European Union
European Regional
Development Fund

Smart Chemistry Specialisation Strategy

“Report on current status of implementation of Regional Innovation Strategies in Lombardy”

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1. Description of Partner Region

1.1 General Description

The Region of Lombardy is located in the heart of Europe, at the crossroads between the major East-West communications routes (linking the Iberian Peninsula and the Balkans) and the North-South routes (linking Continental Europe and the Mediterranean). The territory extends over a surface of 23.861 sq. km. It is the Italian region with the highest concentration of people, businesses and wealth: the region represents 16,5% of the overall national population with approximately 9,9 million inhabitants in 2014 (Istat, 2015), with 24% of the population under the age of 25 and 17,4% over 65. 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 about the 2% of all the population of the European Union of 27 countries (Eurostat 2013).

Macroeconomic framework

The growth of a regional economy is based on work, entrepreneurial freedom and cultural, scientific and technological innovation. In Lombardy this growth is fostered by the implementation of targeted and transversal actions, such as the support of globalization and technological upgrading, the innovation of financial management and access to credit. Cultural assets and landscape are also part of the region's economic resources.
The gross domestic product (GDP) of Lombardy, amounting to 331.405 million euro (Infocamere, 2015), is the fifth largest GDP among the European regions. Lombardy Region alone contributes 2,61% of the entire European Community GDP and 21% of the national one (Infocamere, 2015).

The added value of processing industry in Lombardy is EUR 91.433 million, 27% of the regional GDP; the value added of the service sector is EUR 206.309 million, 5,61% of GDP. In Lombardy, the labour market is characterized by a high employment rate (65,1% - Istat, 2015). 4 million of employed people live within the regional borders. They represent 18% of the total Italian workforce. In Lombardy, the agricultural sector accounts for 1,3% of the total labour force (compared to 3% at national level); the industrial sector represents 34% of the total labour force (compared to 28% at national level); the services sectors employees make up 64% of the total labour force, a percentage lower than the national rate of 67%.

Lombardy's production system is still one of the most developed in Italy and in Europe: at the end of 2014 more than 813.000 enterprises were active, employing 3.496.393 people (Istat, 2011), (approx. 8,1 enterprises every 100 inhabitants) of which more than 99% were small and medium-sized enterprises. In 2014 about 27,6% of the total of Lombard businesses is composed of corporations and about 18,8% of partnerships, while the remaining 51,2% are sole proprietorships (Infocamere, 2012).

The economy of Lombardy is characterised by a wide variety of industries ranging from traditional sectors, such as agriculture and livestock to heavy and light industries. Following a trend that is common to many other European regions, the service industry has also had a strong development in the last decades. Although 40,4% of the regional territory is represented by the Alpine mountain area, Lombardy concentrates a staggering figure of 37,2 businesses per

squared kilometre. Some 40% of the total number of firms is based in Milan and its province, and the main sectors are: mechanical, electronics, metallurgy, textiles, chemicals and petrochemicals, pharmaceuticals, food, publishing, footwear and furniture. The service sector is also very well developed and mostly related to international trade and financial services.

Lombardy's R&D expenditure has grown marginally since 2009. In 2013 Gross Expenditure for Research and Development (GERD) in Lombardy amounted to 1,3% of GDP, in line with the national value but below the European average (2,11%) and still far from the 3% established by the EU 2020 strategy.

According to the Regional Innovation Scoreboard 2014, Lombardy is a moderate innovator. Lombardy scores low in the following areas (ranked from lowest to highest): Innovative SMEs collaborating with others; R&D expenditure in the public sector; Population with tertiary education; Non-R&D innovation expenditures; EPO patent applications; R&D expenditure in the business sector. On the contrary, Lombardy performs well (but still below the EU average) in areas such as employment in knowledge intensive activities.
The regional Business Expenditure for R&D (BERD) is the highest in the Italian economy (over 75% against a national average of 50%), amounting to 0,9% of regional GDP vs. a National and EU average of 0,7% and 1,3% respectively. The private R&D expenditure was concentrated, over the years, in health, energy and environment, advanced manufacturing, agrifood and ICT. Lombardy is the first Italian region by number of patents registered at the European Patent Office (EPO). Regional patenting activity (1.193 EPO patents in 2013) amounts to approximately 31,8% of the total number of EPO patents granted in Italy but is relatively weak in comparison with other European advanced areas. Patents concentrate in the areas of manufacturing technologies (industrial technologies, metallurgy, mechanical engineering, chemicals, textiles). Lombardy concentrates more than 20% national human resources employed in R&D activity.
Despite the long-term effects that the financial crisis has had on the real economy, Lombardy's industrial sector remains stronger than in the rest of the Country. Its added value accounts for slightly more than 30% of the total regional value added vs. 21,5% at the national level (Istat, 2015). Industrial activities represent 11,2% of the total number of economic activities (10,2% in Italy).
Lombardy has a high level research infrastructure, it is characterized by the specialisation in various technical and scientific disciplines and includes skills and research groups of international ranking. Lombardy counts thirteen major academic institutions (six public universities, one polytechnic university, six private universities) and a university high school (IUSS - Istituto Universitario di Studi Superiori of Pavia). Their size is generally small or medium (less than 10.000 students), with the exception of the University of Milan (over 40.000 students) and Bicocca University of Milan, Polytechnic University of Milan, University of Pavia and Bocconi University (10.000-40.000 students). They 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).

1.2 Challenges for the region

The present legislature started in 2013 and the challenges for regional government till 2018 are elaborated in the programming document PRS (Regional Development Programme). Among the regional government goals, one is the increasing of the commitment to support research and innovation policies. Such investments are considered strategic for the economic development of the Region and will assure benefits for the social demand in fields such as healthcare, environmental quality and sustainable mobility. Lombardy Region is concentrating the efforts to provide answers to the needs of the enterprise and society.
Lombardy strategy encourages the creation of a context where people could be inspired and able to develop ideas, projects and innovative enterprises trying to enhance the match between innovation demand and offer, supporting with specific initiative strategic sectors and emerging technological environments.

2. Description of chemical / bioeconomy industry

2.1 General Description

Bioeconomy is a key sector for the sustainable recovery of Europe from an economic environmental and social point of view. Thanks to the availability of natural resources, the regional territorial dimension is crucial for the implementation of development bioeconomy models. Sustainability is the central issue since it embraces both the environmental and social dimension as well as the economic one: employment, territorial relations, value chain, reindustrialisation, industrial revamping, development of new products and processes for the market, international competitiveness.

Bioeconomy is part of all the social challenges of the present years: efficient use of resources, increasing the use of renewable raw materials, climate changes, development of a knowledge economy, reduction of the environmental impact of the productive activities, growth of the population, etc. More and more official strategic or policy documents use the bioeconomy taxonomy: eco-industries, green industries, green chemistry, circular economy, highlighting the importance of the topic. In particular, green chemistry represents two different concepts: “sustainable chemistry” meaning the reduction of the environmental impact of the traditional chemistry and “biomass chemistry”.

Lombardy region has a strong potential: it’s the most important agricultural region in Italy with a relevant forestry heritage, excellent research infrastructures and the first in the chemical and pharmaceutic industry; on the other hand it has a strong and articulated manufacturing sector representing a rich market of products coming from renewable raw materials in different fields such as: food, chemicals, pharmaceutic, cosmetic, textile and materials.

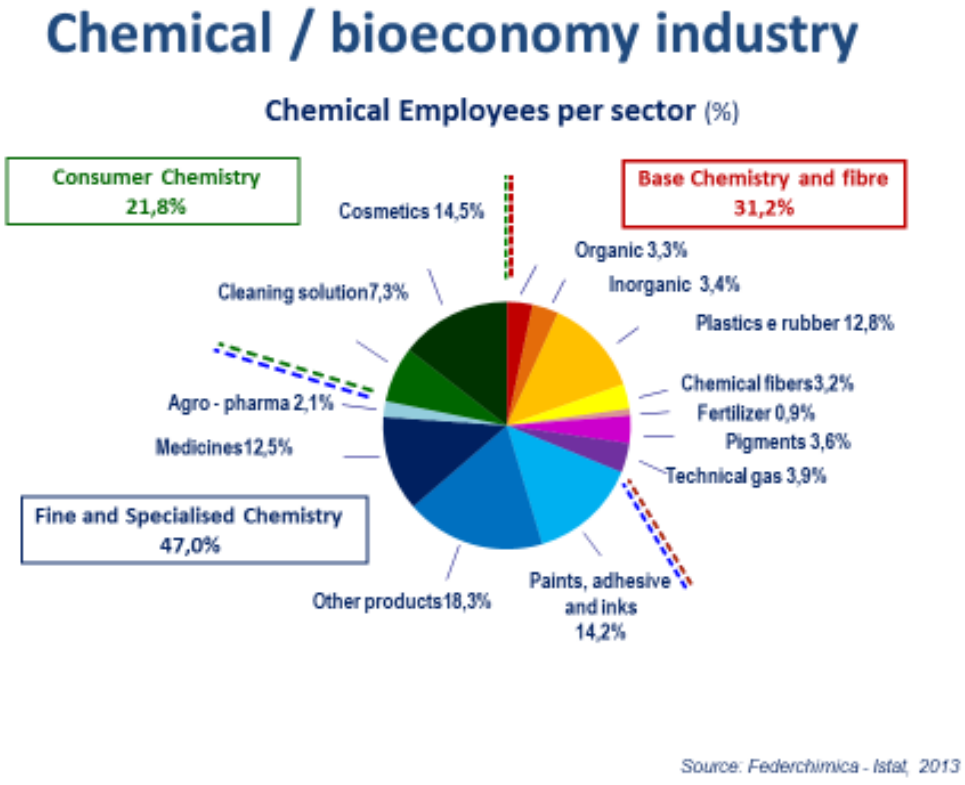

Figure 1: Chemical and bioeconomy industry
Source: Federchimica

Despite this favourable overview, Lombardy lacks of innovative bioeconomy firms and also traditional companies which, even if dealing with such topics, don’t identify themselves as bioeconomy industries.

The situation is different when talking about the research and university sector. At regional level 8 universities with 18 departments and 897 professors deal with green chemistry related topics.

University	Departments	N. Professors
Milano- Università degli studi	Dipartimento di Scienze agrarie e ambientali	33
	Dipartimento di Scienze per gli alimenti	45
	Biotecnologie	45
	Chimica	46
	Farmacia	62
Bicocca	Biotecnologie e Bioscienze	29
	Scienze dei Materiali	28
	Scienze ambientali e territoriali	30
Insubria	Biotecnologie e scienze della vita	27
	Scienze ed alta tecnologia	48
Pavia	Biologia e biotecnologie	59
	Chimica	31
Brescia	Ingegneria civile, architettura, territorio, ambiente e matematica	36
Bergamo	Ingegneria energetica e termofluidodinamica	45
Piacenza	Scienze economiche agro-alimentari	7
Politecnico di Milano	Chimica, Materiali, Ingegneria chimica	115
	Energia	109
	Civile ambientale	102
Totale	**18**	**897**

Table 1: Overview of green chemistry related research institutions
Source:LGCA

Moreover, the National Research Council (CNR) has on the Lombard territory 7 institutes specialised in topics such as biophysics, biotechnologies and molecular technologies.
Green chemistry and traditional chemistry are considered enabling industries, meaning as manufacturing sector with its ability to innovate products and processes, to support and promote innovation in all related fields.
This extended value chain involves not only university and research bodies but also public entities, because of the related legislation such as technical standards, waste regulation, subsidies in the energy sector, green public procurement, and the entire population who should be aware of the sustainability of the products.

2.2 Indicators (Focus on NACE Code 20 Chemical Industry and 22 Plastic Industry)

Local Units		N. Employees per Local Unit		Turnover	
N°	% on Italian basis	N°	% on Italian basis	Mld €	% on Italian basis
1.096	31%	46.016	42%	28,4	55%

Table 2: Indicators chemical industry
Source: elaboration and estimate on data Istat (year 2013)

2.3 Challenges for the industry

In order to identify the main challenges in bioeconomy domain (including green chemistry), Lombardy Region organized in-depth interviews with several stakeholders divided by competencies and sectors such as policy-makers and representatives from the research and productive system.
In conclusion, the key concept has become: to increase – an underrated issue by now - the connections and the proactivity so to promote cultural leap of the actors.
Even if in Lombardy the framework conditions are well-established and widespread, Large Companies are still partially active in bioeconomy field.
This state of art dictates some specific challenges addressed to Large Companies. The LCs should firstly set in changing the attitude towards bio-economy, regardless regulatory framework conditions. It is an ex-ante conditionality to be ready to catch up new market opportunities and/or to react promptly to the emerging environmental, energy and social challenges.
This process is closely knit to the challenge pointed out by the regional Smart Specialization Strategy which underpins the evolution of the traditional and/or mature industries in emerging industries.
The achievement of such challenge foresees also direct involvement of policy-makers and a direct dialogue between LCs and Public Administration becomes pivotal in order to:

- attract public incentivization (and funds) for the establishment of specific pilot plants, that will become – like in similar experiences all across Europe – attractiveness poles for research bodies and SMEs;
- support, for some industrial sectors, the definition of a strategy driven by new market opportunities overtakeable in short-medium horizon through currently available or well developed technologies.

Another premise in this context is to stimulate more investments on research and specific training courses, starting from universities. This will exponentially increase the dialogue and effective links between education, research and innovation.

In the context of difficulty of Large Companies to drive the changes, SMEs have - once again - the great opportunity to be pioneers and to become themselves leading innovation pillar; but, given the high fragmentation of Lombard SMEs productive system, they also have to face some challenges:

- wider open-mindedness to participate at regional/national/EU networks and initiatives, in order to join ideas, means and efforts and to take up the opportunity to explore in shorter terms the real potential of new processes and products;
- more active participation in public calls for proposal, mostly – for the reasons above - where cooperation with large enterprises and research bodies is required.

3. Description of Regional Innovation Strategy

3.1 General Description, Challenges and Objectives

The Smart Specialisation Strategy, or "Regional smart specialisation strategy for research and innovation"[1] (hereinafter, S3) is one of the tools of the Europe 2020 strategy and is the ex-ante conditionality to access the ERDF structural funds in the new 2014-2020 Community programmes. Lombardy Region, through its own S3 strategy, seeks to chart an "integrated path" of development of the Region, by identifying resources/competences and innovation potential, and setting priorities in terms of industries and technology areas to focus investments on.

Figure 2: Logo Smart Specialisation Strategy
Source: Lombardy Region

The S3 document is divided into 5 parts. Part One starts with a brief introduction of the regional context, highlighting the underpinnings of the Region's production system and of research and innovation. Part Two presents Lombardy Region's vision, with focus on research and innovation, and envisages the future drivers of growth by analysing the main strengths and weaknesses of the Lombard system. Part Three focuses on the priorities of action and the decisions on which Lombardy Region intends to devote resources. It explains how the specialization areas (fields where Lombardy Region intends to innovate) are chosen, and illustrates the characteristics of the various specialisation areas in terms of production and scientific system and their international positioning. Strategic goals are set for the growth of the Region's competitiveness, identifying the target to focus resources on, based on the strengths and weaknesses. Special attention is paid to the mechanisms of participation, dialogue and discussion within and outside Lombardy Region in setting priorities of action and identifying the specific measures to adopt. Part Four deals with the definition of smart specialisation strategy to reach the desired goals, with focus on the new mechanisms to steer the demand for innovation (such as pre-commercial procurement) and on financial instruments. Part Five covers the evaluation and monitoring mechanisms of the action plan, providing governance scheme and systems to review the chosen policy and implementation measures.

Lombardy Region, based on balanced top-down and bottom-up decisions, has identified, following a period of rationalization, **7 Specialisation Areas (SAs)**, and has changed to a

[1] DGR X 1051 of 05/dec/2013

radically new vision. Specialisation Areas include and well represent the majority of the economic and scientific bodies situated in the Region.

The specialisation areas identified so far are:

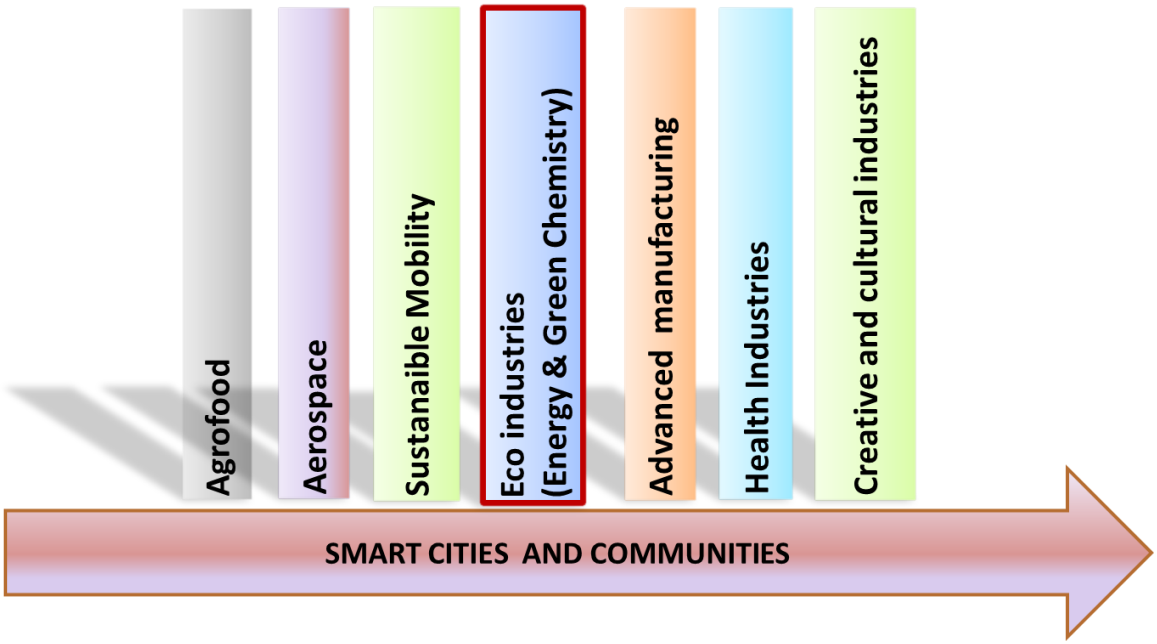

Figure 3: 7 Areas of Specialisation
Source: Finlombarda S.p.A.

The Specialisation Areas, therefore, constitute a new approach and mean for Lombardy Region to decode the peculiarities of the Region in a different way. The Region through SAs develops a new regional strategy, fine-tuning the priorities of action described below. The process of identifying the technological priorities within the SAs requires a continuous and inclusive mechanism to systematically capture and enhance new strategic competences.

3.2 Focus on chemistry / bioeconomy, etc. – highlight thematic priorities

The Eco-Industry Specialisation Area comprises more than **40.000 businesses** employing approximately **190.000 people**. The green industry is composed of a rich and varied system of skills, which includes:

- **Energy & Cleantech**, covering the scientific and industrial skills of power generation, renewable energy, and water management and purification;
- **Smart grids**, covering components transmission and smart energy distribution;
- **Energy efficiency & sustainable building**, covering efficiency skills in the civil, industrial and sustainable building fields;
- Part of the **Green Chemistry** skills.

Since Green Chemistry includes activities related to the production of the chemicals and energy from renewable sources (biomass and/or organic waste), it's actually positioned at the crossroads of almost every macro trend identified by the European Union: resources efficiency,

increased use of renewable raw materials, fight against climate change, development of a knowledge based economy, reduction of economy's fallouts on the environment.
The development of the Green Chemistry implies the development of a 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, covering final residues into energy.
The **key enabling technologies** in this specialization area are advanced materials, industrial biotechnology, photonics, micro and nano-electronics, and advanced manufacturing systems. This SA crosses other areas and is a valuable environment for cross-fertilization phenomes for new opportunities to identify of prospective emerging industries.

3.3 Further activities to specify innovation topics (e.g. roadmaps)

The challenge that Lombardy Region faces is therefore to help the production system seize and intercept new market opportunities within the SAs through the evolution of traditional industries into emerging industries, by addressing the needs of the new markets (strengthening the market-driven approach) and helping to improve the quality of life of the community (society-driven approach)**.**
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 industries[2].
To support and accelerate the process of establishment of emerging industries, a series of "tools" have been identified thanks to continuous dialogue with stakeholders that will be supported by specific initiatives:

- *Clusters, other enterprise aggregations and international network*: 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. Lombardy Region seeks also to turn clusters into effective tools of "soft" governance between the territory and the regional administration in order to have trustworthy interlocutors to involve systematically in the planning of regional strategies.
- *International networks:* internationalisation is one of the key factor supporting the birth and affirmation of the emerging industries through participation to thematic networks at European and international level such as NEREUS Network of European Regions Using Space Technologies and ECRN European Chemical Regions Network.
- *Open Innovation: (www.openinnovation.regione.lombardia.it*) – a collaborative platform supporting the creation of enabling environments for businesses' growth and evolution into emerging industries. It is addressed to those involved in innovation processes, businesses, research institutions, services of public interest and elsewhere. Bringing together a large representation of regional innovation stakeholders, the platform is an instrument for dialogue and governance, a large and complex environment of relationships between public and private economic players. Importantly, implementation of open innovation practices has

[2] 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

been proved efficient in all industrial sectors, particularly in the emerging industries, thus being in line with the goals of the regional government. The Platform contains a set of tools and methodologies to support the creation of innovation ecosystems around strategic topics, identified earlier in the RIS3. The Platform is "open" and inclusive, with very low entry barriers while ensuring a good quality of transactions through an "orchestration" methodology relying on "facilitators" and "community managers" supporting other participants when they become active, validating content and rules for routing. The Platform is structured around a hierarchical taxonomy of 8 strategic themes, which map the Specialization Areas (SAs) of the RIS3 and 48 specific topics, further detailing the SAs. Each of the qualified Platform users selects among those their competences and interests; those categories are further used to describe all the contents published on the Platform – starting from news and discussions up to project proposals and defined collaboration projects to finish with. This makes the Platform a powerful tool allowing to map the key competencies and, at the same time, identify the spheres of major interest, which is already bringing valuable feedback to the regional executives.

Open innovation achieves in July 2016 more than 3.600 users with 86 thematic communities discussing about the S3 Specialisation Areas, 5 of which on eco-industries; main purpose of the communities is to facilitate dialogue and to share project ideas: over 700 discussions have been initiated by the Platform users, more than 200 project proposals have been launched which have received over 430 expressions of interest.

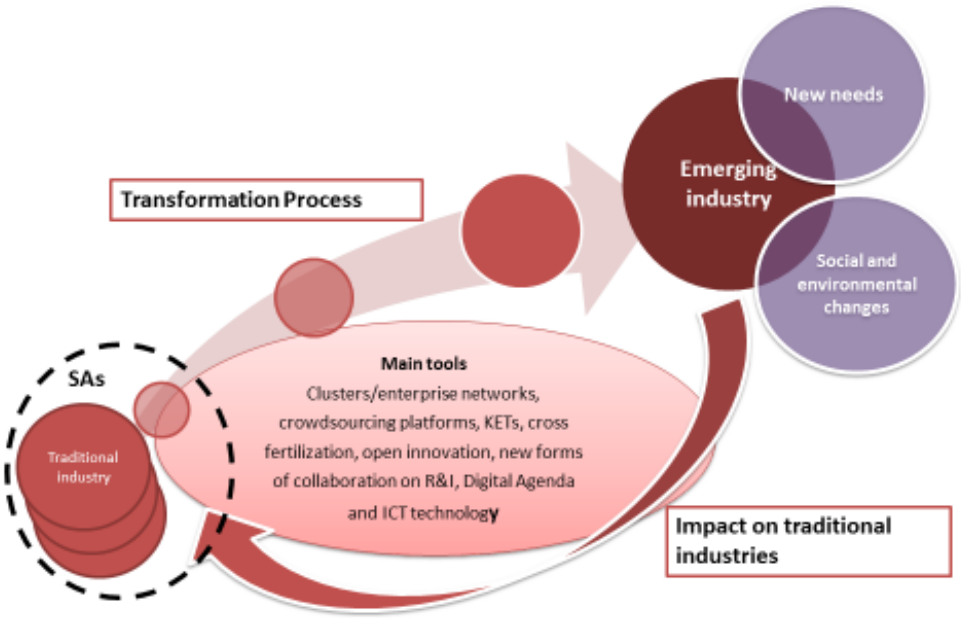

Figure 4: Evolutionary process into emerging industries
Source: Lombardy Region S3 - DGR X 1051 of 05/12/2013

4. Description of ERDF Operational

4.1 General Structure

Regional Operative Programme ERDF 2014-20 Lombardy

The Regional Operational Programme (ROP) Lombardy, funded by the European Regional Development Fund (ERDF) under the regional competitiveness and employment objective, is the main multi-annual programming document.
It is structured according to strategic priorities and objectives that the Region intends to pursue in the period 2014-2020.
Lombardy's ROP-ERDF 2014-2020 provides investment funds of nearly one billion euros (€ 970.474.516) with the priority objectives of the Region's economic growth and social development as well as the enhancement of its industrial system. The ROP promotes a smart, sustainable and inclusive growth model in line with the objectives identified in the "Europe 2020" strategy and with the regional government's development policies promoting productivity and competitiveness of the business sector. The ROP supports a model of growth, which emphasises research and innovation, focusing on the promotion of new technologies.
Through the Operational Programme Lombardy Region is able to give concrete answers to the citizens needs and to promote initiatives to increase the competitiveness of the whole Lombard territorial system. The programme is based on 6 priority axes, plus one dedicated to the technical assistance. The 7 priority axes are integrated and coherent and split into specific objectives and attended results to achieve through dedicated actions financed by the programme.

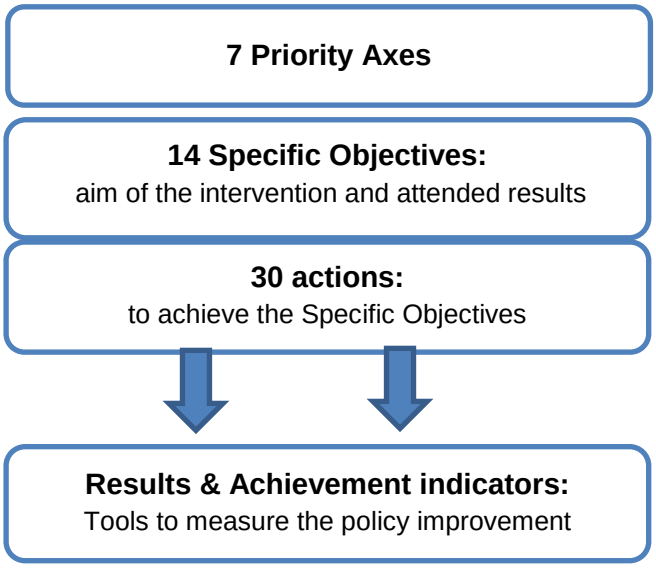

Figure 5: 7 Priority axes
Source: Finlombarda S.p.A

The implementation of the actions included in the ROP ERDF foresees synergies with the other European funds, in particular with the Regional Operational Programme European Social Fund: actions dedicated to the enhancement of the entrepreneurs and workers' competences and to the development of the employment.

4.2 Responsible Bodies

During the preparation phase and negotiation with the European Commission of the Regional Operative Programme, Lombardy Region appointed the GD Presidency the ROP ERDF 2014-2020 Managing Authority through an official act (DGR n X/87 on 29th April 2013) and the Director of the specialist function to the European Programming as person in charge.
Afterwards, in order to guarantee a more efficient management, a rationalisation process has been activated:
Starting from September 2015 the ROP ERDF 2014-2020 Managing Authority is the General Directorate University, Research and Open Innovation. Moreover, the specific General Directorates are responsible for the 7 axes:

- Axes I - Strengthen technological research, development and innovation
- Axes II - Improve access to information and communication technology (ICT), and the uptake and quality of local ICT
- Axes III - Promoting SMEs competitiveness
- Axes IV - Support the transition to a low-carbon economy in all sectors
- Axes V - Sustainable urban development
- Axes VI - Tourism strategy for internal areas
- Axes VII - Technical assistance

4.3 Priority Axes and Available Funding

Available funding per Priority Axes

Axes 1	349.355.000,00	36,00%
Axes 2	20.000.000,00	2,06%
Axes 3	294.645.000,00	30,36%
Axes 4	194.600.000,00	20,05%
Axes 5	60.000.000,00	6,18%
Axes 6	19.000.000,00	1,96%
Axes 7	32.874.516,00	3,39%
TOTAL	**970.474.516,00**	**100,00%**

Table 3: Funding per priority axes
*Source:*Finlombarda S.p.A

Specific targets of Priority axis I
Strengthen technological RD&I

- Increase businesses' innovative activity raising the proportion of firms which engage in R&D in collaboration with outside bodies
- Strengthen regional and national systems for innovation by raising the proportion of GDP spent on R&D overall.

Specific target Priority Axis 3
Promote SME competitiveness

- Start-up and consolidation of MSMEs raising the three-year and five-year survival rate

- Consolidate, modernize and diversify the Region's production resources and arrangements by making the most of a strategic repositioning of Lombardy on tourism, culture and general attractiveness so as to raise the number of customers/visitors
- Reawaken the propensity to invest within the regional economy increasing the economy's rate of innovation
- Improve access to credit, business funding and risk management in farming
- making them more readily available throughout the enterprise economy.

5. Description of Funding programmes

Lombardy Region didn't plan initiatives or funding programmes directly dedicated to chemical related topics. In the programming period 2014-2020 a certain number of actions are and will be implemented supporting innovation with focus on the 7 Specialisation Areas approved in the S3.

The implementation of the new ROP-ERDF has basically started only in 2015 and, among the initiatives launched so far, the "FRIM FESR 2020" and "R&D line for aggregations", developed in the frame of the strategy "INNOVALOMBARDIA for Research & Development", have the aim to enhance the Lombard innovation ecosystem.

FRIM FESR 2020:

Total Budget	€ 30 million
Project Budget	Minimum amount €100.000
Beneficiaries	Micro, Small & Medium enterprises active offices on the Lombard territory
Sectors	Manufacturing, building and service to enterprise
Main objective	Supporting innovation investments in Research & Development
Activities	Industrial research, experimental development, patenting, finalised to the introduction of product or process innovation.
Project Duration	18 months

Table 4: FRIM FESR 2020
Source: Finlombarda S.p.A

R&D LINE FOR AGGREGATIONS

Total Budget	€ 120 million
Project Budget	€ 1 or 2 million
Beneficiaries	SMEs, large companies with active offices on the Lombard territory and research institutions
Main objective	Supporting R&D programme achieved by enterprises in collaboration with research centres.

Activities	Industrial research, experimental development, patenting, finalised to the introduction of product, process or service innovation.
Project Duration	24/30 months

Table 5: R&D Line for Aggregation
Source: Finlombarda S.p.A

The above mentioned measure foresees the application of the art.70 of the structural funds financial regulation concerning the “Eligibility of operations depending on location”, allowing Lombard SMEs to include in their partnership research centres outside Lombardy.
As far as the green chemistry thematic area is concerned, 4 projects have been submitted and approved to take part in the second step (evaluation procedure will end in October 2016), with a total investment of about 7,9M€ (7% of the total 80 projects submitted) with a requested contribution of 5M€.
The 4 submitted projects have a focus on the following topics:

- biopetrol,
- biocatalytic process for production of antibiotics,
- bioplastic from urban waste,
- biochar.

6. Governance

6.1 Description of involvement of innovation stakeholders in development and implementation of RIS with focus on chemical related topics.

Smart Specialisation and its requirement to maximize the quality, quantity and impact of regional research and innovation investments, has been a trigger to review the policy for innovation with a clear, structured and integrated path in Lombardy Region.

S3 is considered as an opportunity to “explore” new territorial developments, to construct regional competitive advantages by implementing new “industrial policy approaches”. Starting from the strengths of the Lombard ecosystem (7 Specialisation Areas: Aerospace; Agri-food; Eco-industry; Creative and Cultural Industries; Health Industries; Advanced Manufacturing, Sustainable Manufacturing), Lombardy Region changes its mind-set with an integrated strategy with long term view and underpins the transformation of traditional and mature industries in emerging industries.

Lombardy has settled a "hybrid" model of innovation policy governance. This model combines a top-down approach in areas in which the region pays attention to some central themes or sectors with tangible efforts of foresight (e.g. SAs, Research Infrastructure, Emerging Industries, Supporting tools – financial and non-financial, etc.), and, at the same time, has pursued so far an effective bottom-up approach, encouraging local stakeholders to develop initiatives such as technology poles or service centres. The closely knit top-down and bottom-up approach helped to achieve consensus and identify concrete Working Programmes (WP), based on Horizon 2020 WP model, within each SA with the contribution of regional stakeholders and feedbacks from Lombardy Technological Clusters and from field experts.

With innovation actors becoming part of the governance, Lombardy Region reorganises its governance set up via the implementation of specific processes aimed at improving multi-level coordination, strategical and operational governance, strategy evaluation and monitoring, policy learning and continuous consultation and sharing process.

Focus of multi-level coordination is the systematic dialogue and the collaboration with the European Commission, with the national institutions such as Italian Conference of Regions and Autonomous Provinces, with other European Regions by one hand and with Lombardy Region Managing Authority, other Directorates General, etc., by another.

The core structure is located within strategical and operational governance and strategy evaluation and monitoring level. The governance manages different factors involved in the strategy life-cycle such as update of the policy process, inter-directorate collaboration, human capital and the policy learning process – contributes to create a closer alignment between R&I and Industrial Policies, in line with European and national tendencies too.

Private and public investors, innovative and high growth enterprises, academy and research bodies, representatives of civil society are involved in co-creation of policies.

The above mentioned SAs are for the regional innovation policy just a starting point for the identification of the investment areas. Further, the regional measures (i.e. Calls for proposal) are set-up on SAs with specific technological themes. These themes are tagged with the territorial stakeholders: their involvement was guaranteed through scientific and industrial representatives members of Lombardy Technological Clusters, through field experts and public consultation organized within the collaborative platform Open Innovation.

Moreover, Lombardy Region takes part to different thematic European networks such as NEREUS - Network of European Regions Using Space Technologies and ECRN European Chemical Regions Network. Such membership is crucial for the definition of the regional policies in line with the other participating regions' trends and helps forging the European policy in the concerned field.

Official partner of the S3Chem Project is the Directorate General Social Housing, Expo 2015, Business internationalization, whose Regional Minister is the President of the ECRN initiative starting from June 2016 and represents the region in the S3Chem Project.
Participation to the European Chemical Regions network is particularly relevant for the definition of a green chemistry regional strategy dealing with REACH regulation (registration, evaluation, authorization and restriction of chemicals), waste directive, circular economy and EU emissions trading system.

6.2 Description of established structures and stakeholders

The Lombardy regional administration plays a central role in designing/implementing RTDI policy. New mechanisms have been introduced with the Strategic Document for Research and Innovation (2003), updated in 2012, with the Smart Specialization Strategy and with Law n. 11 "Impresa Lombardia: per la libertà di impresa, il lavoro e la competitività". The Strategic Document for Industrial Policies provides action lines to support the competitiveness and the internationalisation of the productive system and research too.
In defining its strategies, Lombardy Region 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, Lombardy Region has implemented an integrated approach, 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 decision policy-making process of the regional Directorates-General with responsibilities and competencies also related to other issues.
In order to involve citizens and other subjects that could contribute to define policy path, Lombardy Region organized in 2013 an event dedicated to Research and Innovation, with the aim to launch a dialogue and a discussion with qualified and institutional actors at European, national and regional level within fields of interest for Lombardy Region related to research and innovation. The event marked the start of a public consultation process (through an online questionnaire) on themes related to the Smart Specialisation Strategy involving 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 strategy. It had a very successful feedback, with over 850 replies.
The main goals are, on the one hand, to inform a larger number of subjects, in a clear and transparent manner, with the results of the regional initiatives and exploiting the best; on the other, to gather from the community comments, observations, suggestions for improvement and

adjustment of the initiatives which are under designing phase. The above mentioned system of data collection is a relevant part of the regional 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.
The establishment of the Lombardy Technological Clusters was realized through a consultation process that involved approximately 3.300 stakeholders (out of which 2.000 companies and 600 research bodies) gathered in in 144 aggregations. This process allowed the selection of the Lombardy Technological Clusters that could apply to be recognized as a Lombardy Cluster and that can apply to regional grants dedicated to the Cluster organizations. The regional administration of Lombardy is channelling ROP-ERDF calls also via such innovation intermediaries and this is likely to increase their centrality in the regional system and their contribution to the definition of technological trajectories.

Lombardy Green Chemistry Association

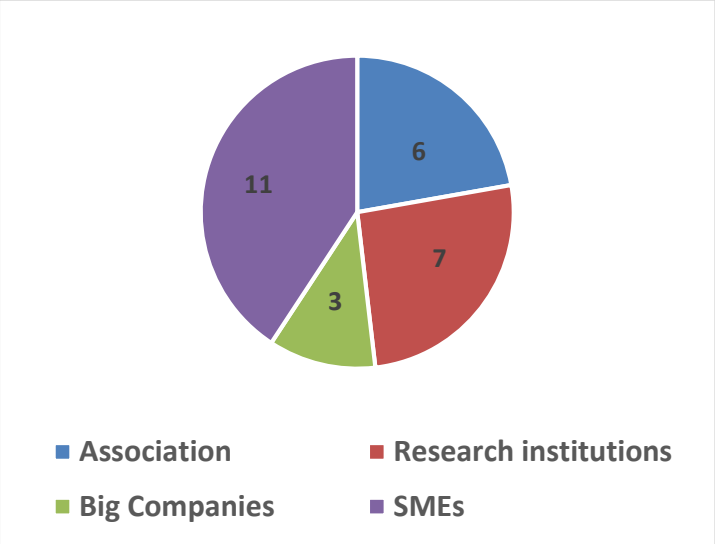

Figure 7: Structure of the LGCA
Source: Lombardy Green Chemistry Association

Figure 6: Logo of the LGCA Source: Lombardy Green Chemistry Association

The goal of the cluster is to create at regional level "the best framework conditions for the setting up of a bioeconomy based on:

1. use of biomass from agriculture, forest and waste, following the principles of sustainability
2. through the active involvement of the whole value chains".

Bioeconomy is considered for the Lombard Region a strategic topic starting from the S3 and able to support the envisaged harmonisation of the instruments supporting investments and initiatives in the frame of the structural funds: ERDF, ESF and EAFRD.
Thanks to its transversal dimension, bioeconomy could be a relevant opportunity of growth for the Lombard territory and means to start an open discussion among the different Directorates General with the aim to agree on a common regional strategy putting together all needs and potential of the regional system.

In May 2015 an expert group jointly with representative of region DGs dealing with green chemistry, bioeconomy and circular economy started the discussion about a common definition for bioeconomy.
A Working Group on bioeconomy topic was then formally created, in order to encourage the sharing of initiatives implemented on the territory aiming at improving bioeconomy perception and start joint actions to achieve a shared vision and strategy able to support the Lombard territory growth through an integrated and global value chain.

7. Current Challenges for implementation of RIS and expectations to interregional learning

The "Smart Specialisation" is a major innovation in the way of the regional industrial policy, through which it emphasizes and affirms the principle of priority no longer tied to a traditional vision for industrial sectors but based on a logic of selectivity and concentration of interventions on specific technologies to support specific sectoral areas or new higher value-added markets.
The “ex-ante conditionality” for ERDF becomes an opportunity for Lombardy to “test” concretely new paths of development of the territory has the involvement of citizens in decision-making process regarding the innovation and competitiveness is viewed as a considerable improvement:

- exploring new knowledge limits;
- thinking beyond schemes;
- Improving what is already existing or creating what is not;
- are some of the citizens’ inputs during the raise awareness process about innovation.

“A goal without a plan is just a wish” (A. de Saint-Exupery), is the sentence that is marking the regional actions to give shape to strategy. Lombardy Region, in order to increase the competitiveness of its territory begins to rationalize it as a company that primarily focuses its attention towards the market, towards the most profitable sectors in terms of social impact, with strong technological and innovative potential, the so called “emerging industries”. This vision becomes a spearhead of new political choices in order to anticipate the structural evolution of the regional economy.
To accelerate the transformation from traditional and mature industries in emerging industries, Lombardy Region sets two types of intervention: direct support to the Lombard stakeholders (companies and research bodies) through specific calls for proposals in order to facilitate the evolution of the value chain and develop technologies; regional initiatives that consist in building up “environments” in which businesses can thrive and evolve into emerging industries.
The creation of enabling environments for enterprises so that they can grow and evolve from traditional industries into emerging ones dictates open innovation spaces approach as a model of knowledge management. A regional “Open Innovation Platform”, digital space and a physical space of “Lombard Technology Cluster Stateroom” as well as the participation to international networks have been carried out in order to give a prompt response to strategic challenges: the growth and competitiveness of the Region.
The confirmation of the vision starts with cultural leap: the model of the Region as a company in terms of revenue, human capital and social return on investments. “Phase 0” was to review the governance system, “phase 1 and 2” were the set upping of an Entrepreneurial Discovery Process adopting a top-down (sectoral data analysis and recognition of the Emerging Industries on Lombard territory) and bottom-up approach (public consultation and sharing on strategic

fields and technological themes) and final phase of innovative policy mix set-up on thematic priorities and fields.
Interregional collaboration on Emerging Industries could be a proper way to implement the S3 in terms of Global Value Chain.
Some example of the topics that could be discussed at interregional level in order to proceed with the identification of specific market niches with high economic and technological growth level:

- verifying if Emerging Industries are envisaged as transversal topic of the S3 of involved regions;
- defining the terminology used for Emerging Industries and Emerging Technologies;
- identifying an Entrepreneurial Discovery Process dedicated for Emerging Industries (EDP);
- identifying proper tools
- setting-up and implementation of a specific EDP
- supporting the internationalisation of the Emerging Industries

Moreover, in order to facilitate the interregional dialogue, the above mentioned tool “Open Innovation Platform” can be used since multilingual interface (an open licensing of the code is foreseen in 2017).