



# logistop

Plataforma Tecnológica en Logística Integral, Intermodalidad y Movilidad

# Sra

## STRATEGIC RESEARCH AGENDA



Spanish Technology Platform in Logistics, Intermodality and Mobility





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# 1

## Executive Summary

The **Strategic Research Agenda (SRA)** document has been developed within the framework of the activities of the Spanish Technology Platform in Logistics, Intermodality and Mobility, Logistop. Logistop was created as a multidisciplinary work forum that is open to all agents with interests in the field of Logistics. It therefore brings together companies of the logistics sector, all bodies carrying out logistics activities in their organisations and also includes technological centres, universities and other research organizations. Logistop's activities focus mainly on R&D and Innovation, setting itself up as a tool at the service of its members, with the aim of creating and mobilising the critical mass of innovation necessary to generate knowledge and harness it, ensuring competitiveness and sustainability in the logistics sector in Spain.

The SRA aims to become a benchmark document in the field of R&D and Innovation, providing guidelines for work in companies, technological centres and universities and being used to define the lines of support of public administrations and other bodies financing R&D and Innovation activities. Thus it aims to be a coordination tool for strategies, efforts and public and private R&D and Innovation financing,

favouring the structuring of the system and encouraging the development of large, high-impact projects that make it possible to overcome current barriers and position Spanish companies at the forefront of knowledge and excellence in logistics management.

The SRA includes the **key actions** necessary to carry out in the different **fields** identified as strategic on the basis of the analysis carried out in the document "Documento Visión Estratégica 2020 de la Logística en España" (*2020 Strategic Vision of Logistics in Spain*) in order to achieve the desired situation for the sector. Additionally, it identifies all agents involved in the development and implementation of the actions as well as the **tools available to facilitate and help the implementation and development of the SRA.**

The following table includes the key actions to be developed later in the document. These have been divided on the one hand into key actions focusing on specific technical aspects, **research, development and innovation actions**, and on the other into **transversal actions**, which are horizontal in nature and/or lack R&D and Innovation activities as such.

## Table of key actions grouped by strategic fields

### TRANSVERSAL ACTIONS

<p><b>General Recommendations</b></p>	<p>Raise awareness among Administrations and the public for the effective implementation of the different regulations regarding the collection and treatment of waste and achieve greater participation in recycling actions</p> <p>Promote the implementation of systems that prevent non-controlled movements of products in the supply chain, as well as of the means of tracking these products</p>
<p><b>Training and Knowledge</b></p>	<p>Define and recognise new professional duties in the field of logistics and make a "job profile chart"</p> <p>Design and propose the training map for all levels, including the recycling of professionals</p> <p>Promote the extension in companies of the concepts of Logistics and Supply Chain, the relevance of this economic activity and new logistical strategies and applications</p>
<p><b>R&amp;D and Innovation Promotion</b></p>	<p>Raise awareness of the importance of R&amp;D and Innovation in the logistics sector, promoting the generation of own knowledge and technologies within Spain</p> <p>Devote more financial resources and make a more efficient and coordinated use of these resources, establishing strategic priorities for the development of logistical knowledge within Spain</p> <p>Promote the development of large national and international scale projects in strategic areas related with Logistics.</p>









## RESEARCH, DEVELOPMENT AND INNOVATION ACTIONS

<b>Sustainability and Corporate Social Responsibility</b>	<p>Analyse the products from the point of view of design according to logistical requirements (in order to favour recycling, reuse and remanufacturing)</p> <p>Optimise the reverse flow of materials and all associated resources</p> <p>Develop methods for a more efficient treatment of end-of-life products</p> <p>Promote the use of more environmentally friendly methods of transport and the development of actions that improve logistical infrastructures in terms of sustainability</p> <p>Improve the monitoring devices and environmental safety measures applicable to the logistics of all kind of freight</p>
<b>Security, Safety and Reliability</b>	<p>Develop tools and methods for the improvement of safety in freight transactions and security of information exchange between agents of the supply chain, as well as in passenger mobility</p> <p>Develop tools to guarantee product reliability, monitoring product evolution and traceability throughout the supply chain</p>
<b>Promoting Collaboration</b>	<p>Design and develop methods that favour the exchange of information without affecting the confidentiality of the know-how</p> <p>Develop tools that favour a joint strategic vision of the supply chain and encourage strategic alliances among agents that collaborate in the chain</p> <p>Develop tools that make it possible to apply collaborative approaches, especially within the context of SMEs</p>
<b>Co-modality / Intermodality</b>	<p>Improve the management and organisation of interoperability / intermodality</p> <p>Establish the physical relationship between the different transport modes</p> <p>Optimise and improve the use, utilisation, design and management of logistics infrastructures</p> <p>Develop modelling and optimisation in the field of transport</p>
<b>Technology</b>	<p>Develop information exchange technology platforms from the point of view of interoperability</p> <p>Promote technological progress in product design according to logistical requirements (packing and packaging) and its coordination in operational management</p> <p>Research into new business models that promote visibility and traceability, driven by ICTs and applied to transport systems</p> <p>Develop the technological vision of business processes and research into performance measurement systems in the context of Logistics and the Supply Chain</p> <p>Define the logistical requirements of the physical / technological aspects of transport vehicles and materials</p>

# Contextual framework and development methodology of Strategic Research Agenda



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Logistics is acquiring growing importance in the strategies of companies and have increasingly become a fundamental factor for competitive improvement in a global environment that is continuously changing. Globalisation, a threat to local markets, also brings with it an opportunity to enter new markets, which depends greatly on the success of the logistics and the supply chain management.

The logistics sector has traditionally been identified as with transport companies whose exclusive function was focused on carrying freight and passengers from one point to another. However, the recent and future evolution of the sector has led to the integration of transport activities with a series of increasingly complex services that can be found within the concept of logistics activities. This activity could thus be defined as the set of bridging services in and between the agents of the supply chain, including, in addition to transport, activities related to the management of inventories and orders, storage, assembly, final packaging, intermodality, distribution networks, urban mobility, etc. In this regard, logistics include all activities related to physical and data flows carried out in and between organisations. Thus the logistics activity makes it possible for the product to acquire its value when the client receives it in the right timeframe and in the right manner at the lowest cost possible, resolving the classic maladjustment in the production cycle between production and consumption as a consequence of the spatial and temporal separation between both phases, the origin of the economic functions of distribution and commercialisation.



In the case of passengers, it means a user can make a journey in a shorter space of time, at a lower cost and with the highest degree of reliability, while still respecting sustainability criteria.

The increase of competition and the need to offer products, processes and services with greater added value means that companies must have a flexible and robust integration of logistical operations and processes. In addition, the concept of customer attention has evolved very quickly over the last decades and, nowadays, clients are a company's final aim - satisfying their needs and achieving their loyalty is the basis for success.

Under all these conditions we can conclude that supply chains must be flexible, agile, safe, reliable and efficient, while still respecting sustainable growth criteria, with an optimal integration of physical and data flows.

In this context, technological advances and new technologies provide an essential opportunity for the development of these aims, also favouring new forms of commercialisation that require the introduction of innovative formulas for supply chain management.

Logistics management implies an inevitable but necessary cost, given that it determines the availability of the freight at the time and in the place where the client need it, with the added value this implies. In

the case of passengers, the cost is aimed at satisfying the needs of users by optimising their mobility. In this regard, good logistics management avoids inefficiencies and favours reduced costs, becoming a competitive advantage for the company.

In addition, the growing need for human resources with all levels of training and diverse profiles has made logistics into a discipline in its own right. However, it is necessary to improve the knowledge of the future needs of professionals, identifying the most sought-after profiles and encouraging the implementation of the necessary training programmes to cover those needs.

The logistics processes of Spanish companies have improved in recent years, although their position is still behind those of other countries. Factors such as the high degree of investment required, infrastructures that are sometimes obsolete or inefficient, and a business sector that essentially comprises SMEs, which have greater difficulties inherent to their condition when it comes to integrating and adapting to the situation and evolution of markets, condition the national development of logistics.

However, this situation offers in turn a chance and a challenge that can be met. To do so, it is important for public administrations, universities, technological centres and other research bodies to support the efforts made by the business sector to develop and





incorporate innovative concepts that make it possible to make the most of Spain's extensive size and its geographical location - on the periphery with regards to Europe, but a gateway for markets such as Africa and especially Latin America.

In recent years, public investment in R&D and Innovation has considerably increased, offering a great opportunity that companies can and should make good use of.

The generation of knowledge and its transfer to the logistics sector through new improved products and services, together with the development of training programmes adapted to company needs and to promoting an innovative organisational culture, are driving forces to increase the productivity and competitiveness of companies using and offering logistics services.

All issues dealt with above are included in the document *Strategic Vision Document 2020 of Integral Logistics in Spain*, in which, based on the work of its members, Logistop established a series of strategic fields of action to focus on in order to increase the opportunities of logistics activities and be able to develop a competitive industry while maintaining sustainable development. Included in the different *strategic fields*, the platform listed a series of *key actions* to carry out over the next few years. Figure 1 shows the strategic fields of action for logistics in Spain as established by Logistop.

The figure shows that the main aim of logistics must be **client satisfaction**, never forgetting that **profitability** and growth are main aims within an organisation's business strategy. In order to fulfil these requirements, it is necessary to plan a logistics management that enables the organisation to be **flexible** to changes in demand and to the new scenarios which it shall have to face, to be **efficient**, in order to carry out any action optimally, and to be **responsive**, in order to achieve success in an increasingly changing environment, so as to offer **reliability** with the provided service or product.

In order for an organisation to be able to act according to these premises, it must promote the development of a series of complementary **strategic areas** that can subsequently become key, such as **human resources** trained in the subject and with the

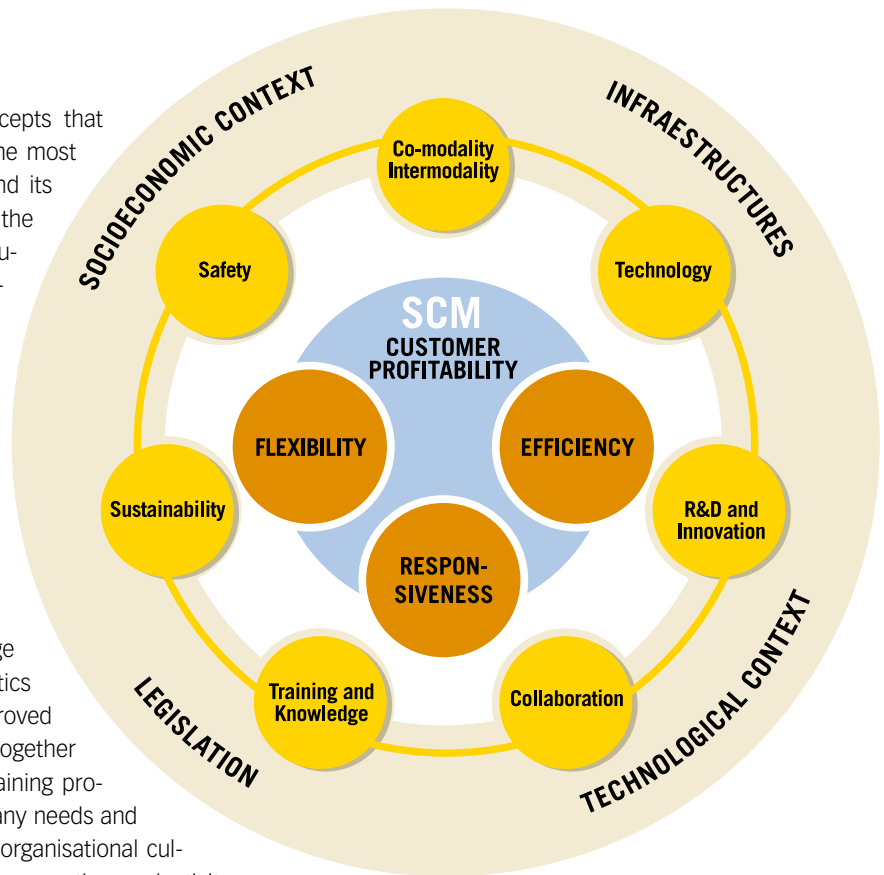


Figure 1. Strategic fields of action in Logistics

knowledge to manage, use and apply the available **technology**, as well as to develop and access the **R&D and Innovation** carried out within this activity, know how to create and act in **collaborative frameworks** between the different agents that make up the supply chain to which the organisation belongs, apply **co-modality /intermodality** in the transport of freight and passengers and manage both physical and data flows in a **safe** environment, while still respecting the need for sustainable **development**.

In addition, there is a series of frameworks of action with regard to logistics on which individual companies have scarce influence, but which nevertheless affect them greatly, such as **legislation**, the **socio-economic environment**, **infrastructures** and the **technological environment**.

*Logistop's Strategic Research Agenda (SRA)* is the following step with regard to the document *Strategic Vision Document 2020 of Integral Logistics in Spain*, given that it further studies the key actions listed in that document, defining specific R&D and Innovation lines associated to those key actions and to the R&D and Innovation needs of the companies.

A methodology based on several phases was used for the development of this Strategic Research Agenda. The first phase involved carrying out 2 surveys,

the aim of which was to find out which of the key actions and strategic fields included in the **Strategic Vision Document 2020 of Integral Logistics in Spain** were of greatest interest to Logistop work group members. The **1st survey** was answered by 46 members of Logistop. The **2nd survey**, developed with the aim of verifying the results of the 1st survey, was answered by 63 members of Logistop, approximately 40% of which were from companies and business associations.

Once the surveys had been carried out, a **Panel** was formed, comprising 31 **Experts** in addition to Logistop's Technical Committee, with the aim of assessing the results obtained in the surveys and, on the basis of that assessment, redefining and developing in detail the key actions already set out in the **Strategic Vision Document 2020 of Integral Logistics in Spain**.

Based on the meeting of the Panel of Experts and their subsequent work, Logistop's Technical Committee drafted the first version of this document, which was assessed and commented on by the members of the panel of experts. This assessment gave way to the second version, which was examined, assessed and commented on by all members of Logistop work groups.

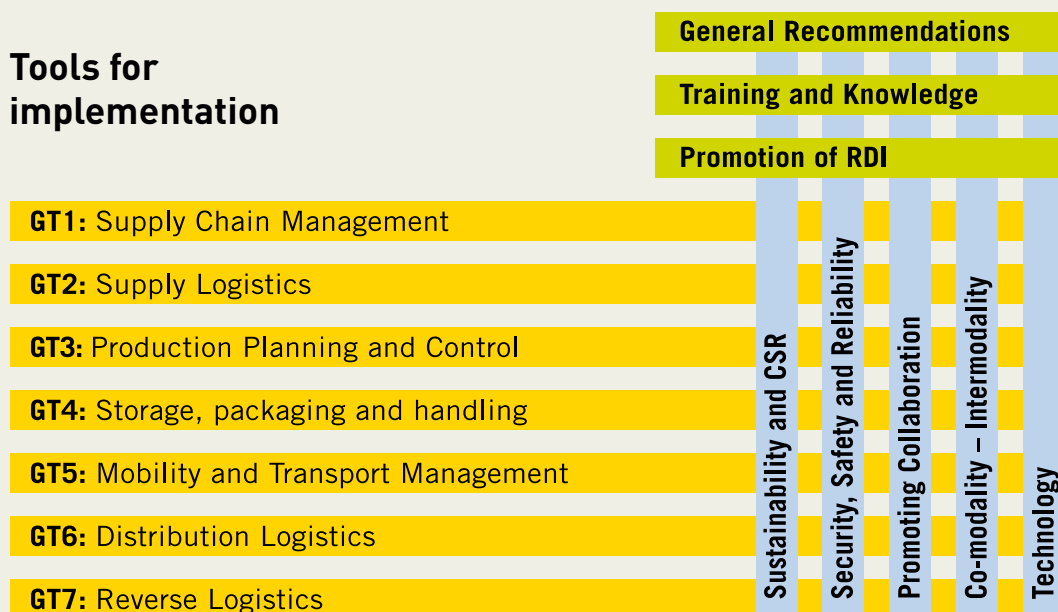
Based on these comments, Logistop's Technical Committee drafted the third version of the docu-



ment, which was assessed by the Permanent Commission of Logistop, thereby generating a fourth version of the document, which was subsequently slightly modified and approved by the Governing Board of the Platform.

At the meeting of the Panel of Experts it was pointed out that it was important to distinguish the actions in terms of type and aim, given that some of them were transversal and transcended the technical scopes of the logistics area, whereas others were specific R&D and Innovation actions. Taking this into account, the Strategic Research Agenda is conceived of with the following basic structure, as represented and explained below:

## Tools for implementation





#### THE STRUCTURE OF THE SRA REPRESENTED IN THE FIGURE ABOVE INCLUDES:

**Transversal Actions.** This section includes actions that transcend technical scopes and R&D and Innovation actions. They are classified as follows:

- **General recommendations.** This point includes recommendations and actions desirable to carry out in order to improve the logistics situation in Spain, although they are not R&D and Innovation actions as such and are not aimed at promoting R&D and Innovation and Training and Knowledge, which are aspects developed in specific sections.
- **Training and Knowledge.** This point includes the specific actions within this strategic scope, which aims to achieve the harmonisation and improvement of human resources trained within the field of logistics, as well as to improve the logistical knowledge of companies by showing the competitive advantages that logistical excellence can generate.
- **Promotion of R&D and Innovation.** This point includes actions that must be carried out within this strategic scope with the aim of favouring the global development of R&D and Innovation in logistics within Spain and to facilitate the implementation of the R&D and Innovation actions identified in this Strategic Research Agenda.

**Research, Development and Innovation Actions.** This section will include key R&D and Innovation actions contained within the scope of Logistop work groups:

**GT1: Supply Chain Management.** Study of the mechanisms that take part in an efficient development of the re-engineering of logistics process, work methods, methodologies, strategies and techniques to support decision-making, according to design criteria that affect the efficiency of the parts that comprise the supply chain.

**GT2: Supply Logistics.** Study of operational systems, methodologies and tools for the optimal development of the supply functions of companies, in terms of the relationship with suppliers and the integration of goods in the production chain.

**GT3: Production Planning and Control.** Analysis of concepts and techniques for the management and control of production that allows the implementation of efficient production plans, including complexity in the exchange of information between agents of the production chain as well as the control of intrinsic parameters such as uncertainty or quality.

**GT4: Storage, packaging and handling.** Concepts, designs and technologies associated to packing and packaging, from manufacturers of packaging, raw materials or packing methods and their users to environmental aspects, safety regulations and certifications or containers for transport and traceability systems associated to packing. Development of methods and technologies for the optimisation of the internal logistics operation for the storage of freight and its correct handling.

**GT5: Mobility and Transport Management.** It covers concepts related to freight and passenger transport, from intermodality to network distribution, load safety, logistics platforms, consolidation and distribution centres, as well as studies on urban mobility, public transport, specialisation in loading and unloading systems.

It also includes environmental aspects of transport, the necessary infrastructures and the development of transport and infrastructure planning policies.

**GT6: Distribution Logistics.** Study and development of strategies, organisation and business processes for the efficient distribution of freight, balancing the efficient use of the methods of transport as well as information technologies and communications.

**GT7: Reverse Logistics.** Research aimed at promoting and developing reverse logistics, under-



stood as the process of planning, executing and efficiently controlling the flow of raw materials, ongoing inventory, finished products and information, from the point of consumption to the point of origin, with the aim of recycling it, creating value or destroying it appropriately, with reference to both materials and packaging.

The development of the identified key actions implies one or several of the abovementioned work groups and they have been classified in accordance with the strategic scope on which the action would have impact:

- Sustainability and Corporate Social Responsibility.
- Security, Safety and Reliability.
- Promoting Collaboration.
- Co-modality/Intermodality.
- Technology.

After a brief explanation of the situation in each specific area, the key actions will be approached and the aims they include will be outlined, as well as the activities and R&D and Innovation lines to be carried out to achieve the aims sought.



## 3

# Transversal actions

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This section includes all actions described as transversal because they are horizontal to the technical sphere or they transcend the development of R&D and Innovation itself.

It proposes a series of **general recommendations, Training and Knowledge and R&D and Innovation Promotion** actions, strategic fields of action identified in the *Strategic Vision Do-*

*cument 2020 of Integral Logistics in Spain* that include and develop specific activities to be carried out with the aim of globally promoting the generation of knowledge and its effective transfer to the business sector through innovation and the training of qualified human resources, all within the field of logistics.

## 3.1 GENERAL RECOMMENDATIONS

The General Recommendations listed here include reflections on the current situation of Logistics in its most general sense, which in some cases lead specifically to recommendations that must be transmitted to the agents involved, including public administrations, which can and should channel these recommendations within their scope of competence.

**3.1.1 / Raise awareness among Administrations and the public for the effective implementation of the different regulations regarding waste collection and treatment and achieve greater levels of participation in recycling actions**

As the result of the general awareness of the need to advance in sustainable development, the Administrations have launched measures to control the waste collection and treatment systems, though it is necessary to carry out additional efforts for the correct and effective implementation of these measures.

**Public Administrations must become involved in the development of systems for the treatment of waste and for the recovery of out-of-use products**, which are those that no longer satisfy the needs of consumers but which still offer certain value that may be recovered through recycling, reuse or remanufacturing, which in addition requires the development of new logis-

tics networks that move and process the returned material.

This trend will also have repercussions on the development and strengthening of markets for the recovered products, which must be regulated and promoted by the Administrations, generating new logistics needs. Carrying out these actions should finally lead to a notable increase of out-of-use products managed by Integral Management Systems (IMS), the creation of new systems of management for new products that can be recovered, and to the development of new markets that can absorb the new offer of recovered products.

#### **SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Encourage the use of recovered products (recycled, remanufactured, reused) in the context of Public Administrations, companies and individuals, by raising awareness among the authorities, business leaders and the public in general.
- Promote among the general public the existence and operation of Integrated Management Systems (IMS) for the recovery and/or elimination of out-of-use products.
- Analyse the degree of knowledge and the perception, motivation and attitudes of the general public regarding the elimination of waste and the use of recycled materials.
- Establish effective systems of public communication to increase public participation in the elimination of waste and the use of recycled material.
- Promote the creation of new and more efficient IMS for the effective treatment of the new waste.
- Establish the conditions necessary for a better operation of IMS, facilitating the participation of the different agents and intermediaries of the reverse logistics flow.
- Carry out campaigns that visualise the environmental problem of out-of-use products and the need to participate in these recycling programmes.
- Encourage Administrations to exercise greater control on the bodies that have to comply with the regulations in force.
- Promote the use of recycled material in the fabrication of new products.
- Promote training in university contexts in fields such as recycling, ecological design, as well as the creation of ecodesign spaces.
- Systematically reduce packaging materials by stipulating that they should be made with recycled materials and reusable.
- Establish the way in which the cost of reverse logistics should be distributed across all participants in the supply chain.



#### **3.1.2 / Promote the implementation of systems that prevent non-controlled movements of products in the supply chain, as well as of the means of tracking these products**

In order to develop any supply chain, it is vital for there to be reliability as regards the information and the freight present in the chain. However, this reliability is difficult to achieve without the use of systems that avoid interferences in both flows (shrinkages, insertion of undesired materials or data into the chain, etc.). The aim proposed in this action is to promote the use of these systems, including not only computerised aspects but also widening their definition, incorporating anything from sensors and other equipment to identification and traceability elements, including processes and procedures defining the activity in a safe manner.





One of the most surprising facts is that a large part of the necessary technology is already available on the market, although most of the companies that could benefit from their use are unaware of their specific applicability. This is why the main challenge is to strongly support the implementation of these technologies.

The **aims** of this key action are focused on making significant **progress in the implementation of systems that prevent the non-controlled exit of products from the supply chain**, with the subsequent improvement of the tracking means required for these products.

This way, these aims would be reflected in the integration of automatic identification technologies with anti-theft technologies, in the incorporation of systems based on the concept of e-pedigree or in the increase of exhaustive controls of goods leaving the manufacturer's warehouse and arriving at the delivery point.

In addition it would also play a decisive role both in the elimination of unnecessary costs of simultaneously maintaining two different systems for identifying items and anti-theft, and in achieving total traceability of the products throughout the supply chain and the control of shrinkages, thus guaranteeing the reliability of the product and the data used.

Lastly, it would affect the guarantee of the product not being counterfeit thanks to the e-pedigree fa-

cilitated by the EPC chip, very useful when it comes to detecting counterfeits and controlling the grey market, and very generally, in the reduction of financial losses caused by administrative or human errors.

#### **SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Favour the integration of automatic identification technologies with anti-theft technologies, strengthening their compatibility with current systems (radiofrequency, acoustic-magnetic, CCTV, etc.).
- Support their integration with GPS systems.
- Promote the development of hardware equipment (antennae, readers) and software that optimise the joint behaviour of all the technologies, as well as the treatment of the registered information.
- Develop plans to promote the adoption of this kind of initiatives by companies, with a view to improving competitiveness and safety for end users.
- Develop standards that facilitate open loop solutions.

## 3.2 TRAINING AND KNOWLEDGE

The adequate training of human resources, the improvement of the knowledge of the relevance and potential for development of logistics within the economy as a whole and the application of the concept “Logistics” are fundamental aspects for the efficient development of logistics in Spain. Due to the constant evolution of the field and to the associated concepts, training and the dissemination of knowledge is essential for a practical development in line with the general evolution of the environment.

In addition to the existence of a critical mass of professionals trained in the field, it is important that the profiles associated to logistical roles are recognised and that academic training adapted to the needs of the business sector is promoted. This need is becoming pressing given that the demand of logistics professionals is increasing, a trend that will likely continue in the future. In this field, the following actions are proposed:

### 3.2.1 / Define and recognise new professional duties in the field of logistics and make a “job profile chart”

The professional profiles of the Logistics sector are not adequately defined in terms of their duties, responsibilities or the training they require, because the training programmes specialising in Logistics have only been created recently. The main aim of this action is to **create a job profile chart** that defines the **duties, competencies and specific training needs** necessary for the different work positions existing in the professional logistics sector. This will make it possible to avoid companies confusing positions, salaries, duties and powers, and will make it easier to identify those professionals who have the right skills to carry out their remit. It involves **defining on an occupational scale** the main characteristics of each profession within the field of logistics; the qualifications it requires, the level of education and experience necessary, where the activity takes place, work conditions, etc.

The aims of this action also include searching for definitive definitions and clearly classifying duties, responsibilities and criteria when it comes to integrating the logistics function within the business sector as a whole, as well as establishing and clearly setting out the different professional levels within each sector in which the logistics function has a role.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Carry out a comparative analysis in advanced countries of how work positions are defined in the field of logistics, what the requirements are for each of them, or how the hierarchy is set up.
- Make a job profile chart setting out the duties, competencies and specific training needs of the different job positions existing within the Spanish logistics sector.
- Develop a study of the estimated need of professionals in Spain in the different training levels.
- Promote the development of human resources trained in the field of R&D and Innovation in order to generate knowledge and technological capacity within the field of Logistics.





### 3.2.2 / Design and propose the training map at all levels, including the recycling of professionals

Given the growing demand for logistics professionals and the scarce coordination of related training at different levels, it is necessary to design a **training map for all levels of the Logistics sector**. In addition, it is necessary to create a framework to propose to university institutions in order to standardise logistics-related studies.

The main aim of this action is to **establish a practical, useful professional training for the logistics sector**. In order to fulfil this aim it is essential to define recycling training at technological centres for the sector's professionals. In addition, its aim is for logistics as such to be considered a specific discipline in the design of new official graduate and post-graduate studies within the framework of the Bologna Plan, allowing for training of human resources specialised in Logistics, especially including professionals of R&D and Innovation in Logistics. The specificity of these human resources and the qualifications is marked by multidisciplinary, requiring basic knowledge of Engineering, Economics and Business Management and Administration.

It is worth pointing out the alignment of this action with European policies and more specifically with the contents of the **Freight Transport Logistics Action Plan\*** within its section on "Sustainable quality and efficiency", where it deals with training and staff.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Identify strengths and weaknesses of the current training map so as to establish a plan of action (priorities, lacks to be addressed...).
- Reach an agreement with centres for dissemination of knowledge, business schools, public bodies, etc. to establish a logical calendar of events and avoid overlaps in time and a saturation of market supply.
- Promote the creation of sectoral and intersectoral forums for the exchange of ideas and experiences regarding specific aspects, where agents and companies involved in the supply chain can participate.
- Study the new university framework as established in Bologna. Establish some minimum targets that help create a new degree aimed at the main players in the logistics sector.
- Find out about the concerns of sector professionals to offer them courses in certified and specialised centres.

### 3.2.3 / Promote the extension in companies of the concepts of Logistics and Supply Chain, the relevance of this economic activity and new logistical strategies and applications

The business activities of Logistics and Supply Chain Management have been gaining significant importance in recent years, and are experiencing a rapid growth. However, the scope and potential of these activities are still relatively unknown by the sector's organisations. This is why it is necessary to **extend the concept of Logistics in its widest sense**, establishing channels of communication and information in order to publicise innovations in logistics, new strategies and logistics applications aimed at industry professionals and other agents. In addition it is necessary to find out and quantify by means of indicators the **relevance of logistics with regard to the economy as a whole** and communicate it to all sectors of society including user companies and public administrations, as well as establishing procedures to obtain an effective communication.

\* Freight Transport Logistics Action Plan. Communication from the Commission. COM(2007) Brussels. 18.10.2007



### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Generate a list of the economic activities related with Logistics, Supply Chain Management, Intermodality and Mobility.
- Quantitatively size (business volume, number of persons employed, etc.) the importance of the logistics industry in Spain both in terms of mobility of people and mobility of freight, and in general all activities mentioned in the above point.
- Generate a network of associated centres in charge of transmitting, through experts in the matter, where to find out about the status of current initiatives and identify the most effective

communication channels for the transmission of information.

- Establish a system of standardisation and certification of logistics centres. The aim would be to provide infrastructures such as the Intermodal Logistics Platforms with the same standards as the European Network of Intermodal Nodes.
- Create a global group of companies, including companies in the logistics sector and the divisions of companies using logistics.
- Create a document regarding the contribution of Logistics, Supply Chain Management, Intermodality and Mobility to the competitiveness of the Spanish economy.

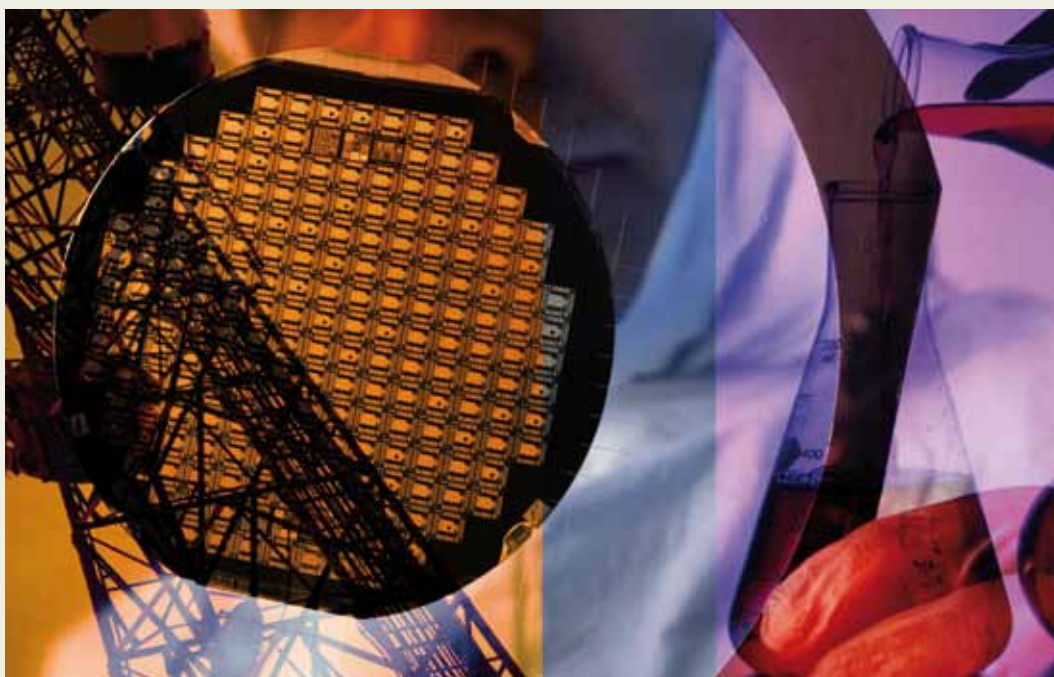
## 3.3 PROMOTION OF R&D AND INNOVATION

The analysis carried out in the *Strategic Vision Document 2020 of Integral Logistics in Spain* shows that there are great opportunities for improvement and progress in this field, both in terms of developing knowledge and innovative solutions associated to the management of physical and data flows, and the technologies associated to this management.

The number of R&D and Innovation activities carried out by research institutions and companies on a national level is low compared to Europe. Thus, with the aim of **contributing to the National Strategy of Science and Technology** (ENCYT in its Spanish acronym) **in the field of**

**Logistics** it is necessary to propose a series of actions to promote and encourage the development of R&D and Innovation capacities of the Spanish Science and Technology System (SECYT in its Spanish acronym).

The results of the second survey carried out by the Platform with the aim of assessing the priorities of the industry's agents are evidence that the issues related with the Promotion of R&D and Innovation are essential. Agents in general are very aware of the importance of promoting R&D and Innovation, both in terms of financing for the generation of knowledge and of an effective diffusion and transfer to companies of said knowledge.



### 3.3.1 / Raise awareness of the importance of R&D and Innovation in the logistics sector, promoting the generation of own knowledge and technologies within Spain

The main objective is to **get Spanish companies whose main activity is logistics to recognise the importance of R&D and Innovation for the development of their business** and decide to invest in R&D and Innovation in such a way that they can generate innovative and competitive services. With this a substantial increase of R&D and Innovation projects is expected, promoted by companies and institutions specialising in the field of logistics, leading to companies managing R&D and Innovation in logistics, increasing their use of cutting edge technologies, generating new services and incorporating the latest advances to their business processes.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Engage in activities to disseminate the opportunities of public financing for carrying out R&D and Innovation activities, as well as specific actions aimed at companies.
- Publicise to the business sector the R&D and Innovation capacities existing in Research Bodies and the existing mechanisms for the promotion of collaboration between research bodies and companies.
- Establish mechanisms of dissemination that transmit how R&D and Innovation in logistics creates improved competitiveness in companies (success cases of business R&D and Innovation projects or in collaboration to seek a clustering effect).

### 3.3.2 / Devote more financial resources and make a more efficient and co-ordinated use of these resources, establishing strategic priorities for the development of logistical knowledge within Spain

The final aim of this action is **to have the means for the comprehensive management of the supply chain, generating a Spanish technological focus able to generate and offer logistics technologies and knowledge** and making it possible to strengthen scientific excellence in technologies and logistical knowledge, promoting the creation of policies and financial instruments of public-private collaboration used by Administrations for said purpose and achieving a culture of collaboration in R&D and Innovation among companies of the chain through these mechanisms.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Establish the real capacities of the SECYT in the Logistics sector, considering both the research potential of Research Bodies and the capacity for the development of R&D and Innovation in Logistics by companies of the sector and their ability to absorb knowledge.
- Creation of Logistics Clusters created as groups of companies and research bodies in which knowledge is generated and transferred effectively to the companies comprising the cluster, which in turn is integrated in the R&D and Innovation activities. The actions of the clusters must be on an international scale in order to have extensive knowledge of the technique and also favour technological and knowledge transfer on an international scale, thus making it possible to increase export levels, specifically of Spanish technologies.
- Creation of a National Observatory of Logistics and Supply Chain Management that carries out surveillance and technological prospection activities with the aim of extending best practices and R&D and Innovation results of national and international projects as well as policies and regulations that affect the activity of companies and institutions, keeping them up to date with the latest information regarding innovation in the field of Logistics and Supply Chain Management.
- Generate a series of indicators that make it possible to quantify and know the evolution of R&D and Innovation in Logistics in Spain.
- Monitor the implementation of the SRA and further study the national map of logistics requirements from the point of view of R&D and Innovation, in such a way that it is possible to access the opportunities of the international market in the future.

### 3.3.3 / Promote the development of large national and international scale projects in strategic areas related with Logistics

The results of the survey carried out by Logistop revealed that the promotion of the development of large national and international projects was a priority issue.

The question is to encourage **Spanish bodies to promote large projects on a national scale (such as CENIT or PSE) and also internationally (VII Framework Programme) within Logistop's reach**; these projects should be focused on strategic and priority aspects for Spain.



**SPECIFIC ACTIVITIES TO BE CARRIED OUT  
WITHIN THE FRAMEWORK OF THIS KEY  
ACTION:**

- Promote the inclusion of Logistop research priorities in the calls of European Projects and the arrival at a specific R&D and Innovation line in Logistics in the national and Autonomous Community Research Plans with a potential for future development.
- Create a website where R&D and Innovation project proposals can be posted, classified by key actions identified in the SRA, to promote collaboration among research bodies with similar interests and between these and companies.

- Propose to financial bodies the development of a policy of R&D and Innovation incentives that prioritises projects in which several groups participate, as well as those aligned with strategic priorities and those of international reach.
- Facilitate information to companies regarding the existing aid for international projects and tools that encourage the participation of Spanish companies in international projects, such as, for instance, the Unit of International Innovation, which helps in the management and construction of the consortia, putting at the disposal of companies an expert team to obtain this help.





# Research, Development and Innovation Actions

# 4

This section will be divided according to the strategic contexts included in the **Strategic Vision Document 2020 of Integral Logistics in Spain** as specified below, in which, after a brief explanation of the situation of the specific context, key actions will be studied to develop each of the specific areas:

- Sustainability and Corporate Social Responsibility.
- Development of Security and Reliability.
- Promoting Collaboration.
- Co-modality /Intermodality.
- Technology.

The members of Logistop, through surveys developed for the drafting of this SRA, underline the importance of the strategic contexts: Co-modality/Intermodality and Technology, although the importance of the rest of strategic contexts is also significant.



## 4.1 SUSTAINABILITY AND CORPORATE SOCIAL RESPONSIBILITY

Growing social conscience makes it necessary for issues such as Sustainability and Corporate Social Responsibility to be considered by companies despite the fact that they are generally reticent to adopt new principles in which they initially see no advantages to be achieved in terms of benefits or productivity. These aspects are increasingly taking root, mainly thanks to the fact that Public Administrations are playing a significant role in raising social awareness regarding issues related to Sustainability and Corporate Social Responsibility.

The existence of a sustainable transport policy that contemplates the levels of contaminating emissions and noise, the congestion of infrastructures, a packaging design that incorporates non-contaminating, environmentally-friendly materials, and production with lower levels of contamination, among other things, are all aspects that sustainability must take into account from a logistics point of view. All of this is also within a context in which the law in force obliges companies to subject an increasingly large number of products to end-of-life treatments.

Greater collaboration between the different links in the logistics chain would favour awareness raising and an improved treatment of waste, making it possible to face the progressive increase in costs of raw materials and energy while at the same time reducing the consumption of natural resources.

In addition, the search for massive markets and low cost manufacturers boosts long distance logistics, working with countries where legislation is not so restrictive in terms of the environment, work conditions and human rights compared with Europe. The impact of transport should be reduced (applying Life Cycle Assessment principles) and measures will have to be adopted for the use of the most environmentally friendly methods of transport, with a view to avoiding congestion, accident proneness, a better use of loads, etc.

The second survey carried out by Logistop during the development of this SRA also revealed the interest of the agents in Sustainability and the Environment. Their interests focused on questions related to **environmentally friendly transport alternatives** and to **reverse logistics** and the environmental benefits it brings about.

It is a fact that there is a generalised interest in issues related to the environment and sustainability,

both nationally and internationally, as reflected in the Freight Transport Logistics Action Plan\* in its specific line "Green transport corridors for freight".

With regard to Logistics, the following key actions related to the sustainability of these operations are proposed:

### 4.1.1 / Analyse the products from the point of view of design according to logistical requirements (in order to favour recycling, reuse and remanufacturing)

In achieving less impact of end-of-life products, facilitating their subsequent treatment and minimising the extraction of the raw material, the development and promotion of Ecodesign appears as a key factor. The benefits of this focus are not only those related to the environment and to energy savings, but also to the improvement of the image of the product and even to the development of new technologies that favour these productive and end-of-life treatments, in such a way that guarantees the quality of the products manufactured with these materials. New business units will be created progressively in the companies of many industries to make the most of the new business opportunities arising from this field.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Promote the development of pilot projects with public and private financing with reference to different industrial products within the production chain itself (supplier-client), in collaboration with universities and technological centres.
- Research and invest in the study of the design of processes for the reincorporation into the production chain of recycled and reusable material per sectors.
- Promote the standardisation of quality standards of the recycled raw material, improving the uncertain image of "bad quality"
- Support the development and implementation of norm UNE 150301.

\* Freight Transport Logistics Action Plan. Communication from the Commission. COM(2007) Brussels. 18.10.2007



#### 4.1.2 / Optimise the reverse flow of materials and all associated resources

Once end-of-life products have been deposited by users for their treatment, an important logistical problem arises that must be tackled in order to have access the most efficient networks. Thus it is necessary to develop **models to design and plan efficient reverse networks** with reference to the use of resources and their impact on the environment, which can be transferable to the business context. It will be necessary to define standardised network operation processes, including measurable efficiency indicators, obtaining performance processes and indicators or KPIs that support a valid model for environments with returns and minimise client response times. Solutions must be provided to achieve greater efficiency in the management of returns, reducing the movements of empty equipment (lorries, containers, etc.) and reducing costs.

##### **SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Study the impact of reverse logistics on surface transport from an environmental point of view and propose alternatives for action.
- Develop collaborative models that favour the management of returns
- Develop methodologies for the calculation of costs per sectors that make it possible to study the economic impact brought about by the reverse flow of materials and all associated resources, as well

as facilitating decision-making when faced with several alternatives.

- Analyse the current networks of return of materials in different sectors to analyse their efficiency, proposing alternatives for improvement and validating them with simulation models.
- Design systems of information that implement the new models identified.
- Research and develop new materials and packaging systems, in such a way that facilitates recovery, recycling or valorisation tasks after their useful life in terms of packaging-product.

#### 4.1.3 / Develop methods for a more efficient treatment of end-of-life products

Once the products are released by their users, collected and transported to a treatment centre, there are a significant number of decisions to make related to processing these products to extract hazardous components or to reuse their materials.

Most of these treatments start with the disassembly of the products. It is therefore necessary to **define new paradigms of productive systems appropriate for processing returned material**, develop online models to define end-of-life strategies for components of end-of-life returned products as well as planning models for operations in disassembly workshops, including sequencing and capacity models, while at the same time attempting to reduce the environmental and financial impact of these op-



erations and paying special attention to the commercialisation processes of the products recovered through these methods.

#### **SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Adapt manufacturing models designed for assembly environments (manufacturing cells) to the characteristics of the treatment systems for end-of-life products.
- Identify for a set of products the characteristics that would make it possible to establish the end-of-life options and analyse the factors that would enable an online definition of the operations to carry out.
- Develop models to define the most appropriate component disassembly sequence for each product.
- Develop models and tools that facilitate the definition or generation of products based on recoverable material originating from end-of-life products.
- Adapt classic inventory management and planning models for assembly environments (MRP, scheduling algorithms) to practical disassembly environments, including characteristic features of these, such as uncertainty in the supply of materials or others.

- Establish protocols to incorporate in the product development components that have alternative uses at the end of their lifecycle.
- Analyse the commercialisation of recovered products and the development of these markets as well as ways of boosting their importance.

#### **4.1.4 / Promote the use of more environmentally friendly methods of transport and the development of actions that improve logistical infrastructures in terms of sustainability**

Sustainable development attempts to satisfy the needs of present generations without compromising the possibility of future generations being able to satisfy their own, while stressing the importance of respect for the environment. Currently, this concept goes beyond the sphere of government bodies and has become a social concern.

In the field of transport and logistics infrastructures, sustainable development aims to encourage the use of alternatives that commit to using less contaminating and aggressive systems with regard to the environment.

The main **objective** of this key action is to **promote the integration of the environment and sustainable development in decision-making within the field of transport, both freight and passenger related, and of logistics infrastructures**. Specifically, the aim is to promote the use of environmentally friendlier methods of transport such as sea and rail, and to improve land transport sustainability, as well as developing an efficient integration of all methods, applying intermodality and co-modality to reduce the volume of CO2 emissions of transport in Spain, which are not included in the emissions trading scheme but which member countries have committed to reducing by 2020. In addition, it also aims to create a less contaminating public transport culture that can challenge the deep-rooted private vehicle culture existing in our country. Thus the objective is to minimise the use of private transport in order to reduce the levels of emissions and congestion. Another goal is to obtain comprehensive knowledge on which urban and metropolitan transport policies are based, in such a way that the different agents, administrations, related companies and citizens with interests in said sphere can reach an agreement.



#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Analyse types of transport and their use, drawing special attention to their environmental impact, as well as to possible alternatives that are more environmentally friendly.
- Study systems and ways to improve land transport in terms of sustainability, such as for instance analysing the impact of increasing the maximum gross weight per lorry and their length, the use of Giga Liners, Ecocombi lorries, etc.
- Analyse the situation of the different transport modes with regard to the different administrations that are competent regarding sustainable mobility.
- Encourage collaboration with and between all socioeconomic agents and the different administrations involved.
- Promote the development and implementation of R&D and Innovation in sustainable mobility.
- Participate in the next 2008/09 review of the Spanish Strategic Plan of Infrastructures and Transport (PEIT or Plan Estratégico de Infraestructuras y Transporte).
- Analyse the perceptions, motivations, attitudes and expectations of users of both public and private transport that influence their choice of a certain type of transport.
- Analyse the factors underlying the behaviours and preferences of private vehicle users, with the aim of encouraging public transport as the main option for urban travellers.
- Develop methods to quantify costs and environmental impacts of complex supply chains as well as those produced in traveller transport including, among others, aspects such as the intensity of CO2 emissions.
- Promote in transport and logistics the rational use of energy (energy efficiency), as well as R&D and Innovation of clean and renewable energies applicable to the sector.
- Develop distribution systems that solve the last mile problem, structuring the urban space in a friendlier way for citizens, while at the same time dealing with basic environmental aspects (transfers, quieter loading and unloading, use of vehicles with less emissions and use of alternative transports) as well as safety and comfort of citizens (traffic congestion, accidents).
- Determine feasible environments for the collective use of electric industrial vehicles rather than

the individual use of the heat engine, and promote their use.

- Improve transport management systems as well as existing telematic solutions to speed up and improve traffic, reducing noise and vibrations as well as emissions.

#### 4.1.5 / Improve the monitoring devices and environmental safety measures applicable to the logistics of all kind of freight

One of the most relevant aspects within the field of safety in logistics is related to hazardous freight. The implications associated to an ineffective safety system for its transfer or management can have consequences of extreme social and/or environmental seriousness. For this, it is essential to use a **safety level adapted to the characteristics of the freight involved** and its effects.

The **aim** of the activities for this key action is to promote preventative and reactive research regarding events that may occur in freight logistics operations (transport and/or handling of freight) that imply elements of danger for the protection and/or safety of the environment.

In addition, this key action should involve activities in which the necessary mechanisms can be implemented for all bodies involved, in order to be able to react to an event occurring in the different operations carried out during the logistical flow of freight which may pose a risk to the environment.

The aim therefore is to obtain **results** such as the increase of analytical skills for decision-making in potentially dangerous situations, thus minimising the consequences for the environment, and reducing the response time to events that lead or may lead to situations of risk for the protection of the environment. Of course, the direct collateral effect will be to have technologies or tools that make it possible to monitor, control and prevent the negative effects that logistical operations have on the environment.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Promote research, development and innovation in such a way that protocols, technologies, tools and safety services are defined, leading to a minimised impact of the logistics operations on the environment.

- Analysis of risks and study of factors associated to operations of the logistical flow of freight that may lead to potential incidents or situations in which the safety of the environment is put at risk.
- Advanced data management and fusion systems that make it possible to have a comprehensive vision of data related with safety aspects of the environment in logistical freight processes.
- Procedures, technologies and systems for real-time monitoring and diagnostics of potential risk situations for the environment associated with logistics operations.
- Design and development of devices and tools for the prevention of negative effects on the environment derived from carrying out logistics operations.
- Design and development of mechanisms and systems for coordination in case of environmental emergency, in the shape of contingency plans that make it possible to face extreme emergency situations caused by logistics actions.

## 4.2 SAFETY, SECURITY AND RELIABILITY

Safety, security and reliability are key to ensuring the efficient operation of Supply Chains. In today's industry, where market flexibility and competitiveness rule, it is important for there to be **reliable systems** that ensure that the products are available at the time and in the place desired, and in the conditions established. For a Supply Chain to be efficient and successful, it requires good systems that guarantee the **safety and security of both the product and the processes, as well as of the information** along the entire Supply Chain, providing the best levels of reliability and ensuring the availability of the product at the time and in the place desired while fulfilling the established requirements.

In addition, those Supply Chains with the best security and safety mechanisms are better at reacting to disruptive elements (such as a terrorist attack or an unforeseen weather phenomenon or natural catastrophe). Security mechanisms thus become strategic Supply Chain elements to be taken into account from a research, development and innovation (R&D and Innovation) point of view.

The actions proposed in these regards are aligned with the content of the **Freight Transport Logistics Action Plan\*** in the section "Simplification of transport chains", with respect to the issues related specifically with security.



\* Freight Transport Logistics Action Plan, Communication from the Commission. COM(2007) Brussels. 18.10.2007





**THE FOLLOWING KEY ACTIONS ARE PROPOSED:**

**4.2.1 / Develop tools and methods for the improvement of safety in freight transactions and security of information exchange between agents of the supply chain, as well as in passenger mobility.**

One of the main elements required to achieve a reliable and robust supply chain is the trust that the different agents place in its management and in the reliability of the goods present in the supply chain. It is not possible to create an efficient supply chain without the trust of its agents and, in turn, it is impossible to gain this trust without the agents having experienced this security and safety.

The goals of this key action focus on **developing different systems and tools that enable reliable transactions** of goods and information among the different agents that make up the supply chain.

This can be put into practice by encouraging the implementation of automatic identification (RFID) and Electronic Product Code (EPC) technologies, in efficient processes and practices promoting the development of technology and setting up information exchange mechanisms through distributed networks, as well as developing security policies for the access and handling of this information. It is the “EPC Global Network” concept. Also by connecting information derived from the implementation of automatic identification technologies with the development of systems for efficient management, encouraging the exploitation of this information in ERPs, SGAs, CRMs, etc.

Another intended effect of this action is to ensure the integrity and reception of the EDI messages exchanged between the supplier and the client, from orders, delivery notes, receipt confirmations, invoices, etc. This requires legal validation of the electronic invoices issued and received through the electronic signature and the availability in real time of all the information regarding the logistic movements of a given set of goods and the use of this information for decision making.

To do this, it is necessary to harmonise item identification standards across the industry, as well as the standards for information exchange on a global scale, which would lead to a reduction of operational and logistic costs through optimising the current processes, as well as to a reduction of out-of-stocks in shelves and in logistics platforms or warehouses.

**SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Develop security protocols in freight transport management that take into account aspects of security, safety and prevention of occupational hazards, in loading and unloading and the journey itself.
- Design and develop mechanisms, devices and tools to improve the safety of people who take part in logistics flow operations along the Supply Chain.
- Analyse the methods of control and protection of goods in the different links of the Supply Chain.

- Evaluate the different systems of security and protection of goods in the event of possible attacks that may occur along the Supply Chain.
- Develop industry decision making tools that take into account prevention, protection, detection and warning solutions.
- Perfect the systems that prevent non-controlled exit or entry of products in the supply chain, as well as the means of tracking these products.
- Ensure the integration and compatibility of the new RFID systems with the current identification systems, such as, for instance, the GS1 system (previously EAN, bar codes and EDI messages).
- Run pilot programs for EPC/RFID technology implementation, especially at the logistics level. Must cover both product labelling (physical) and information exchange through the EPC Global Network.
- Develop secure RFID devices.
- Integrate RFID technology with mobility systems, PDAs, mobile telephony, etc. and with data transmission mechanisms, GPRS, etc.
- Develop new business applications and software within the scope of this key action.
- Develop an EDI software type that is flexible and multifunctional, as well as the communications network and its integration with the internal management systems and include an electronic signature in these documents.
- Encourage the implementation of electronic invoicing to ensure integrity and authenticity and to prevent rejection of exchanged messages. To do so, an electronic signature module and a digital certificate are required.
- Promote compatibility of the new developments with the current systems and encourage the standardisation of the latter.

#### 4.2.2 / Develop tools to guarantee product reliability, monitoring product evolution and traceability throughout the supply chain

Just as reliability of information is a critical element for the smooth operation of a supply chain, monitoring the state of the goods present in the supply chain is essential to ensure users' trust. Naturally, the legal aspects, quality requirements and specific characteristics of the products require the state of the products to be monitored at different stages of the supply chain.

In addition, the specifications required (production date, batch number, etc.) to verify product traceability, make it possible to foresee how the properties of the products will evolve in the course of the entire process, in the absence of exceptional occurrences. However, it is not possible to talk of total reliability without a method of permanent monitoring such as that which can be and should be offered by new technologies.

The aims of this key action are geared to promoting the **development of devices and procedures that make it possible to monitor the position of the product throughout the supply chain, as well as the product's evolution in terms of quality and consumption readiness, ensuring, at the same time, its traceability.** These aims could be put into practice in two ways. Firstly, by supporting the development of EPC/RFID automatic identification technologies and integrating these technologies with sensors. Secondly, by developing fraud prevention systems based on new concepts or already existing concepts such as EPCglobal's e-pedigree.

Requirements will be evaluated by means of a detailed quantification of black points or points lacking monitoring in the different links of the logistics chain, it being deemed optimised if no areas without monitoring are detected along the entire course of the supply chain. Thus, additional information related with how the goods should be supplied, such as for example the serial number or batch number, must be provided, enabling a simple way of controlling the goods stored at the manufacturer's warehouse and comparing the merchandise sent with that received at the point of delivery.

Other also important aims of this action include achieving a practical validation of the proposed technologies by means of pilot programs as a step prior to their implementation, the appearance on the market of proven reliability products to monitor and control products' specific properties, and a significant reduction of the risk of monitoring black points appearing in supply chains, especially in products with a high degree of social sensitivity.

This way, the idea would be to advocate the introduction of a "traceability culture" in companies that would lead to an improvement in the management and quality of the products on the market and to the awareness-raising of the Administration with regard to the importance of product traceability and monitoring for company competitiveness.

With this, it would be possible to achieve full traceability of the products along the supply chain, as well as reliability and quality control thanks to the presence of sensors. It would also help with fight-

ing against product fraud successfully thanks to the e-pedigree provided by the EPC chip, enabling fraud detection and making it possible to control parallel goods markets.

Lastly, the financial losses caused by the reduction of products arriving to market in suboptimal conditions, theft or loss would decrease.

#### **SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Encourage the development of secure and low cost packing and packaging that guarantee end product reliability.
- Set up initiatives that promote research, development and innovation of devices sensitive to product characteristics and with sufficient reliability to guarantee sustained monitoring across the chain.
- Promote the study of collaborative monitoring methods that minimise the risks of black points or points with no monitoring across supply chains.
- Promote development and training plans for “good practices” in traceability and product monitoring along the entire logistics journey.
- Develop plans to encourage adoption of this type of initiatives by companies with a view to improving their competitiveness and the safety of end consumers.
- Favour the development of more evolved sensor systems, including RFID chips equipped with sen-



sors (humidity, temperature, pressure, etc.), wireless sensor networks, etc.

- Promote the development of hardware equipment (antennae, readers) and software to optimise the performance of RFID technology and its integration with sensors as well as the handling of recorded information.

## **4.3 PROMOTING COLLABORATION**

In order to meet the demands of today's fast-changing, increasingly demanding and unpredictable markets, companies must not only encourage collaboration among its departments, but also a **higher degree of collaboration with partners and agents within the same Supply Chain**. The recent concept of Supply Chain Management gives Collaboration a relevant role in itself.

Collaboration among the different agents belonging to the same Supply Chain is a question of strategy in today's globalised environment. The Supply Chain is made up of the company, but also of its clients, distributors and suppliers. A good collaboration strategy among the different agents can lead to favourable consequences such as cost reduction, improvement

of quality and service, more efficient planning, a greater capacity to react in the event of unexpected changes, a greater degree of flexibility, joint decision-making and lead-time reduction, among others. For these and other reasons, it is important to encourage collaboration in the supply chain, to allow companies to take advantage of the opportunities in the market.

The agents who took part in the second survey carried out by Logistop for drafting the SRA showed that they paid special attention to those collaborative aspects that enable and encourage the development of methods that can be applied in SMEs.

In the strategic field of Collaboration, the following key actions are proposed:



#### 4.3.1 / Design and develop methods that favour the exchange of information without affecting the confidentiality of the know-how

Collaborative supply chain practices aim at an integration beyond the boundaries of the company itself. The opportunity to generate value resides in integrating the spaces of action of the different agents of the chain, with a comprehensive and shared vision, and bearing in mind clients' needs. This integration involves combining both the information systems and the knowledge of each organisation of their business. The typical phases that precede knowledge management are: generation of new knowledge, transfer of knowledge to the agents of the chain, joint integration of the knowledge and joint knowledge management to achieve synergy advantages in the strategic relationship.

More specifically, this action pursues two **goals**. Firstly, **to increase synchronisation among the members of the supply chain**, generating new synergies and strengthening those already existing. This increase will make it possible to improve the process of knowledge integration among strategic agents that operate in the same supply chain or network. The other goal pursued with this action is **to identify the opportunities that enable and the barriers that prevent an efficient generation, transfer and integration of knowledge among the agents of the supply chain**. This will provide information regarding the variables that act and moderate this knowledge integration, the interrelations with other collaboration channels in the supply chain and with the efficiency of it. It will help to identify the implementation of good practices in companies regarding knowledge integration.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Detect and analyse successful cases of knowledge integration in supply chain management. This analysis can be done by supply chain type and/or by sector.
- Carry out an analysis of the current system of generation, integration and management of knowledge in supply chains.
- Design and build a conceptual model that determines the elements that take part and their interrelation. This conceptual model must be empirically verified.
- Design tools that enable the exchange of information among agents of the supply chain, basing this exchange on the tacit and explicit sharing among organisations, incorporating systems to measure the effectiveness of these tools to help with the subsequent decisions among the participating agents. This will require the development and adoption of knowledge integration policies.
- Study pilot cases for the implementation of these tools.

#### 4.3.2 / Develop tools that favour a joint strategic vision of the supply chain and encourage strategic alliances among the agents collaborating in the chain

The potential of companies operating according to the concepts of global supply chain management lies in the joint planning of activities. This requires that the companies acquire a joint strategic vision of the strengths and weaknesses of the supply chain or network in which they operate.

The main advantage companies would obtain by implementing this action would be **an improvement in the competitiveness brought by adopting strategic alliances**, taking advantages of the opportunities for strategic alignment of the agents of the chain, with the end client or consumer as their common focus. The operational implementation and the required developments associated with this action are detailed within the strategic field of Technology, more specifically, in actions 4.5.1 and 4.5.4.

This action has three main **goals**. Firstly, to achieve an **increase in the awareness of companies with regard to the opportunities for improvement of competitiveness and/or collaboration** when it comes to establishing stable and lasting alliances among agents of the supply chain: flexibility, increased value and commitment to costs, growth, reliability and/or service adaptation, among the most relevant. The second goal is to **identify the mechanisms that explain the formation of the interorganisational relationship**, its development and the alternative interrelation structures, from simple and purely commercial transactions, repeated and long-term transactions, to vertical integration. The third and last goal is **to improve decisions regarding interorganisational collaboration**, both in vertical and horizontal relations, analysing in depth aspects such as access to potential sources of information, strengthening of the mechanisms to regulate the exchange of information among companies, joint decision-making or the formation of interorganisational work teams.



**SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Identify the phases in the formation of the joint strategic vision of the supply chain (environmental analysis to detect threats and opportunities for the supply chain) as well as an analysis of the strategic behaviour in interorganisational relations; dependence, proximity, power, influence, conflict, cooperation, trust and satisfaction. In addition, different units should be established to analyse interorganisational relations; organisation, interorganisational network, etc.
- Design systems that enable an improvement of the capacity to generate value by means of interorganisational strategic relations, such as incentive systems to make the information available accessible to the entire supply chain, and systems of measurement and evaluation of goals to be met by the parties, compatibility of goals, centralisation of decision-making, cost integration, scope of interactions in the channel, attribution of authority in dual relationships, division of tasks to be carried out, commitment to leadership, formalisation of the activities, consensus of control, evaluation of compliance and rules of exchange.

- Design, develop and implement experimentation environments that make it possible to test and view joint strategic scenarios seeking to align the visions of all the agents involved in the supply chain.
- Develop standardised concepts to encourage an effective flow of goods across the supply chain.

**4.3.3 / Develop tools that make it possible to apply collaborative approaches, especially within the context of SMEs**

The Spanish business sector is comprised mainly of small and medium enterprises, which are the main generators of supply chains and, depending on the sector and the products they provide, require more or less dynamic force. It is in the SME sector where we find the main opportunity **to generate value through promoting collaboration** between companies that operate within the same chain. Moreover, it is SMEs that require more external support to provide and supply, swiftly and easily, the tools that enable collaborative decision-making.

The **benefits** SMEs would obtain with this action include increasing competitiveness in their supply chain by setting up these tools, which should bear

very much in mind the environment, sector or chain where they operate.

The specific **goals** sought by this action are, on the one hand, **to increase the capacity of innovation of SMEs** both from a technological and methodological point of view through the joint creation of product and value, and, on the other, to evolve SMEs from their current follower status to their future leader status in the supply networks where they operate.

#### **SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Study and diagnose barriers and opportunities related with collaboration of SMEs in the supply chain and/or network. Case studies of excellence in representative sectors.
- Develop tools to aid decision-making for collaborative management among SMEs and other participants in the supply network, taking into account, among other aspects, the integration of local limitations with the opportunities of an in-

ternationalisation process. These tools should be adapted to realistic collaboration scenarios with the specific circumstance of the SME environment. The implementation of these tools should be considered a process of change management and management of the corresponding knowledge, for the evolution from the present situation to the desired situation.

- Develop interoperability methodologies among SMEs and other members of the supply chain or network, that make it possible to integrate common operational processes such as joint innovation of products and processes, the flow of shared information for automated decision-making or joint KPI systems. These tools should take into account in their design real time multichannel access (phone, PDA, etc.), among SMEs and other participants in the chain, as well as ICT architectures and service-oriented communication platforms, that enable the exchange of data and information in real time.
- Promote collaboration scenarios among companies and specifically, encourage collaboration of SMEs within the Supply Chain.

## **4.4 CO-MODALITY/INTERMODALITY**

There is a clear European and Spanish commitment to encourage intermodality, although there is still some way to go before there is a real **intermodal use of transport**. It is undoubtedly, however, seen as a **means of improving the competitiveness of companies** and favouring sustainability at the same time. The different modes of freight and passenger transport have grown exponentially in recent years, and there is already an efficient, albeit not collaborative, transport infrastructure system for the different modes.

Increasingly global markets and the growth of international commerce and mobility increase the need to use transport and require a promotion of intermodality. Companies are increasingly facing longer distances, with higher standards of quality and service, while attempting to minimise costs. Transport users also have more possibilities to choose from for their travels, and their standards are increasingly high in terms of the quality of service they wish to receive. To achieve the desired scenario, it is necessary to adapt not only the infrastructures and technologies, but also the processes.

Current concern with encouraging and developing intermodal transport at the European and national level is reflected in the results obtained in the surveys carried out by Logistop. In these surveys, the actions proposed for Co-modality/Intermodality come first, reflecting the priority of this issue in several aspects.

The research lines proposed by Logistop in this SRA have points in common with the **European Road Transport Research Advisory Council (ERTRAC)**. In fact, the strategic field, "Co-modality/Intermodality" is significantly aligned with the proposals in the areas of research of ERTRAC's Strategic Research Agenda, as well as in its document "Steps to Implementation" in the areas of urban mobility and long-distance freight transport.

To broach the current problems and improve the efficiency of intermodal transport use both for passengers and for freight, the following key actions are proposed:



#### 4.4.1 / Improve the management and organisation of interoperability / intermodality

This key action aims to **develop the efficient use of transport modes, both individually and in the framework of a multimodal integration** in the European transport system. Specifically, this key action aims to reach **an optimal and sustainable use of resources** with a view to mitigating the externalities produced by transport, such as traffic congestion; emissions and accident rates. It also aims to **improve efficiency, swiftness and integration between modes**, in order to favour intermodality and decongestion of the roads. In addition, it aims to encourage optimal operation of logistics infrastructures and networks associated to the different transport modes and solve the problems that arise due to the fact that, on a national level, the logistics development does not respond to an integrated system logic, in that the initiative and responsibility does not lie with a central body.

This action also aims to promote innovative models of public-private collaboration in the management of logistics infrastructures, as well as to transfer part of the road freight traffic to rail and sea transport, encourage cooperation between logistics platforms and modal interchange centres generally and the optimal management of resources and infrastruc-

tures of intermodal centres together with the standardisation of management models and operational systems of said centres, also taking into account the mobility of people.

This action is aligned in many aspects with those proposed in the **Freight Transport Logistics Action Plan\*** in the section on "Sustainable quality and efficiency" in issues related with benchmarking intermodal terminals.

#### ACTIVITIES AND TASKS TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION

- Analyse the flows of goods and passengers and establish land transport corridors.
- Study the mechanisms for transport modes to be complementary rather than competitive among one another, in such a way that they co-operate and harmonise to produce synergies.
- Design an efficient national network of transport and logistics nodes.
- Study the creation of high speed bus and taxi corridors in certain areas.
- Efficiently design modal interchange centres, taking into account a plan of requirements within the



\* Freight Transport Logistics Action Plan, Communication from the Commission. COM(2007) Brussels. 18.10.2007

different modal interchange centres or the creation of a system of data transfer between modal interchange centres.

- Manage to adapt the services offered in the terminals to the different transport modes.
- Establish a common work methodology that makes it possible to develop optimal procedures to manage and organise the logistics activities of the intermodal centres.
- Establish innovative solutions for mobility management, paying special attention to areas with bad road transport communications and develop new concepts of mobility for elderly and disabled people.

#### 4.4.2 / Establish the physical relationship between the different transport modes.

The Strategic Infrastructures and Transport Plan (PEIT) defines Intermodality as the basic pillar of freight and passenger transport. The allocated investment in intermodality for the 2005-2020 period is 3,620,000,000 Euros. In relation with this, it is important to point out that the experts surveyed by Logistop pointed out as one of the key priority actions that of "Promoting the use of freight transport by rail, both for interior and exterior traffic and for access to sea ports" and that of "Promoting the connection of long distance rail systems with individualized transport systems", which shows the importance of this key action.

Specifically, this action is concerned with intermodality as the physical relationship between different transport modes. The aim is to reach a series of criteria of **standardisation of intermodal transport equipment, to determine the needs that an intermodal load unit should cover** in such a way that it is compatible with and can be handled by different transport modes and can become a standard. Although containers fulfil their function as a load unit that is easily transportable by different transport modes, its intermodal nature is at the very least debatable. That is why there is an international effort to create an intermodal load unit that enables interchanges between the different modes in the most quick and efficient way possible. It is also important to standardise infrastructures and traffic regulations, thus completing the interoperability of the national network with European corridors, as well as the creation of a network of infrastructures and services for international transit, functional and management measures. The development of a network of transfer

nodes for intermodal transport made up basically of platforms, centres or terminals; nodes that fulfil a minimum of needs and requirements defined for intermodal transport, that are integrated within a European network and are prepared to solve a problem of saturation and the expected needs of transfer between nodes for the decade to come.

The aim is also to increase the efficiency of logistics and transport processes through intermodality, to develop real alternatives to freight transport by road, to increase the specific importance of rail freight transport, to create new rail corridors for freight transport and the efficient interconnection through the Pyrenees, especially via rail.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THE KEY ACTION:

- Establish the design characteristics (transport, insulation, handling and flexibility characteristics) of the standard intermodal load unit, taking into account all the transport segments (shipper transport market, consumer-oriented transport market, port terminals, rail operators, short sea continental market, continental rail market).
- Study the specific characteristics the intermodal load unit should meet nationally and its applicability to an international standard.
- Determine the impact the resulting intermodal load unit would have on the promotion of intermodality.
- Make accurate demand forecasts; freight and passenger traffic volumes and types by mode and geographic area until 2020 and create a strategic investment plan until 2020 that covers transport needs, taking into account not only financial profitability, but also social, environmental and personal aspects affected by these infrastructures.
- Establish basic standardization norms of infrastructures and traffic regulations, as well as their specific characteristics on a national level and study their feasibility on an international scale.
- Current and potential contribution of the national network of transports and logistics to the positioning of Spain as an international transit platform. Identification of specific needs.
- Design tools to eliminate barriers observed at the level of information management, infrastructures and nodes.

#### 4.4.3 / Optimise and improve the use, utilisation, design and management of logistics infrastructures

Since the Gothenburg Summit (15-06-01) there have been efforts to promote intermodality, specifically to optimise logistics infrastructures to achieve energy savings, improve the profitability of operators, actions geared to increasing security and improving the environment. On a national scale, the result of the survey carried out by Logistop in the process of preparation of this SRA shows that agents pay particular attention to key actions such as "Promoting the interconnection among transport modes and infrastructures" or "Implementing actions to optimise technological and methodological aspects of logistics infrastructures".

Specifically, this action aims to implement actions for the **optimisation of the technological aspects of the logistic infrastructures**, as well as those geared to optimising the methodological aspects of logistic infrastructures. The creation of smart logistic infrastructures that make it possible to interact with other modes of passenger and freight transport that use them, in such a way that it is possible to reduce the negative effects of transport. Related to this, the aim is to develop a series of indicators, with reference to infrastructures, that make it possible to determine whether those infrastructures fulfil certain environmental, social and economic-financial profitability requirements, as well as to prepare a set of guidelines to favour the construction of logistic and transport infrastructures in a more environmentally-friendly way and with less social impact.

##### **SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Optimise freight transport by means of centres of consolidation of transport companies or logistic operators. Regrouping of delivery areas.
- Develop processes to encourage standardisation of the coding of information handled by the different agents of the chain.
- Develop models that achieve interoperativity and consistent management of the information shared among modes, both freight and passenger transport.
- Apply the existing methodologies to determine the social profitability of building new logistic infrastructures.

- Create infrastructural requirement maps based on specific social profitability.
- Develop methods that enable the simulation of building new logistic infrastructures, transfer of demand to the new infrastructures (deviation of the demand), generation of new demand, etc.
- Develop objective measures to improve mobility, measures to implement pedestrian crossings, cycling lanes, new public transport alternatives, taking into account security, sustainability and environmental aspects, as well as financial profitability.
- Redesign the existing infrastructures associated with passenger transport, trying to improve mobility for pedestrians, bicycles, elderly and disabled people.

#### 4.4.4 / Develop modelling and optimisation in the field of transport

The survey carried out by Logistop to its members highlighted, among the priority key actions, that of "Promoting the optimal operation of the networks associated with each mode of transport and develop techniques to identify bottle necks". This fact implies the growing concern for optimisation both of modes and of transport infrastructures.

The aims of this action are **to promote the optimal operation of the networks associated to each mode of transport**, develop techniques for identifying bottle necks, develop methods which, through simulation processes, enable the optimisation of the organisation of transport operations and the handling of transport elements in intermodal transport infrastructures, the development of methods that enable the simulation of logistic processes between intermodal interchange centres for freight transport. The aim is to improve the urban distribution systems, reduce the number of shipments by optimising the capacity of the vehicles, as well as to create models of transport networks by promoting logistic platforms as strategic nodes of goods management, allowing an optimal planning of transport flows, minimizing costs and maximising profits of all operations. The aim is also to achieve **efficiency in intermodal transport logistic operations** and in goods interchange processes, as well as processes of management of operations among intermodal interchange centres. From the point of view of passenger mobility, the aim is to improve transport, both urban and long-distance, improving the interchange between modes to make it quicker, more flexible and easier.



The scope of this action is aligned with the **Freight Transport Logistics Action Plan\*** in its section "Sustainable quality and efficiency" as regards the issues related with improvement of performance, as well as in its section on "Urban freight transport logistics".

**SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTIVITY:**

- Simulate and foresee the behaviour of transport demand, for both freight and passenger transport.
- Develop models to simulate processes of handling goods in intermodal centres.
- Develop simulation models between intermodal interchange centres and optimisation of operations.
- Seek markets for the "triangulation" of freight and passengers in transport. Optimisation of the capacities of the different transport modes and use of the logistic platforms as nodes and strategic points of the interchanges and triangulations of the different transport modes.
- Develop technological solutions for companies whose distribution systems are congested.
- Develop technological solutions to optimise intermodal routes.
- Modelling and simulation to solve the last mile problem. Develop urban distribution alternatives in the most congested areas, and create urban distribution systems with improved loading and unloading systems, which offer solutions for individuals and cities.
- Develop software to generate optimal routes able to receive environmental inputs (traffic situation, accidents, new delivery/pickup points and other important events) in such a way that the routes can be adapted in real time and optimally.
- Study the optimisation of long-distance logistics.
- Develop comprehensive mobility models, "door to door", emphasising the needs of elderly and disabled people.
- Develop models that make it possible to improve the "vehicle-vehicle" and "vehicle-infrastructure" interface, optimising the capacity of the infrastructure, improving traffic management, traffic information and forecasts.
- Develop solutions to optimise relations between the different passenger transport systems in such a way that it is possible to offer users integrated route maps and all the information associated with said route.
- Develop new concepts and methods to optimise freight and passenger load in transport modes.



## 4.5 TECHNOLOGY

**Technology** is essential for Logistics and Supply Chain Management as it **makes logistic flows smoother**, both the operational and process tasks that guide the product flows, and those of data exchange that guide the **information flows**, not to mention the Decision Making aspects involved in Logistics and Supply Chain management. Furthermore, it is also essential in passenger transport management, from traffic management, security management and systems of vehicle tracing, to real time passenger information systems.

It is important to note that the state of Technology varies greatly depending on the area of the Supply Chain analysed. Although it is true that in all of them (Supply, Planning and Control of Production and Operations, Warehouse Management, Distribution, Transport and Reverse Logistics management, among others) technology is essential, both for internal management (information management, product flow management, demand forecast, etc), and for external management with suppliers or information exchange platforms.

With regard to Technology it is important to identify **hardware type technological aspects** (Handling and Storage Equipment, Robots, Handlers, etc.), and **software type technological aspects** (Management, Control, Forecast and Planning, Orders Management Applications, etc.). As a result, when we speak of **Future Research Strategies** we must also take into account the **strategic research actions in transversal issues** related with Handling and Storage Engineering, Robots, Automatics and Control, etc., as well as Business Modelling and Engineering, Information and Communication technologies, Technological Exchange Platforms of Information and Interoperability, Algorithmics, Optimisation - Metaheuristics, Artificial Intelligence, Computing and Distributed Control, etc.

Given the relevance and direct influence of technological developments for logistics and supply chain management and its processes related both to materials flows and information flows, the following key actions are proposed:

### 4.5.1 / Develop information exchange technology platforms from the point of view of interoperability

The framework of collaboration existing among the members of a given Supply Chain requires communication and coordination of the data and information that circulates within the Supply Chain. The different agents can use different ERP Information Systems, which can at times be incompatible. The need thus arises to develop Information Exchange Technology Platforms that take into account the requirement of interoperability.

The aim of this key action is to arrive at a point where the information exchange technology platform is the catalyst of new business models, paying attention to service orientation as technological support to the operation of new business models. In brief, **to develop standard, free specification and access platforms, tools, methodologies and technologies for the exchange of information**. The elements to be developed must take into account all possible agents, as well as the possible co-existence of open standards and proprietary applications.

The availability of free specification and free access methodologies, standard technologies, tools and platforms, for the Exchange of Information will make the collaboration among agents of a Supply Chain easier. This will also make it easier to trace internal movements globally between the nodes of a given Supply Chain.

Based on the above, the specific aims sought with this key action are geared to promoting interoperability on a business and technology scale, as a phase to facilitate the promotion of collaboration, promoting the use of technologies linked to the Internet as support for distributed business processes, in an environment of promotion of collaboration, of the logistic sector or the optimisation of the occupancy rates or journeys between different nodes of the Supply Chain in the different transport modes, enabling real time access to information.



The results expected from the actions proposed for this key action are to achieve results such as the availability of a Classification of Requirements and Characterisation of the Service-Oriented Systems, improvement of the use of Supply Chains based on access to information regarding service offers in real time or obtaining a detailed study of the benefits and impact observed in the use of these platforms.

#### **SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Identify requirements for establishing standards for Interoperability in Information Exchange Technology Platforms, in the Supply Chain Management.
- Characterise and classify the requirements from the point of view of Interoperability, of the Information Exchange Technology Platform to be developed in a Supply Chain
- Identify requirements to establish standards for Service-Oriented, as technological support to the operation of new business models, based on the Supply Chain.
- Characterise and classify requirements of Services Oriented Systems, in a Supply Chain.
- Apply and adapt, to the Supply Chain and mobility, the results achieved in national and European Projects regarding Interoperability and Service-Oriented Systems.
- Develop, on a documentary, organic and functional level, specifications, and on an information technology level, the information exchange

Technology Platform in the Supply Chain Management.

- Develop, on a documentary, organic and functional level, specifications and on an information level, Service-Oriented Systems.
- Prepare procedures to set up and exploit these technologies. Obtain the critical mass to do so.
- Characterise and carry out a detailed study of the benefits and impact observed in the use of technological platforms and service-oriented systems as technological supports to the operation of new business models, based on the Supply Chain.
- Study technologies that allow mobility and on-board safety systems to interact with public sensors used to monitor traffic, roads or weather.
- Push for the exchange technology platforms not to be based only on information exchange, but for them to also provide traceability and visibility of the events that occur as well as of the products.

#### **4.5.2 / Promote technological progress in product design according to logistical requirements (packing and packaging) and its coordination in operational management**

The scope of this key action takes into account the necessary relationship between the logistics and Supply Chain issues and technological aspects of other Engineering fields (design Engineering, Materials Engineering, Handling and Storage, etc.). There is a clear dependence on the one hand between Materials Handling and Materials Management,





within Logistics and Supply Chain Management and, on the other, the technological characteristics of design, packaging, transport and storage. That is to say, between the R&D&I on both sides, Logistics and Supply Chain, on one, and technological aspects of other Engineering fields on another.

The most relevant aspects this key action covers are defined by the requirements imposed by the transformation of the supply chain concept and the operations included in the new logistic scenarios on the existing handling and storage technologies. Thus, the evolution of the operational requirements defined both for Materials Handling and for Materials Management in a globalised logistics scenario, with increasing mobility requirements and clearly defined environmental requirements, make it necessary for the technological development to go in the same direction.

The aims of this key action focus on two parallel areas: on the one hand, **perfecting handling and storage technologies** based on the aspects defined above; on the other, **optimising product design** (especially as regards Packing and Packaging), **based on the operational needs required for its handling and logistic treatment across the Supply Chain**. Thus, the aims proposed in this last scope include identifying and making proposals for the use of materials that are more environmentally-friendly or developed from renewable sources and which are easier to be reused or recycled, in the context of logistic sustainability and related and integrated with the proposals of the strategic field of Sustainability and Corporate Social Responsibility, it is also important to optimise the palletisation mosaic in the logistics context, paying attention to the ergonomics and design of the Packing and Packaging systems to improve the manipulation, handling and storage of items.

On the other hand, the aims proposed in the first area would involve improving the logistic operations of companies through innovations in manipulation, handling and storage systems and/or automated cross-docking. Especially through automatic identification devices integrated in packing and packaging, through the development of technologies and systems for monitoring them and providing information across the life cycle or value chain of the product, as well as the attainment of operational improvements in manipulation, handling and storage, as a result of systems that enable a smooth exchange of information, among the different agents of the Supply Chain -, through advanced EDI type or similar systems.

The actions proposed below are expected to provide results in terms of a better logistic efficiency and a lower environmental impact, both of the technologies used and of the packing and packaging, whether in Direct or Reverse Logistics processes, a better use of the pallet and a reduction of the logistics costs associated with product breakages during the transportation, storage and handling cycle, a reduction of the cost association with additional manual manipulations, thanks to developments in ergonomics, improvements in product identification and traceability, in manipulation, handling and storage, thanks to the integration of automatic identification devices in packing and packaging. It is also expected for automation to be implemented, thereby improving storage and handling in the short and medium terms, obtaining systems that enable the smooth exchange of information among the different agents of the Supply Chain and to achieve improved operativity in SMEs thanks to automatic identification and development of cheaper and safer means of handling and storage.

**SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Perfect and establish new automatic handling systems that make use of automatic identification.
- Improve the logistic information flows related with handling and storage by developing new data exchange systems.
- Improve cost, security and environmental impact of handling and storage means.
- Develop systems of automatic identification and traceability, increasing accessibility for companies in any business sector or activity.
- Promote generalised use of bar codes to reduce the technological divide in the Spanish business sector.
- Guide research towards the concept of “Packaging logistics”, working on the product design, its packing and packaging, its adaptation and control of the distribution system.
- Guide research towards information systems across the Distribution Chain, including the process of recovery and recycling (Reverse Logistics).
- Standardise the logistic elements: EILU, packaging, labelling, shipping units, logistic processes, etc.
- Establish lines for improvement in the design of packaging systems, increasing ergonomics and adaptability to automated systems of handling and storage.
- Guide research towards simulation of conditions suffered by the packing and packaging, both in the process of transport (simulation of transport risks and aptness programmes: vibration, vertical collision, horizontal collision and compression, etc.) and in the storage process.
- Establish lines for improvement in the packaging systems, materials used and auxiliary packaging elements in order to protect the products from the risks of handling, storage, transport and commercial distribution.
- Promote packaging optimization through research into the dynamic stress and forecast-modelling of their behaviour during the circuit of transport and goods distribution, leading to less losses due to bad functioning of the handling and storage system.

- Develop new systems that enable the integration of automatic identification and traceability devices in the packing and packaging within the flow of materials, such as RFID devices, time-temperature indicators (TTI), leak indicators, freshness indicators, etc.
- Develop Real time Location Systems (RTLS) with a view to optimising the processes involved in the storage, locating products or items easily and accurately in warehouses, compounds, ports, etc.
- Research new technologies for the development of RTLS for storage, such as RFID, Wi-Fi, UWB, sensor networks, etc.

**4.5.3 / Research into new business models that promote visibility and traceability, driven by ICTs and applied to transport systems**

The main aim of this action is to **generate business opportunities** by integrating solutions aimed at companies and the Administration that are based on standard technologies and applications developed in the sectors of transport and logistics.

The actions proposed will attempt to identify the limitations of the current business models of the Transport sector with further added aim: to accelerate the development of software standards related to Service-Oriented Architectures, essential both for systems integration and for the evolution of the network as an ecosystem where transport systems proliferate.

This action is aligned with the “e-Freight and Intelligent Transport Systems (ITS)” proposals included in the **Freight Transport Logistics Action Plan\***.

**ACTIVITIES AND TASKS TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:**

- Operational, technological and economic analysis of current business models. Study the impact of new technologies on traditional business models and identify the barriers and inhibitors of the current models that could be overcome with ICTs related with transport and logistics. Seek ICT solutions adapted to the different levels of investment capacity and implementation of companies.
- Identify information flow, traceability and visibility in the Supply Chain, compiled from its nodes. Implementation of a Framework for information systems.

\* Freight Transport Logistics Action Plan. Communication from the Commission. COM(2007) Brussels. 18.10.2007

- Improve information and transport management through more accurate models to forecast traffic in the short term, as well as models for real time journey time prediction.
- Develop innovations in ICTs that optimise transport and minimise 'empty' movements.
- Deploy a "digital nervous system" that makes it possible to capture and deliver information at the points of origin and/or consumption.
- Seek synergies with other industrial sectors and service sectors with similar problems in defining new Business models driven by ICTs.
- Generate radically innovative approaches, in the definition of new Business models driven by ICTs, through multidisciplinary work groups.
- Analyse the enabling role of ICTs in the development of new business models in transport, mainly those linked to the Internet.
- Identify business models of other sectors that can guide the development of new models for Transport.
- Propose radical transformations of the current logistics and transport sector practices.
- Engage all actors in the logistics sector in the search of these new models.
- Provide solutions to the problem of data confidentiality in the freight transport sector.

#### 4.5.4 / Develop the technological vision of business processes and research into performance measuring systems in the context of Logistics and the Supply Chain

The importance of competitiveness in a globalised economic environment is ever increasing for SMEs. The competitiveness of a company does not depend on itself, but on that of its Supply Chain and within its Supply Chain, on the Management of its Business Processes and the ensuing evolution of its Key Performance Indicators (KPI) or parameters of its Performance Measurement System.

This action aims specifically to improve Decision Making support mechanisms and obtain a flexible mechanism that is able to react swiftly to new conditions in the business environment and in the Supply Networks/Chains, in such a manner that there is a bidirectional interaction between the engineering and operation of the company's Business Processes and of its Supply Chain, as well as ensuring that business processes, both intra and intercompany in SMEs and Supply Chains, evolve from being a



static element associated with quality systems to a dynamic element that drives the operations of the company and its competitiveness.

With the specific activities proposed in relation with this action the aim is to obtain results such as establishing a direct link between the engineering of Business Processes, both those internal, inherent to the company and external processes between companies, in SMEs and Supply Chains, and their execution, simplifying and improving the cost-effectiveness of the maintenance and updating of said Business Processes and combining in a single model both business aspects and Information Technologies, in Supply Chains and SMEs, by developing tools that enable this.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION

- Introduce the vision of internal and intracompany processes in SMEs, pertaining to Supply Chains, from the point of view of engineering and execution of processes.
- Develop a methodology to support the engineering and execution of internal and intracompany Business Processes in the SMEs participating in Supply Chains.
- Carry out a SWOT analysis to obtain a diagnosis of the current situation of the incorporation of the vision of Internal and Intracompany Processes in SMEs, that may serve as a basis to develop the specifications of the tools to be developed subsequently.
- Develop tools, for Supply Chains with the participation of SMEs, that enable the execution of Models of Business Processes and Technological



Architectures, both within companies and between them.

- Generate a module capable of providing monitoring mechanisms for different versions of Processes, both internal and between companies, in SMEs and Supply Chains, and their respective instances.
- Select a formal specification to model internal and intracompany Business Processes, in such a way that it is possible to represent business concepts and generate, at the same time, a link with the information systems of the SME in the context of Supply Chains.
- Develop a Performance Measurement System for the internal and intracompany Business Processes in SMEs and Supply Chains, as well as a System that makes it possible to interrelate the parameters of said Business Processes, as well as derive business rules.
- Develop a System for analysing and monitoring the Performance of Internal and Intracompany Processes in Supply Chains and its corresponding technological tool to put it into practice.
- Develop global Indicators or Performance Measurement Systems, regarding performance of internal and intracompany Business Processes in SMEs and Supply Chains.

#### 4.5.5 / Define the logistic requirements of the physical/technological aspects of transport vehicles and materials

Within the actions determined by the surveys carried out to the members of the Logistop Platform, as well as the corresponding specific activities designed by the panel of experts in logistics that took place in Valencia in January 2008, one of the key actions to bear in mind for the promotion of logistics nationally was “To implement actions geared to adapting the physical/technological aspects of the vehicles”, showing the importance of the need to develop new technologies applied to transport vehicles and materials.

Specifically, the aim is to determine the logistic requirements to implement goods monitoring and tracking systems, with emphasis on the entry and exit warning systems of transfer nodes. Another aim is to identify and analyse the needs of new technologies observed in rail transport and their application to mobile material. To develop reports on the needs that the new adapted intermodal transport units should meet, as well as the techniques of optimisation of the transport elements with regards to their mechanic design.

Defining the logistic needs associated to the new design concepts of elements of goods handling, as well as determining the characteristics of new vehicles capable of adapting their use to intermodal interchange infrastructures. Drawing up the basic requirements for the new technologies of tracking, identification and classification of transport elements, tracking systems and monitoring of refrigerated and normal containers, technologies applied to said containers and their functionality. Attempt to improve the efficiency of transport and the interconnections between transport modes through the introduction of new technologies, implement advanced systems for identification and classification of elements of intermodal transport and the improvement of efficiency in processes of handling and transport of intermodal transport units.

#### SPECIFIC ACTIVITIES TO BE CARRIED OUT WITHIN THE FRAMEWORK OF THIS KEY ACTION:

- Develop new technologies that make it possible to select, both a priori and dynamically in response to unexpected events, the most efficient route, in accordance with different criteria such as financial cost, time, environmental impact, etc.
- Draft reports on the logistic requirements for technologies for monitoring vehicles as well as the transported load.
- Determine the problems of coordination between the information systems of the different transport modes and between these and their associated infrastructures.

# 5

## Annex



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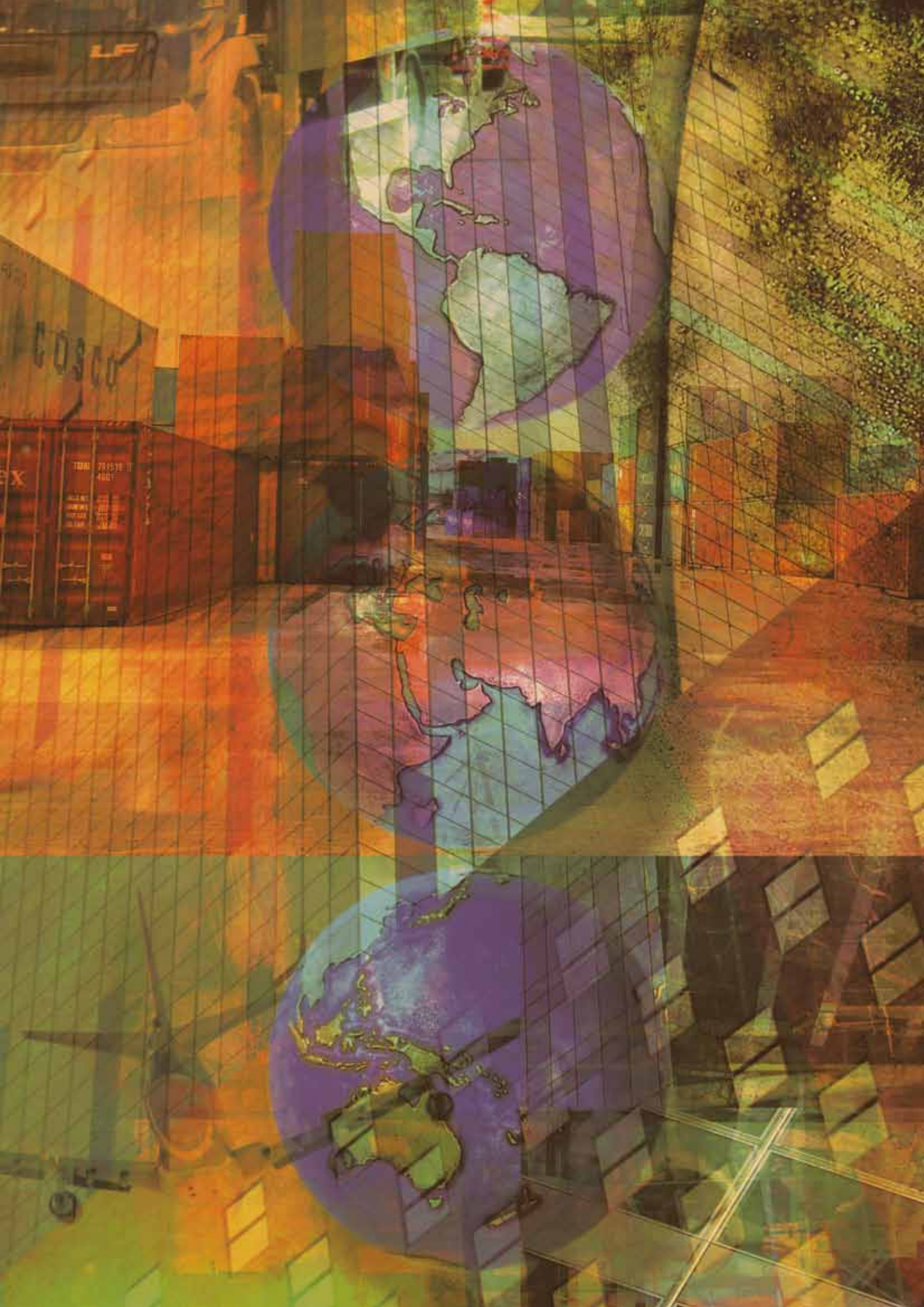
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