and institutions of the Ministry of Public Works to be coordinated. Moreover, this coordination will be extended, where appropriate, to other ministries in order to take advantage of any synergies and be more efficient and effective in the development of initiatives.

Direction

Firm leadership for achieving the objectives

The leadership of the Plan falls to the Directorate General for Transformation, Internationalisation and Innovation of Ineco, a company that is answerable to the Ministry of Public Works, and specifically to the Sub-Directorate General for Cooperation and Innovation.

In addition to the specific organisation of the initiatives, which will have their own initiative leaders and officers, Ineco will provide all necessary mechanisms to promote the Plan's initiatives, acting as a promoter thereof and seeking, when necessary, the leadership of its President and the Minister of Public Works themselves as well as the support of the Ministry's other companies and institutions.

Oversight

Steering the Plan using real, clear and relevant information

The Transport and Infrastructure Innovation Plan requires tools for controlling and monitoring the initiatives so that its objectives may be achieved.

In this regard, the Plan envisages the establishment of bodies and procedures aimed at carrying out a rigorous, efficient oversight that does neither delay nor burden the initiative teams with excessive administrative tasks and provides the Plan Management Committee with a real, objective view of the status of the initiatives and their results in order for it to be able to make those decisions and take those measures that are needed in each case.

Update

A plan that adapts to changes in the environment

Bearing in mind that it is impossible to foresee how our environment will change during the term of execution of the Plan, it is necessary to guarantee that the document will be updated in the event of future changes in the regulations, the studies or the technology that require the modification of technical decisions, budgets or the results of the initiatives themselves. Therefore, this Plan has been designed to be a living document that avails itself of elements that will allow it to continually adapt to the changes in its environment and remain always the best possible working document – up to date and with good results.

Organisational Model

Management Committee

Coordination Committee

Monitoring Committee



The **Transport and Infrastructure Innovation Plan** has been organised around a series of bodies that will be in charge of directing, coordinating, monitoring and updating it and a set of initiative teams that will be responsible for putting it into practice.

The Plan's organisational model envisages three governing bodies:

- **The Management Committee**
- **The Coordination Committee**
- **The Monitoring Committee**

Additionally, every Plan initiative will be assigned a specific team with representatives of the companies and institutions of the Ministry of Public Works involved.

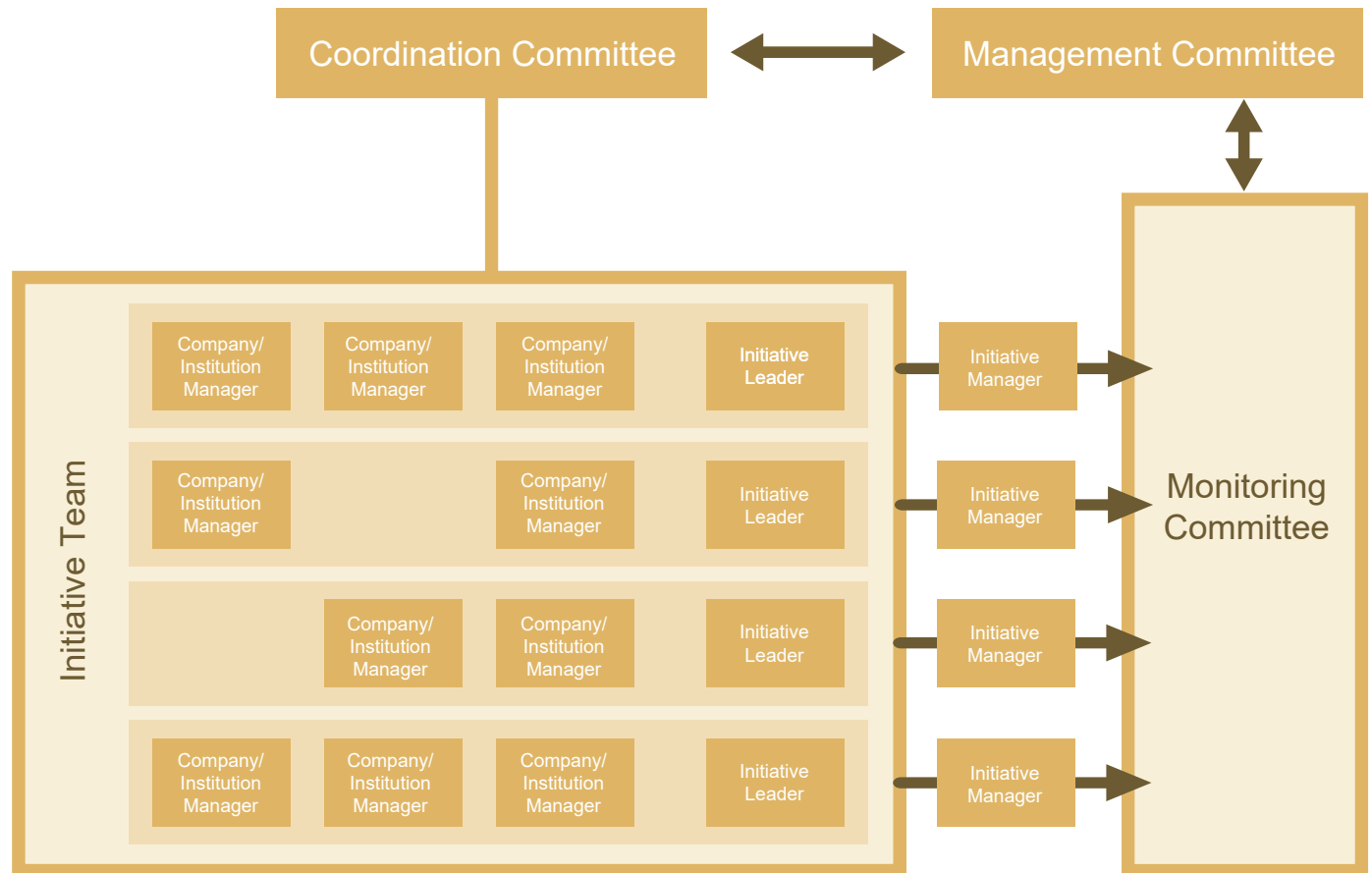
Every **Initiative Team** will comprise:

- An Initiative Leader.
- Initiative Officers.

Finally, the following figure has been created to ensure the initiative is properly managed and executed in all its fields of implementation:

- The Initiative Manager.

The organisation of and the interrelationships in every Initiative Team have been summarised and represented in the following diagram:



* This diagram is for illustrative purposes only and only purports to show the standard organisation of an Initiative Team. Given their cross-cutting nature, each Initiative Team will be made up of the appropriate companies and/or institutions according to their involvement in the initiative.

Management Committee: Makeup

Position	Institution/Company
Minister of Public Works	Ministry of Public Works
State Secretary for Infrastructures, Transport and Housing	Ministry of Public Works
Secretary-General for Transport	Ministry of Public Works
Secretary-General for Infrastructures	Ministry of Public Works
State Secretary for Research, Development and Innovation	Ministry of Economy, Industry and Competitiveness
State Secretary for the Information Society and the Digital Agenda	The Ministry of Energy, Tourism and the Digital Agenda
President	Ineco
President	Adif
President	Renfe
President	Puertos del Estado
President	Aena
General Manager	Enaire
General Manager	Cedex

Management Committee: Functions

- To give decisive impetus to the Plan.
- To ensure the strategic objectives that have been set are achieved.
- To establish and review the strategies for action.
- To solve any incidents that are escalated from the Monitoring or Coordination Committee or from any other stakeholder in the Plan.
- To approve the main milestones and deliverables.
- To meet **every six months**, although it may do so on an extraordinary basis if necessary.

Coordination Committee: Makeup

Position	Institution/Company
Advisor to the Secretary of State for Infrastructures, Transport and Housing Deputy Director-General for Cooperation and Innovation	Ministry of Public Works Ineco

Coordination Committee: Functions

- To coordinate the Plan.
- To specify the makeup of the different Initiative Teams.
- To coordinate the collaboration in and the proper execution of the initiatives.
- To identify synergies and correlations among the Plan's initiatives and other public administration bodies.
- To procure all necessary resources for the execution of the Plan.
- To draft reports.
- To meet **every three months**, although it may do so more frequently if necessary.

Monitoring Committee: Makeup

Position	Institution/Company
Advisor to the Secretary of State for Infrastructures, Transport and Housing	Ministry of Public Works
Deputy Director-General for Cooperation and Innovation	Ineco
Director-General for Strategy and Transformation / Deputy Director of Strategic Innovation	Adif
Director-General for Development and Strategy / Director of Strategy and Business Development	Renfe
Technical Director/Secretary	Sasemar
Head of the Technology Department	Puertos del Estado
Head of the Quality, Excellence and Innovation Division	Aena
Head of the European Convergence Division	Enaire
Technical Manager	Crida

Note: Those institutions which are not involved in the initiatives under way would not be required to attend.

Monitoring Committee: Functions

- To review the periodic monitoring reports sent by the Initiative Managers.
- To prepare the contents and carry out the activities corresponding to the operational monitoring of the Plan.
- To monitor the initiatives and ensure their metrics are observed with regard to the established plans.
- To share the results of each working group with all the others.
- To inform the Coordination and Management Committees of the extent of progress of the initiatives.
- To control the quality of the Plan.
- To approve, or raise to the Management Committee for approval, all potential changes in or adjustments to the Plan.
- To meet **every two months**, although it may do so whenever it is necessary.

INITIATIVE TEAM

Every Plan initiative will be assigned a specific team, in which one person from each of the companies and institutions of the Ministry of Public Works that is involved and/or interested therein will participate, thus ensuring the initiative is coordinated and properly executed with regard to all its fields of implementation.

The Initiative Team will be structured as follows: Initiative Leader and Initiative Officers.

The companies and individuals that will be part of the Initiative Team will be chosen well before the work starts.

Initiative Leader

The company or institution that will lead the Initiative will be chosen by all the Fomento Group companies and institutions that have participated in the drafting of the Innovation Plan.

The Initiative Leader will be a specific person from Adif, Renfe, Puertos del Estado, Aena, Enaire, Crida, Ineco, Cedex, Sasemar or the Ministry of Public Works.

The roles and responsibilities of the Initiative Leader are:

- Being the person who is ultimately responsible for the initiative.
- Coordinating all Initiative Officers.
- Being responsible for the roadmap and for planning the initiative in terms of scope, resources, milestones and budget.
- Being responsible for financially managing the initiative and making sure it is correctly executed in connection with the budget.
- Being in charge of identifying, together with the Initiative Officers and/or the Initiative Manager, potential funding/subsidy lines which are intended for innovation and might be susceptible of applying to the initiative in which they are all involved.
- Drafting the initiative's planning and monitoring data sheets.
- The Initiative Leader will be a member of the Monitoring Committee whenever the latter so requires it.



Initiative Officers

Specific employees of Adif, Renfe, Puertos del Estado, Aena, Enaire, Crida, Ineco, Cedex, Sasemar and the Ministry of Public Works who are responsible for the areas affected by the initiative.

The roles and responsibilities of Initiative Officers are:

- Taking part in the daily operation of the Initiative Team.
- Collaborating in the development of the initiative and its implementation at their companies.
- Seeking, proposing and facilitating, with the Initiative Manager's support and the Initiative Leader's supervision, the incorporation of the Plan's initiatives into the funding/subsidy lines intended for innovation.
- Informing the Initiative Leader of the initiative's monitoring and control

INITIATIVE MANAGER

The Initiative Manager will be a member of Ineco's Sub-Directorate General for Cooperation and Innovation.

The roles and responsibilities of Initiative Managers are:

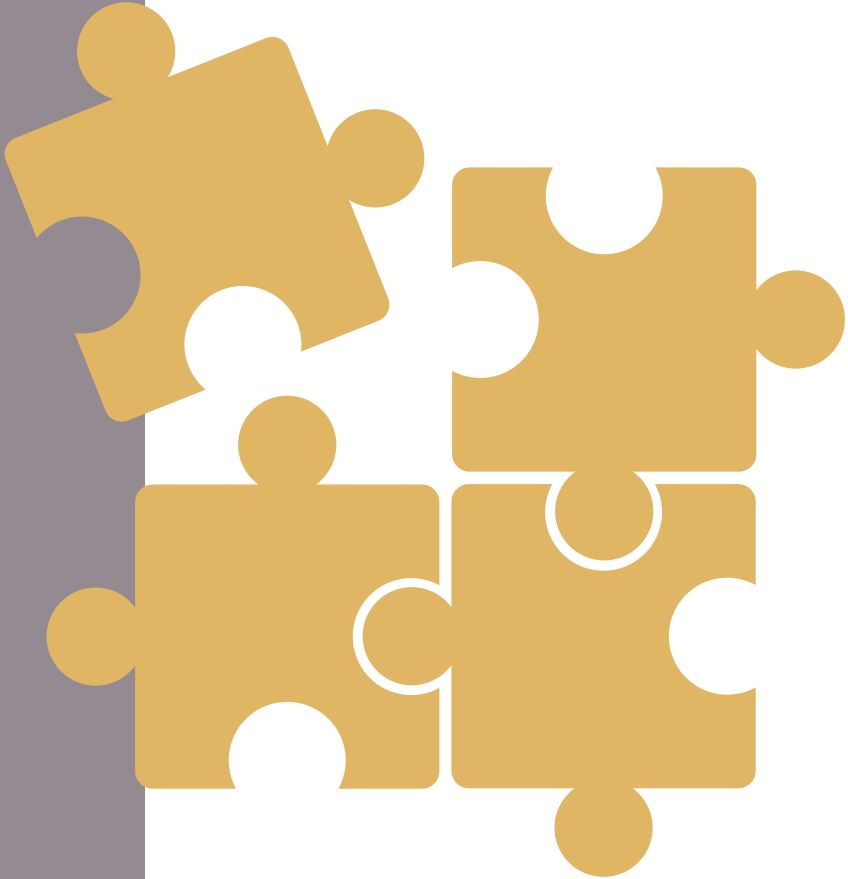
- Discharging executive and support duties for the Initiative Team (Leader and Officers).
- Periodically supervising the initiative plan that was prepared by the Initiative Leader and is executed by the Initiative Team in terms of scope, resources, milestones and budget.
- Receiving, processing and analysing the documentation generated by the Initiative Team.
- Seeking, proposing and facilitating, with the Initiative Team's support, the incorporation of the Plan's initiatives into the funding/subsidy lines intended for innovation.
- Drafting reports.
- Being the Initiative Team's main spokesperson with the Monitoring Committee.
- The Initiative Leader will be a member of the Monitoring Committee whenever the latter so requires it.

Innovation being a cross-cutting matter, the **Transport and Infrastructure Innovation Plan** envisages, in addition to the coordination needs at the Ministry of Public Works level, inter-administrative collaboration to consolidate and align synergies in the transformation efforts that are made by the different Ministries, something that must be taken into account when setting any innovation initiative in motion.

Plan Monitoring, Supervision and Update

Periodic review and update

Extraordinary revision



In order for the **Transport and Infrastructure Innovation Plan** to be properly managed, monitoring mechanisms are necessary in order for the degree of progress and completion of the initiatives to be known at any time.

To this end, the Monitoring Committee will submit to the Management Committee half-yearly reports containing the relevant information on the extent of progress of the initiatives, the overall situation of the different strategic axes and the degree of achievement of the objectives.

A Plan monitoring report will be published once a year. Once the Plan has been completed, an assessment report will be published wherein the obtained results and the degree of achievement of the established objectives will be discussed.

Additionally, every initiative will be provided with its own specific monitoring mechanisms. Initiative Leaders will report to the Monitoring Committee those incidents requiring strategic decisions be made, as set forth in the Plan revision procedures.

The following revision procedures have been established to ensure the Plan is suitably adapted to meet the environment's changing conditions:

Periodic review and update

Those changes that are typical of the standard management of initiatives fall under this heading, such as:

- Changes in the initiative's plan that do not affect committed-to milestones or deliverables.
- Addition of new measurement indicators.
- Unavoidable modifications to the plan caused by delays.

Although these changes are somewhat important and may affect the progress of the initiative, they are not considered to have a major impact thereon and can be made directly by the Head of the Initiative, who must report them directly to the Monitoring Committee for registration and traceability.

Extraordinary revision

The most important changes or those changes which may have a greater occasional impact on the normal course of the work fall within this category. These changes include:

- The addition of new initiatives.
- The elimination of initiatives.
- Modifications of the terms of execution and the milestones of the initiatives.
- Significant changes to the scope of the initiatives.
- Modifications to the budget.
- Changes in the objectives committed to in the Plan.
- Changes in the staff with responsibilities.
- Regulatory, technological or other singular changes that substantially modify the initiatives' situation.

The Monitoring Committee must be asked permission to making these changes, which must communicate its authorisation or rejection or raise the matter to the Management Committee.





5.5

Scorecard

Specific

Measurable

Achievable

Realistic

Time-based



The **Transport and Infrastructure Innovation Plan** is a results-orientated plan. Thus, measurable and quantifiable strategic and operational objectives have been set to allow the real impact of the initiatives that have been set in motion to be suitably monitored.

The objectives of the management system can be referred to as **'SMART'** owing to their characteristics:

- **Specific.** They are clear and sufficiently detailed. Addition of new measurement indicators.
- **Measurable.** It is possible to know the degree of achievement of an objective.
- **Achievable.** The objectives can be flexibly achieved and the Ministry's companies and institutions are committed to reaching them.
- **Realistic.** The objectives are ambitious but the Plan allows them to be achieved.
- **Time-based.** The objectives have been scheduled and are coordinated.

The objectives have to be continually monitored throughout the implementation of the Plan. This will allow the evolution and development of the strategies to be controlled and measured in real time. Based on the results that are obtained, it will be possible to correct and rectify any potential shortcomings in the Plan's implementation by means of the approval of new targets.

A balanced scorecard tool will be used to carry out this monitoring. This tool is essential for the action management bodies and the Management Committee to monitor and follow up on the actions and make good decisions.

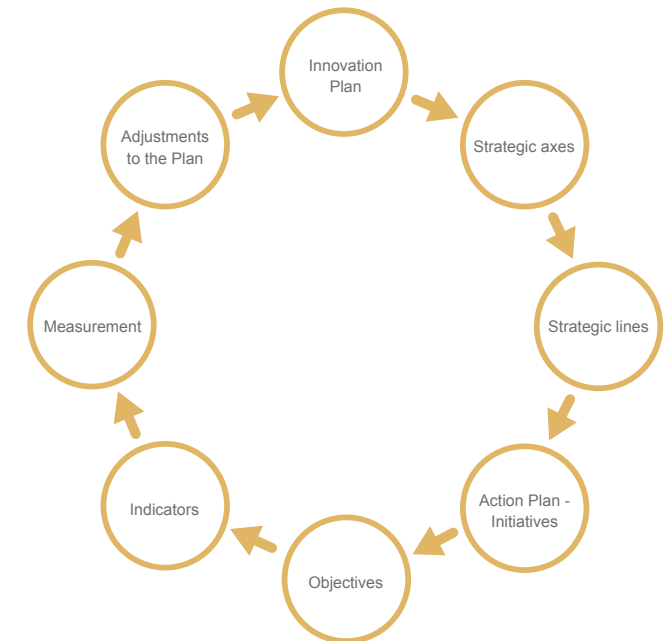
This scorecard consists of a battery of performance indicators which will allow the specific objectives and the envisaged actions to be monitored. In addition, it will be possible to assess these indicators over time, thereby allowing for responses to be designed based on the results that are obtained.

These indicators have been formulated according to criteria for the introduction of indicator systems, which require indicators:

- To be relevant for diagnosing the actual state of the initiatives.
- To be aligned with the ultimate objectives of the Transport and Infrastructure Innovation Plan.
- To have ambitious, realistic targets that motivate all Ministry of Public Works' companies and institutions to become involved.
- To be directly related to the assessed concept in order to be representative.
- To have quantifiable results.
- To have benefits that will be greater than the investment in the resources needed to acquire and process the data that will be necessary to develop them.
- To be comparable in time and hence able to represent the evolution of the assessed concept.
- To be reliable and easy to introduce, maintain and use.

- To be able to be officially approved and compared with other previously introduced indicators such as e.g. those established in the Spanish Strategy for Science and Technology and Innovation (EECTI) and the Europe 2020 Strategy (H2020), such that comparison with other regions and countries may be possible.

In any event, this is an open list that will have to be adjusted according to the objective and target reorientation needs and the requirements of the monitoring and evaluation process.



E1 - User Experience indicators

E1L1 - Mobility as a Service	E1L1-1 - National Mobility-as-a-Service Plan	Degree of knowledge of MaaS Number of companies associated with MaaS
	E1L1-2 - The Fomento Group as data integrator	Number of transport operators involved Publication of the White Paper on Open Transport Data
	E1L1-3 - MaaS Pilot Project within the Fomento Group	Partnership with a last mile transport operator Perception of the combined-transport tickets (with more than one operator) Demand for the new service on offer
E1L2 - Barrier-Free Travel	E1L2-1 - Development and introduction of advanced payment systems	Percentage of sales made via electronic processes Annual investment in ticket purchasing systems Evaluation of the cost of fraud associated with the purchase of tickets
	E1L2-2 - Development and introduction of ticketless validation systems	Percentage of tickets validated without physical tickets Annual investment in ticketing Number of projects based on biometric systems in operation
	E1L2-3 - Promotion of non-stop security systems and checks	Number of biometric technique-based systems certified at the international level Number of patents developed under the framework of the initiative The number of systems introduced (under test or in operation)
	E1L2-4 - Universal accessibility plan in the transport system	Number of Plan-related projects set in motion Degree of improvement in the Universal Accessibility indexes
	E1L2-5 - Positioning inside transport terminals	Number of indoor positioning-capable terminals Number of indoor positioning-related companies
E1L3 - User Profile	E1L3-1 - Big Data and data science for improving user experience	Number of user experience-related predictive models being used Revenue generated by data analysis
	E1L3-2 - Creation of user profiles	Number of registered users The opinion of users
	E1L3-3 - Creation of a Fomento Group marketplace	Sales via the Marketplace Number of products on offer
	E1L3-4 - Opening of new operator-user communication channels	Number of users of the participation portal Introduction of the feeling analysis system Users' opinion of the automated customer service
	E1L3-5 - Creation of a user experience lab	Number of patents generated by the Lab.

E2 - Smart Platforms indicators

E2L1 - Mobility as a Service	E2L1-1 - Smart Station Platform	Number of systems integrated in the platform
		Number of stations where the platform has been introduced
		Number of commercial initiatives developed to sell the solution
	E2L1-2 - Integration of the Smart Station Platform with the city platform	Percentage of integration-required activities carried out
		Number of integrated information entities
	E2L1-3 - Integration of BIM models into the Smart Station	Number of BIM-integrated maintenance/operation processes
E2L2 - Smart Airports	E2L2-1 - Smart Airport Platform	Number of systems integrated in the platform
		Number of airports where the platform has been introduced
		Number of commercial initiatives developed to sell the solution
	E2L2-2 - Integration of the Smart Airport Platform with the city platform	Percentage of integration-required activities carried out
		Number of integrated information entities
	E2L2-3 - Integration of BIM models into the Smart Airport	Number of BIM-integrated maintenance/operation processes
E2L3 - Smart Ports	E2L3-1 - Smart Port Platform	Number of ports where the platform has been introduced
		Revenue from selling the platform
	E2L3-2 - Integration of the Smart Port Platform with the city platform	Percentage of integration-required activities carried out
		Number of integrated information entities
	E2L3-3 - Integration of BIM models into the Smart Port	Number of BIM-integrated maintenance/operation processes
	E2L4 - User Platform	E2L4-1 - User Platform
Number of systems fed by the Platform		
Number of user characteristics collected by the platform		
E2L4-2 - Integration of the User Platform with other platforms and tools		Number of platforms integrated in the User Platform
E2L4-3 - Integration with mobile apps that generate mobility data		Number of mobility data-generating applications integrated in the User Platform

E2 - Smart Platforms indicators

STRATEGIC LINE	INITIATIVE	INITIATIVE MONITORING INDICATORS
E2L5 - Freight Platform	E2L5-1 - Freight Platform	Number of individual users of the Platform
		Revenue from selling the Platform
	E2L5-2 - Integration of the Freight Platform with other platforms and tools	Number of platforms integrated in the Freight Platform
E2L6 - Open Data	E2L6-1 - Promotion of new open data projects	Number of conference attendees
		Number of participants in training courses
	E2L6-2 - Definition the open transport data catalogue	Number of entities that have joined the catalogue
	E2L6-3 - Development of the multimodal open transport data portal	Number of entries posted on the portal
E2L7 - New Data Sources	E2L7-1 - Partnerships with companies that generate mobility data	Number of partnerships entered into
	E2L7-2 - Mining of social media data to use it in mobility and transport	Number of mobility studies conducted using social media data
		Number of studies using this sources of data
	E2L7-3 - Using mobile telephony data to determine transport demand	Number of queries made to O/D matrices
E2L7-4 - Integration of Galileo in the Fomento Group's applications		Number of upgraded applications
		Number of newly developed applications
E2L8 - Single Sky	E2L8-1 - Smart ATM. Smart Air Traffic Management	Capacity of Spanish air space
	E2L8-2 - Unmanned aerial vehicle traffic management platform	Number of UAVs managed by the Platform
	E2L8-3 - Introduction of Big Data techniques in air navigation services	Number of times the air navigation system performance predictive model has been introduced
E2L9 - Smart Maritime Management	E2L9-1 - Smart Maritime Traffic Management	Evaluation of the Test Bench

E3 - Smart Routes indicators

E3L1 - Road and Railway Digitalisation	E3L1-1 - Standardisation of V2I and V2V communications	Number of standards promoted by the initiative
		Number of entities that have joined the White Paper
	E3L1-2 - Introduction of predictive maintenance in transport infrastructures	Maintenance cost savings achieved in the studied infrastructures
	E3L1-3 - Positioning towards 5G networks	Number of initiatives launched based on the Migration Plan
	E3L1-4 - New security systems in the railway infrastructure	Kilometres of track with smart systems installed
		Cost saving analysis with the proposed solutions
E3L1-5 - Deployment of the ERTMS in the Spanish rail network	Completion of a realistic, financially feasible deployment plan	
	E3L1-6 - BIM in linear infrastructures	BIM-integrated design/construction processes
		Number of BIM-integrated maintenance/operation processes
E3L2 - Modelling and Forecasting	E3L2-1 - Development of a Multimodal National Passenger and Freight Transport Model	Number of applications, uses and studies arising from the National Transport Model
	E3L2-2 - Pilot project on a predictive transport demand model	Number of applications, uses and studies arising from the predictive model
		Appraisal of the pilot project
E3L3 - Smart Territories	E3L3-1 - On-demand transport system in rural settings	Number of public transport routes running with the system
		Decrease in the running costs to passengers ratio
	E3L3-2 - Pilot project on dynamic public transport routes	Users' opinion of the new system
Passenger demand		
E3L4 - Logistics and Freight	E3L4-1 - Freight transport cost observatory	Number of accesses to the observatory
	E3L4-2 - Intermodality without barriers	Decrease in the average time spent doing paperwork.
		Stakeholders' opinion of the system
	E3L4-4 - Introduction of last mile services at the Fomento Group	Turnover of the new service
Number of new customers		
E3L5 - New Transport Paradigms	E3L5-1 - Setting up of a technology watch commission	Number of approved corporate technology watch processes
	E3L5-2 - Hyperloop Strategy	Number of feasibility studies conducted
		Publication of the Spanish consultation document
	E3L5-3 - Unmanned Aerial Vehicle Lab	Number of pilot projects set in motion

E4 - Energy Efficiency and Sustainability indicators

E4L1 - Renewable Energies	E4L1-1 - Promotion of energy generation, storage and distribution systems	Decrease in the consumption of energy at the border point
		Percentage of all the electricity consumed that comes from sustainable, renewable sources
		Volume of redistributed energy
E4L2 - Decarbonisation	E4L2-1 - Promotion of the development of the National Action Framework for Alternative Energies in Transport	Ratio of AFVs to the total number of vehicles in the fleet
		Vehicle and infrastructure models available with each technology
		Energy consumption Reduction of the fuel budget for the Fomento Group's fleet of vehicles
	E4L2-2 - The Fomento Group's Plan for the Infrastructure of Electric Vehicles and Other Alternative Fuel Vehicles	Number of recharging points installed within the Fomento Group's sphere
		Decrease in GHG emissions
		Number of VEs and AFVs in the Fomento Group's fleet of vehicles
	E4L2-3 - Introduction of efficient combined-transport services	Interannual percentage variation of combined modes in modal share
		Number of combined-transport initiatives
	E4L2-4 - Intermodal portal for tracking and monitoring environmental indicators and objectives	Number of entities in the transport sector that have joined the intermodal portal
		Number of monitored environmental indicators and objectives
	E4L2-5 - Application of photocatalytic technologies to transport infrastructures	Number of implemented pilot projects
		Degree of improvement in air quality thanks to the use of photocatalytic materials and systems
	E4L2-6 - The bicycle as the axis of urban mobility	Number of stations and transport hubs with the necessary infrastructure for intermodal transfer with bicycles
		Degree of user satisfaction with the intermodal transport offer

E4 - Energy Efficiency and Sustainability indicators

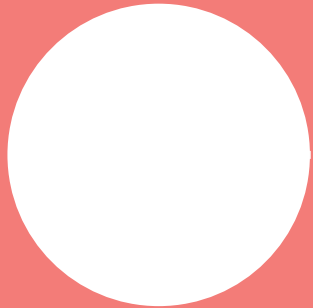
STRATEGIC LINE	INITIATIVE	INITIATIVE MONITORING INDICATORS
E4L3 - New Infrastructures	E4L3-1 - Optimisation of transport elements and adaptation thereof to more efficient and sustainable models	Number of transformed vehicles
		Number of optimised infrastructures
	E4L3-2 - Smart energy management systems in transport infrastructures	Electrical energy consumed
		Number of transport infrastructures with a smart energy management system
		Decrease in the consumption of energy at the border point
	E4L3-3 - Development of smart networks for decision-making	Energy consumed
		Assessment of the pilot projects
	E4L3-4 - Control of flight efficiency in terms of consumption, cost and emissions	Number of detected inefficiencies
		Fuel consumption savings
		Savings in costs arising from flight inefficiencies
	E4L3-5 - New noise and soil pollution control techniques	Number of assessed techniques
		Degree of decontamination achieved
	E4L4 - The Autonomous Vehicle	E4L4-1 - Technical standardisation for the development of the Legal framework of the Autonomous Vehicle
Number of entities that have joined the Committee		
E4L4-2 - Drafting of the White Paper on the Ethics of the Autonomous Vehicle		Publication of the White Paper
		Number of entities that have joined the White Paper
E4L5 - Education, Communication and Entrepreneurship	E4L5-1 - Education, communication and training activities	Number of training actions
		Number of stakeholders that have been the recipients of training actions
	E4L5-2 - Co-working space options	Surface area allocated to co-working spaces
		Number of collaboration agreements with startups with no investment costs for managers

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