



RegioneLombardia

RESEARCH AND INNOVATION STRATEGIES FOR SMART SPECIALISATION IN REGIONE LOMBARDIA

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SMART SPECIALISATION STRATEGY (S3)

Executive Summary

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I. Regional context

I.1. Economic and production system

With over 9.9 million people in 2011 (Istat, 2012), Lombardy is the **fourth most populated region of Europe**, after Bayern (12.5), Île de France (11.7) and Baden Württemberg (10.7). The inhabitants of Lombardy represent 16.5% of the entire Italian population, and 2% of all the population of the European Union of 27 countries.

The gross domestic product (GDP) of Lombardy, amounting to 331,405 million euro (Infocamere, 2015 data), is **the fifth GDP among the European regions**. The Lombardy region alone contributes 2.61% of the entire European Community GDP and 21% of the national one (Infocamere, 2015).

Lombardy's production system is still one of the most developed in Italy and in Europe: at the end of 2012 more than **820,000 enterprises** were active (approx. 8.3 enterprises every 100 inhabitants) of which more than 99% were small and medium-sized enterprises. About 30% of the total of Lombard businesses is composed of corporations and about 17% of partnerships, while the remaining 53% are sole proprietorships (Infocamere, 2012).

The Lombard **agro-industrial sector** is the most important at national level (in 2012 the value of agro-industrial production exceeded 12.2 billion euro, representing 15.6% of the total Italian amount, approx. 3.7% of the total GDP of Lombardy and comprises approx. 61.000 manufacturing facilities).

Despite the growth of the service sector that has concerned all the advanced economies, Lombardy's **industrial sector** remains stronger than the rest of the Country. Its added value accounts for slightly more than 30% of the total versus the national figure of 21.5% (Istat, 2015). Specifically, Lombardy's manufacturing industry, with its 101,277 businesses (Infocamere, 2015), turnover of 220 billion euro, 68 billion euro of added value and about one million people employed (Istat, 2015), is the leading sector by amount of businesses and fourth by workforce at a European level (Eurostat, 2010).

The **service sector** in Lombardy has an added value of 206 billion euro (Istat, 2015) with a weight of 68,5% on the total which is lower than the national figure, stabilized at 73,4%.

The Lombard system has a **strong vocation towards export** and this is why it is more exposed to the changes imposed by globalization. After having recovered in 2012 the levels reached 108 billion euro of export, Lombard exports in 2014 attained a new historic record, by exceeding the threshold of 109 billion euro.

Another interesting indicator in terms of internationalization of Lombard enterprises is offered by the databank of the *Financial Times FDI Intelligence*: it conducts censuses worldwide on cross-border direct investments aimed at starting new economic activities or at expanding pre-existing activities (with the exclusion of pre-existing activity buyouts) and places Lombardy in the top 10 in Europe.

Lombardy is also at the centre of important travel flows (three European corridors), it has significant mobility figures, in particular regarding goods, of almost 286 million tons equal to 21,3% of the national total quantity.

Lombardy is well equipped both from the point of view of **airport** infrastructures – Malpensa is the first Italian airport as far as the transport of goods is concerned (414,317 tons/year 2012) accounting for almost 50% of the Italian market (Assoaeroporti)– and of the articulated **railway** and **motorway, freeway** and **ring road** systems.

1.2. Lombardy's knowledge-based system

Lombardy's knowledge-based system is extremely articulated, it is characterized by the specialisation in various technical and scientific disciplines and includes skills and research groups of international ranking. The **13 academic institutions** (6 public universities, 1 School of Engineering, 6 private universities) and a university school for advanced studies (*IUSS - Istituto Universitario di Studi Superiori of Pavia*) play an important role in producing graduates who represent a fundamental vehicle for transferring knowledge to the production world. Universities offer a strong tendency towards science: engineering courses (20.2%), mathematics, physics and natural sciences (14.9%) and medicine (11.9%) represent almost 50% of the total offer (CNVSU - National Committee for the Evaluation of the University System). The contribution to the formation of human capital is essential especially in light of the data on employees holding a degree or high school certificate, representing 18.9% of the entire workforce, a value which is slightly below the European average (30,2%) (Eurostat, 2014).

In 2012 **expenditures for Research and Development (R&D)** in Lombardy amounted to 1,37% of the GDP, below the European average (2,06%) and still far from the 3% established by the EU 2020 strategy (Eurostat, 2012).

In 2013 Lombardy had more than **117 university spin-offs**, representing 10,6% of all the national spin-offs, with an average age of 5,8 years (Netval¹ – Network for the enhancement of university research, 2014).

Together with the academic institutions, there are a variety of top-ranking **public and private research** centres. Lombardy boasts, in fact, a high concentration, with 12 Institutes of the CNR - National Research Council (out of a national total of 110), 21 local Organizational Support Units (OSU) of the CNR (CNR, 2012) and 17 Institutes for Treatment and Research (out of a national total of 42), finishing off with the only European Joint Research Centre (JRC) located in Italy, at Ispra/Varese.

With 26,7% of researchers and 27,9% of private investments out of the national total value in 2012, Lombardy remains by far the leading region for the scale of private funds allocated to R&D activities (Istat, AIRI 2015). In Lombardy there are 267 **research facilities** housed in private enterprises (AIRI, 2008) and 182 enterprises that are leaders in innovation (European Commission, 2008), a factor that distinguishes Lombardy on the international stage.

Lombardy is also characterized by an articulated research system active in various scientific areas such as: **Health, Energy and Environment, Advanced Manufacturing, Food and ICT**.

Business accelerator/incubator services are provided by 36 entities that have sustained so far the development of over 250 start-ups in Lombardy, by supplying services of strategic

¹ NETVAL - www.netval.it

consultancy, physical environments, shared equipment and logistical facilities (at affordable conditions), training and dedicated finance.

II. Development strategy for research and innovation

II.1. SWOT analysis and key growth drivers

A recent report by the Organisation for Economic Cooperation and Development (OECD)² shows that the Lombard system boasts the following strengths and weaknesses:

Strengths	Weaknesses
high economic production	high fragmentation in undercapitalised micro businesses
strong diversification of businesses in the manufacturing and service industries	tendency towards “informal” innovation activities
strong relational dynamics among players in the subcontracting supply chains	low turnover rate of businesses
widespread presence of representative organizations , of deeply-rooted production sectors and industrial districts	lack of systemic assessment of business support and development programmes
high quality of advanced education and of the private and public research system	poor communication between education, research and production systems
great diversification and wide distribution of industries, particularly in the traditional and modern manufacturing and service fields	

Given the complexity and the wide diversification of the Lombard innovation system, Regione Lombardia intends to **support growth paths** of the Region, not only by appealing to the strengths but also by turning weaknesses into opportunities, for instance by capitalizing all the different forms of creativity, knowledge and skills within the territory and by supporting new globally competitive value chains, capable of attaining **new market opportunities**.

Main growth drivers

- Enhancing synergistic interaction and the **inter-sectoral cooperation** between entrepreneurial and research worlds (districts, clusters, networks, research centres) and across industries, enabling these relations to evolve according to market expectations;
- Enhancing the **“demand pull”** approach to intercept the new needs of society and to steer market research (for instance aging population, specialized healthcare...);
- Facilitating the **enabling conditions** to support innovation (in particular **eco and social innovation**);
- Reinforcing the presence on international markets and developing at the same time the capacity to **attract knowledge and investments**;
- Planning integrated action in the framework of smart cities, aimed also at increasing the **attractiveness of the Region** by promoting its territorial, environmental and cultural assets.

² Report: *Boosting Local Entrepreneurship and Enterprise Creation in Lombardy Region (Italy)*, OECD, November 2012

II.2. Past and future strategy

Over the past decade, Regione Lombardia has spurred Research and Innovation, promoting in particular the scientific and technology-based processes, in many cases pushing the boundaries in terms of purposes and tools, and often setting the pace at a national and European Community level.

The **“district-based” industrial policy**, started and supported over the years by Regione Lombardia, represents one of the fundamental pillars of this strategic approach that considers the support to enterprises and sectors of excellence, especially the industrial and manufacturing-based, as being cornerstones of growth and productivity not only for the business system, but also for the institutions.

The following chart shows the main stages of the path that, starting from the recognition of the “geographically localized” **Industrial Districts with high levels of specialisation in production**, gradually departs from a territorial approach to highlight areas of excellence in production - able to represent poles of development with high technology potential - passing from **Meta-districts**, then redefined as **Priority thematic areas** (with strong existing or potential connections with the research or innovation production world) to the **High Technology Districts** recognized by the MIUR (Italian Ministry of Education, University and Research), to finally reach the **Regional Technological Clusters** (CTR).

What follows is a synopsis of the regional policy process:

Evolution of the Industrial and Research and Innovation policies of Regione Lombardia (GI, MPMI and Research Institutions – RI)

	Traditional sectors (districts)	Thematic districts	Network of Enterprises and RI (DRIADE production systems)	High Technology Districts (DAT)	Regional Technology Clusters (CTR)
Period	Before 2003	From 2003	2009	2011	2012
Actors	SMEs	SMEs, OdR <i>Organismi di Ricerca [Research Institutes]</i>	MPMGI, OdR <i>Micro, Piccole, Medie e Grandi imprese [Micro, Small, Medium and Large Enterprises]</i>	MPMGI, OdR	MPMGI, OdR
Paradigm	Focus on well-defined geographical areas characterized by traditional industrial sectors (industrial districts with specialisation in production and agricultural and rural districts)	Focus on technologies and know how (ICT, biotech, advanced materials, fashion, design). Integration of value chain to encourage excellence in the manufacturing sector	Focus on emerging sectors, technologies, know-how and fields of application (e.g. nautical sector, aerospace, cosmetics, energy ...)	Focus on 10 strategic technological fields (agriculture, aerospace, mechanics, fashion, advanced materials, energy, building, ICT, Biotech, Automotive)	Focus on 9 priority themes (agrifood, aerospace, life science, living environments, smart communities, mobility, green chemistry, energy building environment, smart factory)
Boundaries	Well-defined geographic boundaries	No geographic boundary	No geographic boundary	No geographic boundary	No geographic boundary
Genesis	Bottom up and recognized by the PA	Top down	Bottom up and recognized by the PA	Top down for strategic fields and Bottom up for the formation of districts	Top down from analysis of the scientific and technological foundations of the country and of national and European Community orientations and Bottom up for the formation of regional clusters
Governance	Structured Governance	Non-structured Governance	Structured Governance	Structured Governance	Structured Governance

III. Regione Lombardia priorities

III.1. A new way of decoding the Region

In line with the goals of the “Europe 2020”³ strategy, and spurred by the fast pace of change in knowledge and technology-intensive industries and production in the Region, Regione Lombardia launched some years ago a strategy built on action and measures to **focus projects and available resources** on a handful of priority fields and industries identified as such for their strategic interest or for their potential vis-à-vis the public and private system, specifically on supporting innovation projects in manufacturing.

However, as described in the first chapter, the analysis of the Lombard context shows a dynamic and diversified entrepreneurial and scientific and technological system with excellences in many sectors and fields. Regione Lombardia is aware of the growing difficulty of decoding and governing the changes taking place in the Region in order to devise regional policies that address real needs.

There is therefore a strong need to **change the way of decoding the Region** compared to the past, moving away from a vertical approach, with a perspective on traditional sectors, towards a new horizontal logic based on “systems of competence”.

A new way of decoding the Region

Regione Lombardia, in keeping with the policies implemented over the years, characterized by balanced top-down and bottom-up decisions, has identified, after a period of rationalization, **7 Specialisation Areas**, that represent a new radically vision. The Specialisation Areas include and well represent a consistent part of the economic and scientific actors situated in the territory, and contribute to increase their leadership in the respective theme.

The Specialisation Areas identified so far are as follows:

1. Aerospace
2. Agri-food
3. Green industry
4. Creative and cultural industries
5. Health industries
6. Advanced manufacturing
7. Sustainable mobility

The process of identifying the Specialisation Areas in any case requires a continuous and inclusive mechanism always alert to systematically capturing and enhancing new strategic skills.

³ Europe 2020 is the European Union’s ten-year growth strategy. It consists of seven flagship initiatives providing a framework through which the EU and national authorities mutually reinforce their efforts in areas supporting the Europe 2020 priorities such as innovation, the digital economy, employment, youth, industrial policy, poverty, and resource efficiency. Regarding innovation in particular, Europe 2020 sees an increase in R&D investment to reach 3% of GDP and, regarding education, an increase to 40% of the population aged 30-34 having completed tertiary education.

III.2. Specialisation Areas

Changing the way of decoding the Region means, first of all, revising and redefining the **competence mapping process**. Such a process inevitably implies a transition period towards the new approach that may lead, at an initial phase, to underestimate the potential of the Specialisation Areas, particularly in terms of the positioning of the value chain compared to other European regions.

During this phase, in which the Specialisation Areas still maintain a significant sectoral connotation, Regione Lombardia can seize the opportunity to facilitate and launch tools and initiatives to support and accelerate this process (see chapter IV.2).

The following are **tables of the Specialisation Areas** (hereinafter **SA**) **identified so far**, outlining the system of production and scientific skills, highlighting the value chain, the priority themes of technological development and the enabling technologies.

The production system

The SA, well represented by the Lombardy aerospace cluster, is a regional production set-up, which - thanks to the rich and varied presence of small, medium and large enterprises - accounts alone for about one third of Italian exports by manufacturing sectors allied to aerospace. The **production system** consists of over **185 businesses** with more than **15,000 employees** and an overall turnover of about **4 billion euro**, 1.7 billion euro of which from exports.

The Region offers all the technologies and skills of the entire supply chain required to build fixed and mobile-wing platforms and space frames (from the mechanical components and subsystems, to satellite, helicopter and trainer aircraft integrators).

Prime contractors in Lombardy are: Agusta Westland (helicopters); Alenia Aermacchi (trainer aircrafts); CGS Compagnia Generale per lo Spazio (satellites and scientific payloads); Selex Galileo (Avionics and radar); Thales Alenia Space (space).

The research system

The business and service system is supported by the **research system**, which has long been collaborating in synergy with production relying on scientific expertise in various technological fields: sensors, acoustics, ICT, materials, mechanical engineering, design and integration of complex systems, testing, RfID, remote sensing and earth observation, environmental monitoring, payloads and complex optical systems for satellite applications.

In the sphere of **Lombard universities**, each specialized in its respective field, those relevant to the aerospace industry are: the Politecnico of Milan, the Bicocca University of Milan; the University of Pavia; the Carlo Cattaneo LIUC University.

The many **research centres** situated in the Region include: INAF - the Astronomical Observatory of Brera; CNR-IREA, AWPARC (a cooperation agreement between the Politecnico of Milan and Agusta Westland).

In the aerospace industry, **private research** amounts to an average **12% of turnover**.

In terms of patenting activity, since 2005 more than 255 requests of patent registration have been filed by 13 companies from the Lombardy aerospace cluster, to protect technologies that can be applied in other sectors such as automotive, electronics, simulation and smart maintenance systems and ICT.

The **priority themes of technological development** in this SA are: space integrated systems and space systems, fixed and mobile wing integrated aeronautical systems, electro-mechanical systems and avionics, new technologies for production and infrastructures.

The most significant **enabling technologies** for the area are the ones related to advanced materials, advanced manufacturing technologies, micro and nano electronics and photonics.

⁴ Data from the Lombardy Aerospace Cluster (<http://www.aerospacelombardia.it>)

The production system

The Lombard agri-food production system is the most important at Italian level and one of the most important in the European context. The value of the Region's agro-industrial production exceeds 12.3 billion euro, or 15.6% of the national total. This figure represents approximately 3.7% of the Region's GDP, or as much as 11.5% considering the trade and transport margins. Agricultural production and food processing activities take place in approximately **70,000 production sites**, involving about **245,000 workers**, more than 175,000 of whom are part of the permanent workforce (4.2% of the Lombard workforce). Considering the macroeconomic data of the Lombard agri-food system components (meaning the sum of: intermediate consumption in agriculture, added value of agriculture, added value of the food industry, of catering, and of trade and distribution), the estimated value amounts to about **38 billion euro**, corresponding to 16.4% of the national agri-food system. Most of the final value of the regional agri-food system is provided by distribution and catering, those added value accounts for 41.5% and 18.6% respectively. Lombardy proves to be one of the leading entrepreneurial realities of the **Italian modern distribution**: the density of modern retail outlets (hypermarkets, supermarkets, mini-markets and discounts) exceeds 290 m² per 1,000 inhabitants.

The research system

In the innovation and research system, worthy of note is the **Parco Tecnologico Padano (PTP)**, established thanks to financial aid from Regione Lombardia and local authorities, which is a research centre for agri-food biotechnology. The Technology Pole also houses the Experimental Animal Disease Prevention Institute, the "Lazzaro Spallanzani" Institute, the CNR - IBBA and ITB, CRA - Vercelli, the Faculty of Agriculture (6 departments) - University of Milan, Faculty of Agriculture (1 department) - Catholic University of Milan, ISU - Institute for University Services, the Large Animals Hospital - University of Milan, and the Experimental Livestock Teaching Centre.

Further scientific expertise in the agri-food field is contributed by the University of Pavia, the Politecnico of Milan, the Bicocca University of Milan and the University of Brescia.

The main **research priority themes**⁶ are sustainable and competitive agri-food supply chain, individual well-being (for instance new solutions for healthy ageing through systems, food, supplements and nutraceuticals), food safety and security to ensure food security, availability, and protection.

The most significant **enabling technologies** are biotechnologies, advanced materials and systems of advanced production, photonics, and micro and nano electronics.

⁵ Sources: Lombardy Agri-Food High Technology Cluster; *Lombard agriculture counts-2012*, Regione Lombardia, *VI General Agriculture Census-2010*, Istat, *Agriculture and Livestock*, istat. it, *Data & Trends of the European Food and Drink Industry 2012*, Food drink Europe. Data provided by the Directorate-General for Agriculture and by the Lombardy Agri-Food High Technology Cluster.

⁶ Source: Lombardy Agri-Food High Technology Cluster

GREEN INDUSTRY

The production system

The green industry SA includes over **40,000 businesses** with approximately **190,000 employees**⁷. The green industry is composed of a rich and varied system of skills, which include: **energy and cleantech** (power generation, renewable energy, water management and purification, smart grids, energy efficiency and sustainable building) and **green chemistry**⁸ (production of chemical products and energy from renewable sources from biomass and/or organic waste, production processes that reduce or eliminate the use of dangerous substances thus reducing the environment footprint). As far as energy is concerned, **50% of the Italian plant building industry** and approximately 40% of the Italian renewable enterprises, distributed on various levels⁹, are situated in Lombardy. The energy production system has approximately **28,700 employees** and a turnover of **9 billion euro**. The green chemistry production system involves instead a completely new supply chain, based on the concept of **bio-refinery**, where locally produced vegetable raw material is exploited by extracting decreasing value-added substance, in a waterfall logic, converting final residues into energy. The sectors that can use the products of bio-refinery are, for instance, those of food, animal feed, chemicals and cosmetics in particular, rubber and plastic, pharmaceutical.

The research system

The **research system** of this varied area consists of approximately **3,000 units** counting professors, researchers and temporary staff and of **200** active research and technology transfer public/private bodies, including: the University of Milan, Bicocca University of Milan, the University of Insubria, the University of Pavia, Politecnico of Milan, the University of Bergamo and Brescia, Bocconi University, Carlo Cattaneo LIUC University, the CNR, the RSE.

The **priority themes** of technological development are summarized as follows: energy efficiency also in buildings, renewable energies (biomasses, solar, hydro, geothermal, wind), emission reduction, energy storage, smart grids, power system flexibility, nuclear energy, material recycling, reduction of water consumption and recovery, internal environmental quality, air, water and soil quality.

The most important **enabling technologies** for this SA are advanced materials, industrial biotechnology, photonics, micro and nano-electronics and advanced manufacturing systems.

⁷ Source: European Cluster Observatory

⁸ Source: Lombardy Green Chemistry Cluster

⁹ Source: Lombardy Energy Cluster

HEALTH INDUSTRY

The production system

The SA contains a very rich and varied system of competences which includes the following themes: biotechnologies, pharmaceuticals, medical devices, food, creative industries and constructions for equipped living and working environments and for individual well-being systems. Regarding the production system, the Assobiotec 2012 report states that in Lombardy there are 126 biotech enterprises (52.9% of the national total number) that produce approximately 48% of the total turnover (approximately 3.5 billion euro, data of BioInItaly 2013) occupying an excellent position also at European level.

Lombardy is the first Italian region for number of people employed in the pharmaceutical industry with 30,051 units (47.2% at national level) 2,825 of whom involved in research and development. The R&D investments of Lombard enterprises in this sector amount to approximately 400 million euro (Lombardy accounts for roughly one third of the national total) and Lombardy counts the highest number of surgeries (1810, that is to say 47.8% at national level).

The biomedical enterprises (for example biomedical devices for personal use, instrumental use, electromedical use and for early diagnostics) operating in Lombardy are 816 (307 with more than 20 employees) and they employ 40% of the Italian workforce of this sector (approximately 30,000 employees) with a turnover of around 9 billion euro in 2013 equal to 49.47% of the total Italian turnover of the industry (Assobiomedica data).

The research system

The research system consists of 6 Faculties of Medicine, 2 Departments of Bioengineering, 28 hospitals with university course premises, 288 research centres with research activities in the health sector and 186 centres with research lines in non-food biotechnologies (QuESTIO 2013 data).

Public universities and research centres involved include LIUC, the Catholic University, Bicocca University of Milan, the University of Milan, Vita Salute S. Raffaele as well as the CNR and the Politecnico of Milan.

Special mention must be made of **Fondazione Regionale per la Ricerca Biomedica** (FRRB) (Regional Foundation for Biomedical Research), established in 2011 on an idea by Regione Lombardia, it engages in preclinical research within the Region and in the development of projects in the field of biomedical and biotechnological research for clinical and application ends. FRRB heads the Lombardy Life Sciences Cluster as well as of the national Cluster named ALISEI (Advanced Life SciEnces in Italy).

The **priority themes of technological development** are: e-health, new diagnostic systems, drugs and innovative therapeutic policies, prevention, health monitoring, rehabilitation.

The key **enabling technologies** are industrial biotechnologies, micro and nano-electronics, advanced materials and photonics.

The production system

The system of cultural and creative industries is made up of **260,000 enterprises**, 43,101 of which operating in the fields of design, fashion, recording and music market and entertainment¹⁰ and 17,500 enterprises in the sector of the furniture industry (20% of the national total) with **195,848**¹¹ employees of whom: 28% involved in artistic and literary creation activities, 26% in publishing, 21% in software, 10% in advertising, 8% in radio and TV and 7% in other activities.

The Lombard **cultural industry** ranks **fourth** after three major European areas: Île-de-France (Paris), Inner London and Madrid.

Regione Lombardia is also **second in Europe** regarding the **artistic and literary production and third in publishing**¹².

Regione Lombardia comes fifth in the Top 10 regions for number of employees in copyright-based industries and in the Top 15 software production centres in Europe¹³.

Focusing on Regione Lombardia's signature creative and cultural industries (**fashion, design, architecture, online publishing**), there is still considerable room for further growth, especially if one considers design in the broadest sense.

The research system

The system of scientific skills for the promotion of cultural heritage is mainly composed of the Politecnico of Milan, Bicocca University of Milan, the University of Pavia, the University of Milan, Bocconi University, IULM (Free University of Languages and Communication), the CNR and the Catholic University. IULM, Bocconi University, Catholic University and Politecnico of Milan also play a very active part in scientific skills in the creative field.

The **priority themes**¹⁴ of development will mainly concern: innovative solutions for environmental surveying, smart systems for the analysis of territorial and remote sensing systems and integrated geophysical systems, digital detection and 3D virtualization technologies, development of diagnostic, preservation and monitoring technologies. Other fields of development in the sector will be design and fashion, with particular attention on the eco, social and mobile components, the advanced textile industry, multimedia.

The cultural and creative industry, owing to its transversal connotations, plays an important role in terms of both scientific and industrial skills, to **create the enabling conditions** to spark the creation of new value chains and innovation solutions that satisfy new needs, and as a potential **receptor of innovation**, particularly in the cultural field for the enhancement of cultural heritage as a potential market where solutions can be developed and tested also through enabling technology.

¹⁰ Elaborated by the Milan Chamber of Commerce on data from the Company Registry at 2Q 2010 / Ardizzone, Ramello, 2007 / Di Ardizzone, in progress in May 2011, on Musica&Dischi data (2009)

¹¹ Ibidem

¹² European Cluster Observatory (2010)

¹³ Ibidem

¹⁴ Politecnico of Milano - Centre for the Preservation and Enhancement of Cultural Heritage

ADVANCED MANUFACTURING

The production system

The manufacturing industry is a fundamental pillar of every developed region. In Europe, the manufacturing industry is the first sector of the non-financial economy in terms of added value and number of employees. Moreover, this sector is **complementary to the service industry**, as it produces goods required to produce services, thus generating a demand for services (it is estimated that a new job in the manufacturing sector generates two jobs in the service sector)¹⁵. The production system includes **approximately 100,000** enterprises counting a number of employees in the region of **1 million units** and generating a turnover of **250 billion euro**, with an added value of **60 billion euro** (Istat, 2010). The percentage of R&D investments in the sector referred to the GDP of the region is 1.38% compared to the national level which is 1.26% (COTEC, Annual Innovation Report, 2012). On the other hand, private R&D investments amounts to 3 billion euro (Eurostat, 2010). Regione Lombardia is the **first manufacturing region in Italy** in terms of turnover and added value and the **third in Europe** concerning the number of employees, after Bayern and Baden-Württemberg. Lombardy is the leading manufacturing region in Europe regarding some sub-industries such as: manufacturing of metal products, excluding machinery and equipment; textile industries; production of base metals; manufacture of wearing apparel; printing and reproduction of recorded media; wood and products of wood and cork, except furniture. Lombardy is the first Italian region by number of patents registered at the European Patent Office (EPO) concerning manufacturing technologies (industrial technologies, metallurgy, mechanical engineering, chemicals, textiles).

The research system

The public research system¹⁶ consists of the CNR (ITIA - Institute of Industrial Technologies and Automation), Politecnico of Milan, University of Milan, Bicocca University of Milan, University of Brescia, University of Bergamo, University of Pavia, Insubria University.

There are **2,946** researchers, professors, research fellows and PhD students involved in the study of manufacturing topics¹⁷. Since 2003, **50 university spin-offs** have been created (Netval, 2003-2013).

The research and technology transfer system in the manufacturing industry is composed of **160 research and technology transfer centres**¹⁸.

Lombard Industry and research are present in numerous platforms/initiatives at European level such as, for instance: Manufacture, EFFRA-European Factory of the Future Research Association, EuRobotics aisbl.

Thanks to the complementarity of the skills in Lombardy, the **priority themes of technological development** are connected to the development of the key **enabling technologies** such as, for example: advanced manufacturing processes; mechatronics for advanced manufacturing systems; modelling, simulation, forecasting methods and tools; ICT; sustainable manufacturing technology; advanced materials; strategy definition and management methodologies.

¹⁵ European Commission 2009, European Parliament 2010

¹⁶ Data provided by the Lombardy Smart Factory Cluster

¹⁷ MIUR – National Committee for the Evaluation of the University System “Nuclei 2012”, CNR

¹⁸ Eupolis Lombardia (www.questio.it)

SUSTAINABLE MOBILITY

The production system

The Lombard mobility industry is a comprehensive field that encompasses rubber, rail and water mobility, and logistics. **The automotive manufacturing industry** (products and processes) and **the boat manufacturing industry** are particularly important in this area.

The Lombard automotive sector¹⁹ counts over **43,000 employees**. It consists of more than **100 Lombard enterprises** of medium-large dimensions that operate in different automotive sectors; these are complemented by a multitude of micro, small and medium enterprises working for them on a subcontracting basis providing components, moulds and equipments. The overall turnover is estimated at around **12 billion euro**, representing 30% of the total Italian turnover generated by components. The system includes manufacturers of motorcycles, agricultural vehicles, commercial vehicles and caravans, **manufacturers of machinery**, plants and equipment (moulds, assembly equipment, industrial automation systems), design, construction and marketing of vehicle components. The automotive supply chain in Brescia alone is Italy's second largest automotive pole after Turin, in terms of employees and local production units.

Lombardy boasts an extremely vigorous supply chain for the building of **pleasure boats**, which involves leading design firms, shipyards engaged in the building of sailboats and/or motorboats, businesses specialized in fit-outs and furniture, sail makers, businesses providing maintenance, repair and refit services and logistical assistance, mooring and storage. The production system²⁰ counts approximately 19,000 employees, 2,889 of whom working in refitting–repair and storage, 9,630 working in shipbuilding, 5,804 working in accessories and components and 708 in engines.

Lombardy is the **first Italian region** as regards the **number of pleasure boating companies** situated in the territory and **second in terms of employees** working for them.

The research system

The research system is composed of the following universities and research centres: University of Brescia, Politecnico of Milan, Bicocca University of Milan, University of Milan, Bocconi University, Catholic University, University of Bergamo, University of Pavia, CNR. The private research system includes the Brembo Research Center housed in the Kilometro Rosso Science Park, active in mechatronics and sensortronics (a joint-venture with the DaimlerChrysler Laboratory, that involves ceramic composites and base materials) and Pirelli Labs, which represents the centre of technological excellence of the Pirelli Group.

The **priority themes** of technological development include: structural weight reduction; reduction of CO2 signature through alternative transmissions and fuels; development and dissemination of innovative and efficient urban goods logistical systems through sustainable means; related vehicles (control systems); vehicle safety systems; advanced materials.

The most strategic **enabling technologies** for this area are advanced materials, micro and nano electronics, systems for advanced manufacturing and nanotechnologies.

¹⁹ www.clusterobservatory.eu

²⁰ Source: "La nautica in cifre", yearbook by the UCINA Research Office in association with the Economics Department of the University of Genoa - 2012

III.3. Challenges to address: emerging industries

It is widely recognized that the boundaries between traditional industrial sectors are increasingly blurring²¹. As a result, **cross-fertilization** in the manufacturing and service industries is becoming an important factor to accelerate the process of innovation geared to the emerging needs of the market. Innovation is increasingly driven by the introduction of enabling technologies and of new business and creativity models, and by social challenges that the industry needs to address to ensure its competitiveness.

Emerging industries are those industries characterized by high growth rates and great market potentials. They can emerge both in new industrial sectors and in existing industrial sectors that are evolving or merging to engender new industries²².

Emerging industries are hard to identify, for the very reason of their being emerging, and are clearly recognizable only after a few years, once they have become established industries. However, it is possible **to identify their distinctive and generating factors** and to act concretely on these in order to recognize them promptly and support them in an effective way.

A typical example of emerging industry in Europe is given by part of the traditional textile industry that has evolved into a technical textiles industry through the application of textile processes based on new materials in order to meet the needs of advanced manufacturing industries such as aerospace, automotive, biomedical devices, and so on.

The Challenge of Regione Lombardia

A system of dynamic, diversified and broad production and scientific skills, crossing the various SAs, such as the Regione Lombardia system, has strong potential for convergence and cross-fertilization, which must be decoded and exploited to accelerate the **evolutionary process and establishment on the market of emerging industries and transformation of the mature industry**.

The challenge that Regione Lombardia faces is therefore to help the production system **seize and intercept new market opportunities** within the SAs through the evolution of their traditional industries into emerging industries, by addressing the needs of the new markets (strengthening the market-driven approach) and helping improve the quality of life of its community (society-driven approach).

In order for the mature industries to evolve into emerging industries, "**smart communities**" could be a crucial means to intercept new needs by marshalling and aggregating the skills of the Specialisation Areas. Among the areas associated with smart communities, emphasis will also be placed on promoting cultural heritage with a view to **local attraction** (e.g., living labs for the testing of technologies on the ground, such as technologies for security, preservation, traceability and access to cultural heritage) and as a means of energizing the tourism industry and impacting positively on the rest of the production system.

To support and accelerate the process of establishment of emerging industries, a series of "tools" has been identified thanks to discussion and approval with stakeholders that will be supported by specific initiatives and that can be classified into two categories based on their purpose:

²¹ Expert Panel on Service Innovation in the EU "Meeting the challenge of Europe 2020 – The transformative power of service innovation", final report of February 2011 accessible at the following address:

www.europe-innova.eu/c/document_library/get_file?folderId=383528&name=DLFE-11601.pdf

²² European Cluster Observatory: "Emerging industries": report on the methodology for their classification and the most active, significant and relevant new emerging industrial sectors. July 2012, version 1.3, available at: www.clusterobservatory.eu/eco/uploaded/pdf/1347451111708.pdf

Tools supporting the creation of enabling environments for enterprises so they can grow and evolve into emerging industries	Tools addressed directly to enterprises to facilitate the evolution of the value chain and develop technologies, products and processes able to meet the new needs of emerging markets
Clusters and other enterprise aggregations as tools to create enabling environments for the birth and growth of emerging industries	Enabling technologies to developed in products and processes that can help innovations make the quantum leap
Open Innovation , networks and platforms of knowledge sharing in order to stimulate the aggregation of economic and scientific entities and to share best practices, experience, and knowledge (creation of living labs, crowdsourcing environments, etc.)	Tools for the dissemination of ICT technology
	Tools to stimulate the demand for innovation on specific, functional and performance requirements unmet by the market, such as pre-commercial procurement and public procurement for innovation to stimulate new emerging needs
	Tools to promote intersectoral cross-fertilization aimed at stimulating the birth of innovations geared to the new market needs (for instance, through clusters or open innovation environments)
	New forms of collaboration between enterprises, including large ones, and research institutions to promote the most effective ways to conduct research and innovation activities

Particular attention will be given to **clusters** and other enterprise aggregations as tools to create enabling conditions for the birth and growth of emerging industries. Through the previously described path, a total of 9 Regional Technology Clusters have been created so far in the following areas: Agri-food; Aerospace; Green Chemistry; Energy, Construction and Environment; Smart Factory; Land and Sea Mobility; Life Sciences; Smart Communities Technology; Living Environment Technology. According to the principle of full inclusion, Regione Lombardia gives the territory the opportunity of aggregating enterprises, research centres and other economic entities in new clusters in strategic fields such as, for example, creative and cultural industries. Regione Lombardia seeks also to turn clusters into effective tools of **“intermediate” governance** between the territory and the regional administration in order to have trustworthy interlocutors to involve systematically in the planning of regional strategies. In a medium-long term time period, clusters will eventually develop, becoming vigilant sentinels of their specific system of skills. In this process, large enterprises will play an important role as catalysts of skills and attraction of resources, of knowledge and technology with a positive effect on SMEs.

In order to accelerate the growth process of Regional Technology Clusters (CTR), in the 2014-2015 period²³, Regione Lombardia has planned a direct support to complementary activities and/or activities instrumental in the development and enhancement of CTRs, to be realized with the support of the enlarged Regional System, in order to guide the clusters along a structured development path in accordance with best European practices (for example by measuring the growth and development performance of clusters using indicators for “Gold Label” certification by ECEI²⁴). This process is designed to support the CTRs, including the new

²³ DGR n. X/707 of the 20th September 2013 Regione Lombardia resolves to allocate an overall amount of € 1.000.000,00 to support the complementary and/or functional activities for the development and enhancement of Regional Technology Clusters

²⁴ *European Cluster Excellence* Initiatives (ECEI - www.cluster-excellence.eu/), fostered by the European Commission (DG Enterprise and Industry) in order to develop methods and tools to support cluster organizations in improving their ability to manage networks and clusters.

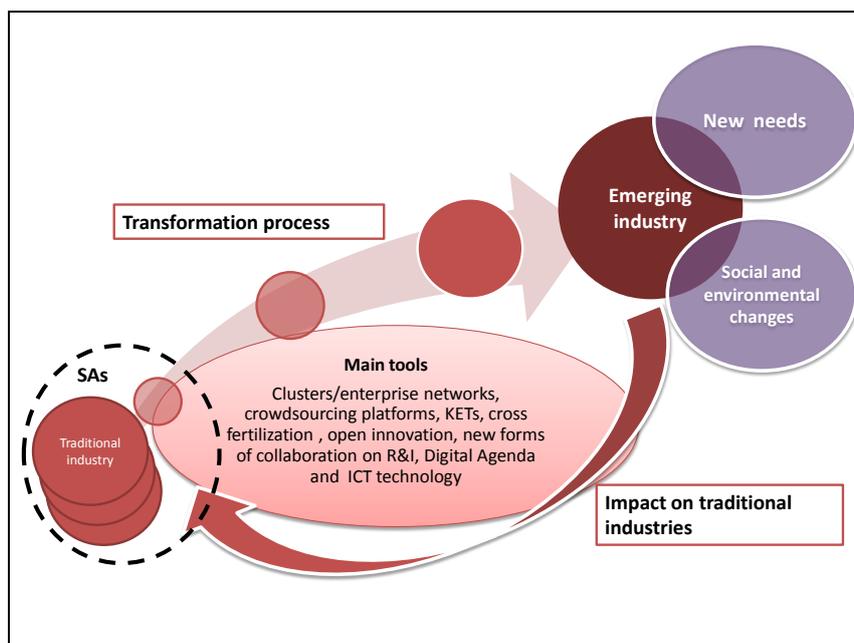
established ones, in setting up organizational structures, albeit diversified according to the peculiarities of the various SAs, that are solid and financially self-sustainable and capable of interacting with the skills within the Region by, for instance, creating theme groups, keeping the skills of the clusters mapped and up-to-date also through QuESTIO registration, updating strategic plans and, in accordance with the research and innovation policies of Regione Lombardia, devising technology foresight studies, systems for the mapping of business development opportunities and of research infrastructure requirements, in order to identify and enhance the assets within the Region and to systematize the process of entrepreneurial discovery.

An example of CTR governance can be well represented by the Lombardy Aerospace Cluster²⁵ which has set up an operational structure that also includes a technical and scientific core businesses and universities organized in working groups on fields of interest (for example, working groups on research and development to update strategic plans, training, marketing and internationalization).

Regione Lombardia intends to complete the start-up phase of the clusters by 2015 in order to have effective tools to use.

The **Open Innovation** tool (Networks and platforms of knowledge sharing) will stimulate the aggregation of economic and scientific entities in order to share best practices, experience and knowledge (creation of living labs, crowdsourcing environments, etc.). Regione Lombardia is launching also in this regard, a pilot project, with ERDF funding in the context of the 2007-2013 European Community programming period, concerning the **creation of a relational environment** (Open Innovation environment²⁶) to integrate an increasing number of “innovation ecosystems” formed of a variety of actors, including large enterprises. This tool will have a start-up and development phase ending by 2015, and will get into full swing in time for the new 2014-2020 programming period.

The following model, identified by Regione Lombardia, links the tools that have just been abovementioned with the evolutionary process into emerging industries.



²⁵ www.aerospacelombardia.it

²⁶ See DCR n. X/733 of 27/09/2013 *Amendments and additions to the guidelines implementing axis 1 of the ROP ERDF 2007-2013. Outline of the 1.2.1.1. line of action "Development of information networks and systems for the dissemination and sharing of information and services among SMEs, among SMEs and research system, and among SMEs and the PA."*

Regione Lombardia intends to support this process also with the aim of generating indirect effects on the enterprises operating in mature sectors that are not yet ready to embark on this path of change.

III.4. Smart specialisation policy targets

Considering the strong vocation for manufacturing of the Lombard territory, Regione Lombardia has identified the manufacturing industry as the priority for its policies, in keeping with prior policies.

Supporting the manufacturing industry, means supporting even the advanced service industry, since 11% of manufacturing output goes into the production of goods needed in the creation of services, while occupation in the manufacturing industry generates occupation in services with a ratio of 1:2 (one person employed in manufacturing means two persons employed in the service sector). In particular, Regione Lombardia will support actions having direct or indirect effects on **micro, small and medium-sized enterprises**, as they make up most of the businesses in Lombardy.

III.5. Mechanisms for discussion and approval with stakeholders

Sharing with regional, national and European stakeholders

In defining its strategies, Regione Lombardia has always maintained a constant and fruitful dialogue both internally, among the various Directorates-General, with national institutions (Ministries, Departments, Agencies, other regions) as well as with European institutions (other European regions, European Commission, Seville platforms, etc.), creating recurring opportunities to gather, discuss and align to the strategies.

In defining its smart strategy, Regione Lombardia has implemented a more integrated approach, not only to strengthen inter-institutional cooperation among Regions, the Ministry of Education, University and Research, and the Ministry of Economic Development, directly involved in planning policies to support research and innovation, but also to facilitate the systematic and structured involvement in the policy-making process of the regional Directorates-General with responsibilities and powers related to other issues, such as the Directorates-General for Agriculture and Emergency Relief, Security and Immigration through the **Central Coordination and Programming Authority (ACCP)**²⁷.

²⁷ Regional institution responsible for the coordination of regional development policies and for integration of Programmes on policy-making, control, communication and information, in order to ensure the coordinated, coherent, complementary and synergistic use of Community, national and regional resources.

Sharing with the territory – Working Groups (WG)

The process of defining the regional strategy is in keeping with a process of self-discovery of the territory's potential and the technological potential that the Region can develop in the international context. Next to consolidated methods used by the Region to share its decisions with the territory (Development Pact), new tools have been added, such as the Working Group on Regional Technology Clusters and the Working Group composed of Industry and Innovation Experts, created to share the next challenges that Regione Lombardia intends to address, and to bring out the needs, through a qualified process of **entrepreneurial discovery**, and meet them through the effective regional actions.

The Working Groups were set up to address the different demands of the Region through representatives of the regional clusters and the large businesses, experts in technology transfer and innovation, and representatives of the research world, to bring out the needs of the production and research system.

Sharing with the territory – Public consultation

In order to involve citizens and other subjects that could contribute to the definition or sharing of decisions, Regione Lombardia organized, on the 25th July 2013, the event named **“Estates General on Research and Innovation”** with the aim of starting a dialogue and a discussion with qualified and institutional actors at the European Community, national and regional level on the activities promoted by Regione Lombardia on research and innovation themes of the past. The event marked the start of a public consultation process (through an online questionnaire) on themes related to the smart specialisation strategy to involve the community in regional decisions, in the context of the quadruple helix model . The purpose was to gather feedback and new ideas on research and innovation to improve regional policies (the new ROP ERDF/ ESF/EAFRD) vis-à-vis Europe 2020. It had a very successful feedback, with over 850 replies.

Outward-looking process

In order to plan a proper outward-looking process, in addition to the attendance of various meetings with foreign regions organized by the Joint Research Centre (JRC) platform of Seville, and with Italian regions organized by the Italian Ministry for Economic Development and the Ministry for Education, University and Research, Regione Lombardia has opened a direct dialogue with other public administrations. For instance, Regione Lombardia organized a **meeting open to Italian regions** with the aim of gathering ideas and/or proposals, comparing the experiences to explore in the context of the ongoing work on smart strategies. Moreover, Regione Lombardia organized a **dialogue with foreign regions** within the network of the **4 Motors for Europe**, focused on the discussion on S3 themes among the 4 regions in the network. In the context of the collaboration among European regions, Regione Lombardia has recently joined the initiative called **“Vanguard Initiative New Growth by Smart Specialisation”**²⁸ and, together with other 9 European regions, it intends to play a key role in the new European growth in the industrial sector, by identifying “smart specialisations” as engines for the development of new emerging industries capable of driving the dynamics of internal growth in Europe.

²⁸ See *Vanguard Initiative New growth by smart specialisation. Engagement for the future of industry in Europe*, Paperback, Dirk Van Melkebeke, Secretary-General Department EWI Editor, Brussels, 8th of November 2013.

IV. Addressing challenges through smart policies

IV.1. European policy framework

Europe's new Horizon 2020 and COSME research and innovation programmes fit into the broader context of the Europe 2020 strategy, which emphasizes the need for greater finalisation, effectiveness and integration of different funding levels (EU, national and regional), and a greater involvement of public/private partnerships.

Specifically, Horizon 2020 must create a coherent set of funding instruments along the entire "**innovation chain**", from basic research to marketing of innovative products and services, as well as seeking synergies and complementarities with initiatives managed at local level in the context of structural funds (2014–2020) that classify research and innovation as a priority task.

The new European framework requires national and regional governments to prepare the Region to sustain the competitive challenge for the European Community resources and to perform a simultaneous action to direct and use resources from structural funds, in particular for aspects of research and innovation that can enhance the **synergies between structural funds and European funds under direct management**, in particular those relating to the Horizon 2020 and COSME programmes.

However, the complexity of the new framework requires the development of a variety of actions capable of recomposing in a **system vision** and in a shared approach the different skills and needs of the operators, and of developing specific actions to prepare local actors to address the competitive challenges of Horizon 2020, and amplify the impact on the Region in a synergistic perspective with structural funds.

The specific actions to be developed can be defined as three main types:

Governance actions	Groundwork to Horizon 2020 (upstream actions)	Actions to increase the impact of participation in Horizon (downstream actions)
<p>Establishment of a control centre to coordinate and aggregate regional actors (for example regional clusters, the subjects that are active in different ways in the European networks and institutions, structures to support operators) aimed at coordinating and aggregating regional players, sharing knowledge, and the co-design and testing of interventions consistent with Horizon 2020</p>	<p>The actions will take into account the various needs of operators and/or may consider measures for strengthening SME planning capacity (e.g. vouchers for purchasing external competences to draft proposals); integration services to accompany Horizon 2020 tenders issued by SIMPLER²⁹ within the Enterprise Europe Network; measures to strengthen the presence of the Lombard research and industry system in the European context (European Technology Platforms, European innovation partnerships, International cooperation networks – e.g. Nereus Network, The Four Motors for Europe, Knowledge Innovation Community of the European Institute of Technology)</p>	<p>Development of actions aimed at facilitating the gathering of Horizon project outcomes with Lombard participation or of interest to Lombard territory and consistent with the priorities defined in S3. The actions, subject to administrative constraints and timeframe alignment, will provide supporting proof of concept for validation actions to accompany marketing stage services during the phase (market scouting, financial measures, identification of potential users)</p>
	<p>Drafting of research project tenders for issues that are in line with the technical and scientific content of Horizon 2020 and with S3 objectives and aimed at promoting cooperation among the various actors along the value chain</p>	<p>Possible support for Lombard SMEs that have passed tender assessment for the new Horizon 2020 tool for SMEs that have not been funded due to budget constraints.</p>

²⁹ The SIMPLER consortium is Lombardy's point of access for the Enterprise Europe Network created by the European Commission to support enterprises. SIMPLER's Lombard partners are: Cestec (now Finlombarda SpA), as coordinator, Milan Chamber of Commerce, and FAST (Federation of Scientific and Technical associations). SIMPLER services are free since they are cofunded by the European Commission and Regione Lombardia.

IV.2. Lines of action

The following is intended to chart a path in which to place macro-interventions and the issues within which regional actions, contained and implemented in the operational programming, should be designed and implemented to achieve S3 goals.

The **roadmap** building process was realized in close collaboration with the territory. The **entrepreneurial discovery** course brings to light confirmations mainly of the strategy that Regione Lombardia intends to pursue in the coming years, intended above all to support an evolution towards emerging industries as golden opportunities for transformation.

Discussions with the community revealed in no small measure the specific needs Regione Lombardia has clearly understood, and new proposals that have been taken on board, outlining a more incisive plan of action. The ideas that came out can be summarized as follows:

- focusing resources on targeted projects of medium-large dimensions;
- fostering the birth and consolidation of new skills and new professional figures capable of enhancing the competitiveness of the innovation system (for instance enterprise network manager or cluster manager);
- creating and/or strengthening tools that bring together skill systems in traditional industries with new skills to develop new businesses;
- focusing the actions on reinforcing a manufacturing base that fosters the growth of new markets;
- concentrating on new tools, to facilitate the entry of new technologies to the market, that allows enterprises to experiment with technologies by testing prototype functions and efficient, sustainable production processes (for example pilot plants);
- facilitating the creation of "environments" driven by the most promising technologies where prototypes can be tested in a market perspective and developing new product concepts (for example living labs), in order to anticipate the needs of the market;
- creating enterprise networks to make SMEs more competitive and proficient in addressing the global market;
- supporting the creation of ecosystems driven by well-defined technological challenges that facilitate the organic and systemic search for regional skills (for example the clusters);
- enhancing the role of large industries as a driving force for small and medium-sized enterprises.

The lines of intervention will propose a number of actions successfully tested in the past and that will be redirected towards the achievement of the new S3 goals and others that are entirely new. The implementation of the specific actions, the time and methods of their realization will be studied in depth in subsequent documentation that makes up the actual operational programming.

The path is divided into two parts:

PART 1: Support and reinforce “enabling environments” for enterprises to strengthen the innovation governance	PART 2: interventions addressed directly to enterprises and research system to support the development and transformation of the value chain
<p>Support to the realization of “major projects” within the Specialisation Areas. Support and promotion will be provided for the realization of a limited number of large innovative projects, inspired by the model of Knowledge & Innovation Communities, aimed at connecting the three sides of the knowledge triangle (education, research and innovation) and at having an important impact on the territory and on its attractiveness.</p>	<p>Creation of “pilot plants” or “pilot projects” within the framework of projects identified by Regione Lombardia such as sustainability and social challenges. These pilot plants will act as a laboratory promoting know-how, development and application of new priority technologies, especially if enabling, the creation of new products and innovative processes by assessing production viability, and new business models capable of promoting the innovative potential of Lombard enterprise.</p>
<p>Reinforcement of the Open Innovation environment, started in 2013, as an instrument of regional governance for the systematic identification of innovative and technological challenges, which the industrial system can address by applying an ecosystem approach; convey cross-fertilisation actions between different technology and production areas, and foster an environment conducive to the development of emerging industries.</p>	<p>Support and promote innovation by applying the Pre-commercial Public Procurement (PPP) procedure, used to promote the presentation of innovative solutions (including green types) by enterprises. Particular attention will be paid on the projects that provide for development or use of enabling technologies with a high innovation potential.</p>
<p>Development and future reinforcement of Regional Technology Clusters both through internal support activities and support during the exploration of new business opportunities (e.g. analysis of emerging markets, activities aimed at increasing visibility of these clusters at national and international levels, also through the inclusion in extended knowledge networks).</p>	<p>Actions for the creation of enterprises, focused on social innovation and environmental sustainability, originating from spin-offs, existing businesses, self-entrepreneurship. Attention will also be paid to new companies (Newco) established through a corporate restructuring process.</p>
<p>Activities aimed at involving clusters in initiatives at European level such as the technological platforms and the Knowledge Innovation Communities (as “raw materials” and “healthy living and active ageing” and the future “Food4future” and “Added Value Manufacturing”) and the participation of the territory in projects within Horizon 2020.</p>	<p>Complementary actions related to the management aspects of organizational and planning “complexities”, to sustain enterprises in the acquisition of advanced services such as, for instance company check-ups, technology audits and strategies, business planning.</p>
	<p>Regione Lombardia has been supporting enterprise networks as an instrument since 2012 and it intends to focus its efforts on encouraging Lombard consortia that create value by exploiting synergies and complementarities among individual businesses that enter domestic and international markets.</p>
	<p>Actions to increase enterprise culture developing synergy also with ongoing training activities to support the growth of enterprises in markets that must satisfy new needs.</p>

IV.3. Financial instruments

With the new 2012 Financial Regulations, financial instruments are defined as EU measures of financial support to achieve one or more specific strategic objectives of the European Union. These tools may take the form of: equity or quasi-equity investments, loans or guarantees, or other forms of risk sharing, and may even be associated with grants if necessary.

This definition outlines the context within which Regione Lombardia is called to compete in order to exploit all the potentialities of the use of financial instruments.

Indeed, Regione Lombardia is aware that in addition to ensuring greater revolving and additionality of the resources available, effectively planned financial instruments underpin the most significant results pertinent to EC programming, such as achieving sustainability of actions, objectively verifiable in the medium to long term; leverage effect of competences deriving from the coming together of different public and private professional skills, required for operating under the same conditions of sub-optimal or “quasi-market” investment.

Over the years, Regione Lombardia has developed high levels of expertise in the preparation and implementation of use of financial instruments for research and innovation, as part of a clear process of integration and complementarity of regional and community planning, encouraging shared methodologies, content and strategy over time, nurturing and reinforcing a continuous path of “**capacity building**”.

In the light of the current economic situation and of the increasing contraction of public resources, the European Commission itself stresses the importance of extending and reinforcing the use of financial instruments as a more efficient and sustainable alternative to traditional funding based on subsidies, thanks to:

- **a greater flexibility** in responding to specific market needs effectively and efficiently, and in promoting a significant participation of financial institutions and private investors based on adequate risk-sharing;
- **a diversified structuring** to better approach the financing needs of the receivers (enterprises, individuals, local authorities, etc.) based on the identification of market failures and therefore supporting the most disadvantaged areas and sectors;
- **a greater simplification**;
- **a systematic transversality and complementarity** both within 2014-2020 European Structural and Investment Funds and at a general level in connection with all relevant public policies (policies acting in synergy with other financial instruments such as the EIB and/or that can be activated in the 2014-2020 cycle as part of Community programmes under direct EU management such as Horizon 2020, COSME, etc.

On the strength of the experience acquired, Regione Lombardia intends to continue along the path it has taken in recent years, also with reference to European Structural and Investment Funds 2014–2020 planning, so as to increase further financial resources in aid of the Region, involving on one hand a larger number of private co-financiers, and on the other those willing to make the most of the contributions received as loans or other forms of financial instruments.

Guidelines for proposal of new financial instruments

1. gradual replacement of of sunk fund logic and dissemination of **transversal board financial instruments**;
2. rationalisation of the instruments portfolio activated in the past by creating a **critical mass of resources**;
3. **innovative method for developing a course of planning** and implementation for financial instruments, through criteria for gradualness, simplification, standardisation and flexibility, that can also be extended at national and/or interregional level, able to change the financial market's mindset to the "quasi-market";
4. expansion of **additionality** through the activation of new funding resources and new channels;
5. **multiplier effect** given by joint leverage and revolving actions that financial instruments are able to bring about.

In the coming years, special attention will be paid to instruments in support of research and innovation policies, and in particular to:

- the support and promotion of the aggregation of enterprises and research centres in the context of Specialisation Areas identified through the involvement of Regional Technology Clusters;
- the enhancement of infrastructure assets and of the ability of developing excellence;
- the promotion of investments by enterprises (also in collaboration with large enterprises and research organizations);
- the support demand of innovation;
- the support for the creation of innovative enterprises, by exploring and strengthening risk capital markets through involvement of institutional investors such as venture capitalists and also by involving informal investors (for instance Business Angels and crowdfunding platforms).

The opportunity, given by Financial Regulation, to combine financial instruments with traditional grants, will allow for actions to accompany key players, first and foremost enterprises, providing support with vouchers for training and consulting services, patenting assistance, etc., allowing the creation of a subsidiary framework within which the effect and impact of the actions triggered by regional financial instruments may be maximised.

IV.4. Digital growth in Smart Specialisation

Digital growth represents economic and therefore employment development which originates from a greater and better diffusion of Internet and from an increasingly pervasive use of next-generation technologies, that play an increasingly important role in social and economic life, as well as being an integral part of the economy to the benefit of all sectors, both public and private.

The smart use of ICT technologies to stimulate demand and the consequent supply of private and public services, and innovative processes, is a prerequisite for achieving any

smart specialisation for Lombardy. It is therefore necessary to consider ICT technologies and their dissemination, as enabling conditions for the efficiency of public administrations, business innovation, and quality of life for the community, but also as key elements for the transformation of production processes.

The tools available for the enhancement of digital growth in Lombardy, starting from areas of intense specialisation, are the **Agenda Digitale Lombarda** and the regional strategy to **support smart communities**.

At the end of 2011, Regione Lombardia was the first Italian region to start a process for the simplification and modernisation of the Region's system, also based on an analysis of future developments in the field of new technologies, innovation and digitisation³⁰, which led to the new **Agenda Digitale Lombarda 2014-2018**³¹ that intends to contribute to restoring competitiveness of economic and social growth. Regione Lombardia will drive innovation for its production system, contributing to the **development of initiatives integrated in the context of smart communities**, recognised as a crucial strategic driver to stimulate the birth of **emerging industries**, and the use of **ICT technologies** in businesses related to previously identified specialisation areas.

Specific initiatives are envisaged for the **dissemination of ICT technologies** in different specialisation areas identified, for example, by creating synergies with the Specialisation Area for "**cultural and creative industries**" that may represent both a fruitful system of industrial and technological skills, and a strategic driver for steering the production system **towards emerging markets**.

In this context, there will also be support for schemes that aim to realize **digital ecosystems** in different theme areas, including info-mobility, food excellence, healthcare, attractiveness, culture and entertainment, and which may provide information, services and applications to the end user in an integrated way (open services), while setting the conditions for the creation and development of smart cities and communities.

For example, it is possible to envisage the realization of **online services to foster sponsoring** (for example with possible crowdfunding schemes) for the cultural and creative sector, of on-line services for the **promotion of product/service ideas** at international level, encouraging interaction with traditional sectors with a view to **open innovation**.

IV.5. Public procurement of innovation

Public procurement of innovation in Research and Development (R&D) services is a means by which public demand can become a stimulus for market innovation, thus contributing to the development of a strategy for enterprise growth and competitiveness.

Public procurement for innovative solutions

Regione Lombardia has started a policy of promoting public demand for innovation capable of optimizing public spending, with the aim of **raising the quality and sustainability of**

³⁰ Agenda Digitale - *Trend Analysis* ed. Regione Lombardia and Lombardia Informatica (http://www.agendadigitale.regione.lombardia.it/shared/ccurl/57/746/ADL_Trend%20Analysis.pdf)

³¹ Contemplated by regional law 7/2012 "Measures for development, growth and occupation"

public services, and at the same time of promoting additional private sector investments in innovation. First Region in Italy, Lombardy decided to forsake the role of mere “funder” of innovation to become the “smart customer” and “co-innovator”, able to impact R&D plans by enterprises and thereby guide them towards satisfying real public interest.

The public procurement for innovative solutions³² was recently applied to increase the circulation of the *Carta Regionale dei Servizi - CRS* (a smart card with multiple functions that can access both traditional and on-line public administration services, containing a private key that ensures recognition of identity while safeguarding privacy)³³.

Pre-commercial public procurement

The pre-commercial public procurement is considered by Regione Lombardia a tool to create the so-called “**market competition**” to foster the advance of enterprises or other innovative economic entities, placing them in a competitive situation before, during and after R&D activities, limiting cases of natural or legal monopoly.

With the pre-commercial public procurement, Regione Lombardia aims, in particular, to stimulate innovation by requesting a number of economic entities to develop innovative solutions, starting from the concept behind the original development of a limited volume of first products or services in the form of a test series. At the same time, the enterprises are allowed to develop better products by virtue of a better understanding of demand and, therefore, reducing time-to-market. The first **pilot project** was developed in the field of healthcare and it concerns automated devices for moving beds and stretchers.

Sectors in which the public procurement of innovation can be applied: **Health, Water, Sustainable Building, Energy and Environment, Transport, ICT and Culture.**

V. Evaluation and monitoring mechanisms

The importance of understanding the results and impacts of public investment in research and innovation is linked both to spreading a culture of the public entity’s public accountability towards the community and of value for money, namely the social and economic value of public investment.

As stressed by the OECD *Report Boosting Local Entrepreneurship and Enterprise Creation in Lombardy Region*, published in November 2012 as part of the Small Business Act (SBA), it is a matter of applying methods of systematic monitoring, avoiding the pitfalls of excessive bureaucracy.

Review of monitoring and evaluation of regional initiatives, even before defining performance indicators, shall start with **careful examination of project evaluation mechanisms**, at all stages in which this takes place: before, during and after.

³² See DGR n. IX/2379 del 20/10/2011, Activation of the procedural path for the awarding of pre-commercial procurement or procurement for innovation of research and development service by Regione Lombardia, on certain strategic themes, aimed at the development of innovative products for use in strategic and priority areas

³³ See www.crs.regione.lombardia.it

To detect the short-term **micro-impacts** and to “**observe**” quickly the response of the territory with respect to the regional initiatives, it is necessary to bind project evaluation criteria to new goals for smart specialisation strategy, so that it integrates with new indicators for the existing monitoring and evaluation system.

The monitoring and evaluating process will therefore be increasingly tied to the principle of **rewarding** excellence and the recognition and **verification of any critical points** in the implementation of one or more actions, and results achieved, compared to those expected. This allows the decision-maker to acquire objective data for assessing **quality, effectiveness and reliability of policies** and, consequently, the need, if any, for reorientation and change.

In this context, in compliance with the regulations provided for by the European Commission on the subject of “Monitoring and evaluation of the European cohesion policy” and in accordance with the Regional Development Plan (DGR 113 of the 14th May 2013 and DCR X/78 of the 9th July 2013), Regione Lombardia outlines four levels of indicators:

- **Context indicators:** realized in collaboration with Éupolis Lombardia³⁴, able to provide a dynamic snapshot of the Lombard context and measure the development of the regional system in its time;
- **Impact indicators:** percentage change of context indicators on which the regional policies intend to act;
- **Result indicators:** indicators selected for each action of the programming tree. They measure changes in connection with the regional interventions implemented;
- **Progress/achievement indicators:** measure percentage progress of a process linked to an action, financial progress and outputs construed as “physical” results obtained through the use of the resources used through regional interventions.

In this document, the result and realization indicators will be studied in depth.

In light of action plan goals relevant to the smart specialisation strategy, a set of result indicators are suggested.³⁵

Depending on variations or new requirements in the context arising during the implementation of subsequent programming, indicators may change or new ones may be added to a dynamic adjustment and realignment course.

³⁴ Regione Lombardia's advanced institute for research, statistics and training

³⁵ See DGR n. IX/4748, 23/01/2013, *Acknowledgment of the communication by President Formigoni on: “Progress in the implementation of regional policies at the close of the ninth legislature – Presentation of the “Strategic Document for Research and Innovation” – Regione Lombardia*

EXPECTED RESULTS	MAIN INDICATORS ASSUMED
Increase in the quality and spreading of industrial research and innovation enterprise activities.	1) Intensity of private spending in R&D: private R&D spending per employee 2) Patent applications filed with EPO per million inhabitants 3) GDP: brands ratio 4) GDP: industrial designs ratio
Increase in industrial focus of academic research on current production system needs	1) Ratio of no. of doctoral scholarships financed by businesses against no. of doctoral students
Development of tertiary sectors capable of act as innovation levers in other sectors	1) Ratio of employees in knowledge-intensive services (NAC E 64, 72, 73) against total no. of employees
Increase of employment in enterprises and in the research system for highly qualified scientific and technical profiles	1) Employees in enterprises (percentage on total number of employees)
Increase in the quality of demand for PA technological innovation	Number of pre-commercial public procurement projects activated by various players reporting to the Regione Lombardia PA Total budget for public expenditure in research and innovation realized through public procurement procedures
Strengthening of the regional innovation system.	Increase of turnover and aggregate exports of technological clusters identified by Regione Lombardia Total number of patents filed by public and private research institutions and by enterprises in Lombardy
Increase in the number of research spin-offs and of innovation start-ups.	1) Ratio of spin-offs to researchers/professors of the universities of origin 2) Birth rate of enterprises in knowledge-intensive sectors

The proposed result indicators listed above are useful for monitoring and evaluating the effectiveness of regional actions, noting the possible impacts of the instruments over an extended timeframe, but not in the short term.

To set up a review process in a timely manner, the system of indicators already selected should be integrated with a set of **“observation” indicators** that are easily measurable and can give quick feedback of useful information for the early evaluation of the initiatives activated.

Possible fields for the definition of “observation indicators”

- **use or development of enabling technologies** (KETs) supported by financial interventions, measuring the number and typology of enabling technologies in financed projects with particular attention to projects that have several enabling technologies;
- **use and development of ICT technologies** in processes and products;
- **hybridization of value chains** through, for example, evaluation of the combinations of enablers of industrial research and industrial development projects;
- presence of projects developing **innovation in new emerging market or in niche markets**;
- **enhancement of technologies and innovations** of the production system and in research oriented to new emerging markets or niche markets;
- **cross-fertilization actions**, for example, between subjects from different Specialisation Areas;
- **new business models** oriented towards “Open Innovation” and the penetration of emerging markets or in the development of niche markets;
- **capacity to attract private capital** also through new forms of financing;
- **enterprise culture** also by measuring the performance of relation environments such as clusters and “Open Innovation”.

To deal with the onset of new needs during implementation of the strategy, a review process will also be set up for “observation” indicators, to modify or integrate them.

At the same time, Regione Lombardia is developing **the system for collection, management and generation of knowledge** connected to both information on regional initiatives implemented and to information derived from measurement of the selected indicators. In particular, thanks to the strengthening of the **Finanziamenti On Line** (Loans On Line) **platform** (<http://gefo.servizirl.it/>), Regione Lombardia can dispose of all the information, in a structured manner and in a way that can be easily consulted, on submitted projects and their progress, and the application named **LAPIS** (*LABoratorio di Programmazione Integrata Strategica*), introduced in 2009, in which planned activities and their local impact are recorded, alongside names of reference stakeholders.

However, for the application of the indicators under consideration, it will be crucial to achieve a timely and **systematic monitoring** of the results produced by regional action, including through a more active involvement of beneficiaries of this action who may be required, for instance, to disclose on a regular basis (at least twice-yearly) data and information on the overall outcome of projects, involving them in a more critical analysis of the effectiveness of the schemes implemented by Regione Lombardia. The process will be supported by the skills contributed by Regione Lombardia enterprises.

Moreover, Regione Lombardia previously put in place **discussion and approval mechanisms** with the Region, with relevant ministerial bodies and the European Commission. In the smart specialisation strategy, the intention is to integrate the existing, reinforced system, with new instruments of dialogue and interaction, to enable Regione Lombardia to approach and “listen” more closely to the community.

The main goals are, on the one hand, to provide a larger number of subjects, in a clear and transparent manner, and in a “**quadruple helix**” perspective, with the results obtained by regional initiatives and exploiting the best; on the other, to gather from the community comments, observations, suggestions for improvement and modification, all to be considered in the review process.

The consulting and approval system can be formed, for instance, by the specific working groups of the **clusters** who have already contributed to the process of defining the smart specialisation strategy.

Another important tool for dialogue and governance of innovation will be represented by the **Open Innovation environment**³⁶, a wide and complex relational environment involving public and private economic actors operating in the innovation system in which ample space will be dedicated to the sharing of results, using suitable IT applications (forums, online questionnaires, communities, etc.) at the end of a systematic and ongoing public consultation of regional initiatives.

The **process of analysis and comprehensive review**, performed at least once a year, involving the various actions undertaken and a summary of the critical issues identified in a broad vision vis-à-vis the accomplishment of the goals of the specialisation strategy, will be governed by Regione Lombardia through the extended regional support system.

This process will become integrated with the process that Regione Lombardia already implements, in accordance with regulatory, monitoring and evaluation constraints of the operational programmes in the context of 2014-2020 cohesion policies.

The governance of the S3 monitoring, evaluation and review process will be aligned and will comply with that defined in 2014–2020 operational programmes.

³⁶ See DCR n. X/733 of 27/09/2013 *Amendments and additions to the guidelines implementing axis 1 of the ROP ERDF 2007-2013. Outline of the 1.2.1.1. line of action “Development of information networks and systems for the dissemination and sharing of information and services among SMEs, among SMEs and research system, and among SMEs and the PA.”*