

National
Technology Cluster

TRANSPORT ITALY

Strategic Research

Agenda 2014/2020



Cluster Trasporti



TRANSPORT ITALY

Is the Italian reference association on surface transportation to bring together road, rail, waterborne and ITS, and represent industries, services for transportation & logistics, academia.

83 ASSOCIATION MEMBERS

- 14 Universities
- 2 Public Research Centres
(Enea + 11 CNR Institutes)
- 7 Research Organizations
- 45 Enterprises (Of which 20 SMEs)
- 10 Local aggregations
(groupin more Than 1000 partners)
- 4 Associations

6 ITALIAN REGIONS



6.4 Euro Billion

Investment in R&D



33.3 Euro Billion

Revenues



90 Plants



200.000 Employees

Premise

The National Technology Cluster Transport Italy 2020 (CTN Tra.It 2020) aims to develop and foster research, innovation and education in the “ground and waterborne mobility” field, gathering together four technological mobility sectors, namely road, rail, waterborne and intelligent transport systems (intermodality/co-modality). The Cluster represents both industries and companies of the tertiary sector (services for transportation and logistics).

Aims and scope

The main purpose of the Strategic Research Agenda is to identify both research and innovation trends¹, even to estimate how Italy will contribute to the pursuit of Societal Challenges defined by the European Commission. This estimate is worked out providing a vision of the

innovations, which will be available in 2030 or 2050, as well as disclosing the priorities for action in 2020 (with related necessary investments).

The Strategic Research Agenda has been drawn up directly involving some Italian regional clusters, enterprises, universities and research institutions, thus creating previously unexploited actual links.

The definition of both research and innovation trends is helpful to set priorities in education developing skills necessary to disseminate innovation.

The Strategic Research Agenda is intended to be a tool on which future regional or national administration programs will be based on. It will also bring to Europe attention to the Italian proposal concerning the CTN Tra.It 2020 fields of interest.

The drawing up process

The Strategic Research Agenda has

been drawn up with a combined process based on a bottom-up activity (through the expression of interest by national stakeholders, i.e. industrial or tertiary sector companies, research institutions) and a top-down action (in compliance with European priorities and Italian Region Smart Specialization Strategy). Over 500 forms have been collected highlighting new research topics, with forecasts at 2030 and 2050. Industry experts have processed the forms presenting them in this document in aggregated manner.

The draw up process -innovative both at national and international level- will grow dynamically over the time; it is expected to further evolve for supporting future political decisions (contribution for Policy Makers).

The CTN Trait 2020 Territorial Context

This document provides for the analysis of ground and waterborne Italian mobility system. Particular attention is paid to each of the four concerned mobility sectors.

Road Transport

A number of indicators have been selected to provide an idea about

the road transport impact in 2014. More than 1.2 million employees directly or indirectly involved, over 3 billion euros investments in R & D, 70 billion tax revenue (direct and indirect, which means over 16% of the national revenue). The ratio of tax revenues to GDP amounted to 4.4% (European value: 3.3%).

In 2014, about 2400 companies (mainly suppliers, about 90% SMEs) were active, with 165,000 direct employees. The turnover of the companies directly involved in the supply chain was around 40 billion euros, exports had a positive balance, amounting to over 7 billion euros. Italy is the fourth European country by number of manufacturing (automotive) facilities, and represents an important competitive environment, which is still growing at a global level. In 2017 about 100 million vehicles will be produced (they were 70 million in 2007). Italy does not assemble a large number of vehicles (focusing on those of high or very high quality and appearance), but it produces components for a large number of vehicles assembled abroad. Given the economic impact of road transport, a number of Italian regions have developed local clusters, e.g. Torino Strategica, From Concept to Car (by Turin Chamber of Commerce), Lombardy Mobility

Cluster, ASTER (Emilia), Innovation Automotive Hub (Abruzzo), Dattilo (Campania), Melfi Manufacturing Campus etc.

Rail Transport

Concerning the rail transport, in 2011 ASSIFER (Italian Association of Rail Industries), reported 200 companies (110 are located in Tuscany). In Europe, rail industrial suppliers count about 400,000 employees, a relevant percentage is estimated to be in Italy. Instead, 2 million are the employees at European level working with rail operators and site managers. The annual turnover of the Italian supply chain for rail mobility amounts to 5/6 billion euros, taking into account the differences occurring each year due to the order typology. The figures do not cover the railway services market (eventually driving R & D & I), that is up to 9-10 billion euros.

In this field there are active regional clusters in Tuscany, Campania, Lombardy, Piedmont, Emilia Romagna, Liguria.

Waterborne transport

Concerning the waterborne transport, the “blue economy” is

an asset all over the Italian territory (15 maritime regions). The Italian shipyards are world leaders in high technology sectors, such as cruise ships, passenger vessels, and superyachts construction. Italian boating plays a worldwide prestigious role in the motor yachts construction. The national port systems hold the first position in terms of volume of goods and cruise transit. The Italian maritime industry consists of about 50,000 companies working in maritime and port handling of cargo and passengers, as well as in naval and boating construction and maintenance. This sector GDP counts 1% employing with more than 220,000 workers, with a regional distribution consistently involving the most disadvantaged regions.

ITS - Intelligent Transport Systems

ITS is a sector aiming to improve the efficiency of the mobility as a whole. The spread of super-fast data networks, the location technology and the sensors for safety and security have made great strides so that autonomous driving and zero accident mobility have a

target horizon. ITS booming industry includes several small businesses or start-ups and a number of major players in the service field.

Strengths, weaknesses, opportunities and threats

A SWOT analysis has been performed for the four mobility sectors (road, rail, waterborne and intelligent transport systems (intermodality/co-modality), the outputs are displayed in the tables reported in the Strategic Research Agenda full text.

Research and innovation in the transport sector

In Italy, research and innovation in mobility and transport field is managed and promoted by several Departments of the National Government (Ministry of Education, Ministry of Industrial Development, Ministry of Transport), as well as by many organizations or institutions working in the same sector. In the last years, Technological Alliances, Clusters, Science and Technology Parks, Innovation Hubs, Competence Centers,

Consortia and Laboratories have been established.

Initiatives supporting research activities are not performed exclusively by such stakeholders, actually there are a number of initiatives undertaken by different trade or business associations.

Relationships between the industrial system and university / research centres and education system

In Italy, as at international level, a natural Smart Specialization Strategy is under development. When, in a particular geographical area, there are important industrial activities, there, often, a university or research center is active, providing graduates in disciplines related to the relevant industrial activities.

In Italy a strong regional networking attitude for innovation, research and education is highly perceivable.

European Union and global guidelines on mobility

The top-down analysis considers

the European Union guidelines to present an exhaustive framework on mobility requirements and trends.

Many Cluster stakeholders are involved in European organizations dealing with mobility, e.g. ERTRAC (European Road Transport Research Advisory Council), ERRAC (European Rail

Research Advisory Council), WATERBORNETP (European Technology Platform sea and inland water transport).

The priorities addressed in the European Commission White Paper on Transport (2013) are shown in the left side of the table presented hereafter, while, on the right, the table displays worldwide targets.

EU 2020 PRIORITIES	WORLDWIDE PRIORITIES
<ul style="list-style-type: none"> • City transport low-emissions and logistics • Aviation and maritime transport low-carbon fuels • Freight, modal shift from road transport • EU-wide high-speed rail network • Long-term comprehensive network • Traffic-management systems in all modes • Multimodal transport information • Close to zero fatalities in transport • Towards ‘user pays’ and ‘polluter pays’. 	<ul style="list-style-type: none"> • Re-programming of financial resources for mobility • Reduction of fossil fuels exploitation • Strong decrease of CO₂ emissions • ITS Development • Solutions for electric or hybrid vehicles • Autonomous and connected vehicles

Benchmarking with international clusters

The European Cluster Observatory (DG Enterprise and Industry, www.custerobservatory.org) is an European agency for data gathering and analysis on Clusters and Clusters policy in Europe. The website lists more than 2000 clusters currently active in Europe. Since the benchmark between clusters cannot be obtained in simplified form, the European Secretariat for Cluster Analysis (ESCA) has been established for this rather cumbersome operation. The need to develop some coordination between regional and/or national cluster is often felt both at national and European level (some regional clusters- Piedmont, Lombardy, Bavaria, Baden-Wuerttemberg - have the same dimensions of whole nations - Netherlands, Belgium, Austria, Sweden, etc.).

CTN Transportation Italy 2020 strategic vision

As mentioned above, the CTN Tra. It 2020 strategic vision has been achieved by a bottom-up and top-down combined process. The bottom-up activity was based on

the collection of forms highlighting new research topics, which have been merged into synthesis arrays, given in Annex 1.




The arrays have been conceived referring to the Societal Challenges defined by the EU, complying with the mentioned top-down process. Synthesis arrays establish a cross reference between the features of products and the Societal Challenges, making possible to display - in a 'snapshot' - the expected impact of the research outputs in 2030 and 2050. The analysis of synthesis arrays identified 11 research and 13 innovation trajectories.

The 11 research trends are shown on the lines of the synoptic table introduced below. The columns on the left side refer to 6 Kets (EU key enabling technologies). The columns on the right side refer to the innovation trends. Graphic symbols for each of the four concerned mobility sectors, highlight the relationship between research, innovation trends and Kets.

The synoptic table identify the possible cross-fertilization between research and innovation trends, as well as the fields displaying urgent education needs.

Strategic visions for the four concerned mobility sectors

The strategic visions for the four concerned mobility sectors have been drawn up referring to the synthesis arrays; the table below displays the strategic insights. The yearly R&D investment required by the CTN Tra.It 2020 stakeholders (taken as a whole) is about 3 billion Euros.




				ITS
Strategies	<ul style="list-style-type: none"> • Development of sustainable powertrains • Development of new vehicle architectures and lightweight construction • Development of efficient, safe and integrated mobility • Competitive and sustainable products and services, with particular reference to components 	<ul style="list-style-type: none"> • Development of sustainable trains, tram, metro and freight vehicles • Safe rail mobility • Availability of rail transport • Competitive solutions for rail transport attractiveness and inter-modality or comodality of passenger and freight transport • Innovative solutions for energy saving of rail vehicles 	<ul style="list-style-type: none"> • Design and production, process and technology • Production systems and plants • Concept design • Vehicle behaviour • Functionality and smart management • Power generation and transformation • Environmental treatments • Insulation and coating • Domatics, Infotainment • e-Communication and connectivity • Transportation infrastructures • Key Enabling Technologies 	<ul style="list-style-type: none"> • Autonomous and Connected Vehicles (technology, traffic management and new services) • Smart Mobility • Big Data and simulation of transport processes • City Logistics and urban freight transport • Inter-modality and logistic platforms for integration of waterborne and rail transport • ICT for integration of vehicles and infrastructures • Vehicle as a sensor: improvement of accuracy and reliability • Safer transport network: ITS for decision making (safety and security)

Context requirements for the development of the four concerned mobility sectors

The context requirements for the development of the four mobility sectors is compliant with the EU strategies and policies for a sustainable and inclusive growth. The following table lists these requirements including the participation of industrial players (such as vehicles manufacturers, traffic managers, technology providers...) highlighting the research programs (starting from TRL 2-3 up to TRL 7-8), covering both technological

research and large scale testing (field operational tests) to accelerate the time to market of the most promising solutions.




Requirement from the social and industrial context

 ITS	 ITS	 ITS
<ul style="list-style-type: none"> • Mobility (urban) to be managed in conjunction with public and private stakeholders • Specific and far-reaching working programmes (national or regional) • Field operational tests 	<ul style="list-style-type: none"> • Actions to reduce time and costs of both field tests and product certification 	<ul style="list-style-type: none"> • Cooperation of different stakeholders starting from research • Update of infrastructure and fleet renewal • Standards development • Education

Sector cross research priorities

A detailed analysis of the CTN Tra.It 2020 vision and related research priorities emphasizes a number of research topics that are across the four concerned mobility sectors.

Research priorities

 ITS	 ITS	 ITS
<ul style="list-style-type: none"> • Technologies for efficient and clean internal combustion engine • Integrated safety and driver assistance systems (autonomous and connected vehicles) • HMI, comfort and perceived quality • Sustainable Manufacturing • Technologies for clean and sustainable electric mobility, • Technologies for lightweight structures • Technologies for clean and flexible production • Innovative materials 	<ul style="list-style-type: none"> • New concepts of rail vehicles (trains, tramways, good transportation vehicles) • Reliable, sustainable, safe/secure, comfortable vehicles • Reliable and sustainable signalling, communication and monitoring systems • Intelligent, Sustainable Infrastructure • Rail Mobility upgrades to meet demographical change • Rail Mobility upgrades to meet change in lifestyle • New city rail concepts towards smart city visions. 	<ul style="list-style-type: none"> • Innovative design methods • Safety and security • Materials and structures • Energy management • Environmental Friendliness • Noise and Comfort • Propulsion devices and manoeuvrability • Hydrodynamics • Breakthrough products • Monitoring • Navigation support systems • Customer care, • Production and maintenance facilities • Port facilities even

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Cross research
topics

- materials
- energy management
- monitoring (data acquisition for prognostic or diagnostic)
- active and passive safety
- security
- comfort e customer care
- mobility management

Education priorities supporting research and competitiveness

Following the research needs identified in the Strategic Research Agenda, it is possible to foresee the educational and training needs for the next years. Multi-disciplinary education for the development of products, production processes and training (namely higher education, technical and vocational training) have been identified as priorities. All stakeholders required training in partnership with the industry (internships or work-study

activities during each school year, as part of the education programs).

A continuous dialogue with companies is deemed necessary to assess the needs to evolve skills that are continuously evolving. This will also create a channel to share opportunities.

The mismatch between the education offer and the requirements from employers should be reduced. International workshops, involving both research bodies and industry, are useful for career guidance and comprehensive education.

Great opportunities are offered

by higher education (master, specialization courses, research grants, doctorates, high apprenticeship...) and from international cooperation to increase technical training and company skills (also “on demand”).

Priorities related to scientific and technological infrastructures

Each mobility field has very specific priorities for the relevant scientific and technological infrastructures. However, a general requirement is networking of transport-focused infrastructures (open innovation framework). An easy access and use of such infrastructures by industrial researchers, in particular SMEs, can support their innovation strategy by means of a proper science and technology transfer. Large or full-scale technology demonstrators, able to validate technological innovations in several fields are envisaged.

The ability to share and use sophisticated and expensive equipment (involving large investments) is another important need.

Response to EU Societal Challenges and capacity of developing Smart Specialization Strategies (impacts)

The output of the Strategic Research Agenda, with its medium and long-term forecasts highlights a significant ability of the four mobility sectors to provide important contributions, allowing national industry to compete and positively face the Societal Challenges.

The four mobility sectors need to develop research topics focusing on safety increase, sustainability and competitiveness of the transport system. These topics are not only ultimate goals, but they foster the development of crosscutting activities among the four mobility sectors, where specific research skills can find common applications. The research and innovation trends illustrated in this document are important topics to be discussed with the Italian Regional administration institutions participating in the CTN Tra.IT 2020. This discussion will allow the implementation of the dual aspect of S3, i.e. regional specialization in a global perspective. So the most

suitable implementation tools of each region will be engaged at their best. In this perspective, the application of innovation policies based on S3 can bring out the regional excellence to increase competitiveness.

Referring to timing, the research and the innovation trends, as they are currently known, are a response of great importance for what

concerns the targets of Social Challenges in the medium term (2030). The forecast on the long-term (2050) highlights the need for a subsequent connection with research activities, based on the actual evolution of contextual elements (such as infrastructures and standards), enabling the achievement of the Societal Challenges goals and the targets of growth.



Cluster Trasporti

Segreteria c/o ANFIA
+39 06 54221493-94
cluster.trasporti@anfia.it
www.clustertrasporti.it