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BASELINE STUDY : Piemonte

Innovation Policy Mix for advanced manufacturing

ORKESTRA, Basque Institute of Competitiveness

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Innovation policy mix for Advanced Manufacturing

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1. Introduction

This report has been elaborated as part of Manumix Interreg, a project that aims at strengthening and improving the effectiveness and efficiency of innovation policy-mixes for Advance Manufacturing (AM) at regional level through evaluation. The project is developed in partnership by governments and institutions in the Basque Country, Lithuania, Piedmont and Wales. Specifically, the consortium of the project is composed by the Basque Government, MOSTA – Lithuanian Higher Education Monitoring and Analysis Centre, FinPiemonte and Welsh Government.

The first phase of the project includes the development of a baseline study to analyse the innovation policy mix of partner regions, its governance and evaluation practices. One report has been developed for each region, as well a general comparative study. These documents have been elaborated by Orkestra with active collaboration and involvement of partner regions, by providing the core information that is summarized in the baselines studies. The studies have been elaborated based on secondary sources, interviews with partner regions representatives and/or other stakeholders, a survey filled by policymakers and a survey filled by beneficiaries of programs (in Piemonte and Basque Country). In the case of Basque Country, an additional workshop with beneficiaries has been carried out.

This report presents the main features of the innovation policy mix for AM in Piemonte. The report is structured as follows. Section 2 presents a general overview of the regional innovation and institutional context. Section 3 defines the scope and challenges of Piemonte's AM strategy. Section 4 delves into the innovation policy mix for AM and the selected policy-mix for Manumix. Section 6 withdraws evaluation practices for AM strategy and the policy-mix. Finally, Section 7 concludes with a summary.

2. Regional Context

Piemonte and its capital Turin are home to 4.4 million people in the north-western part of Italy, with its eight provinces and 1,207 municipalities. Piemonte is one of the 20 Regions of Italy; located in the North West part of the country, close to the French and Swiss border, it has an area of 25,399 km^2 and a density of 173 inhabitants/km^2. The region has more than 440,000 enterprises, over 200 private R&D centres, 380 laboratories, 4 universities and 7 innovation clusters. That represents more than 26,000 R&D employees.

Table 1. Piemonte main indicators

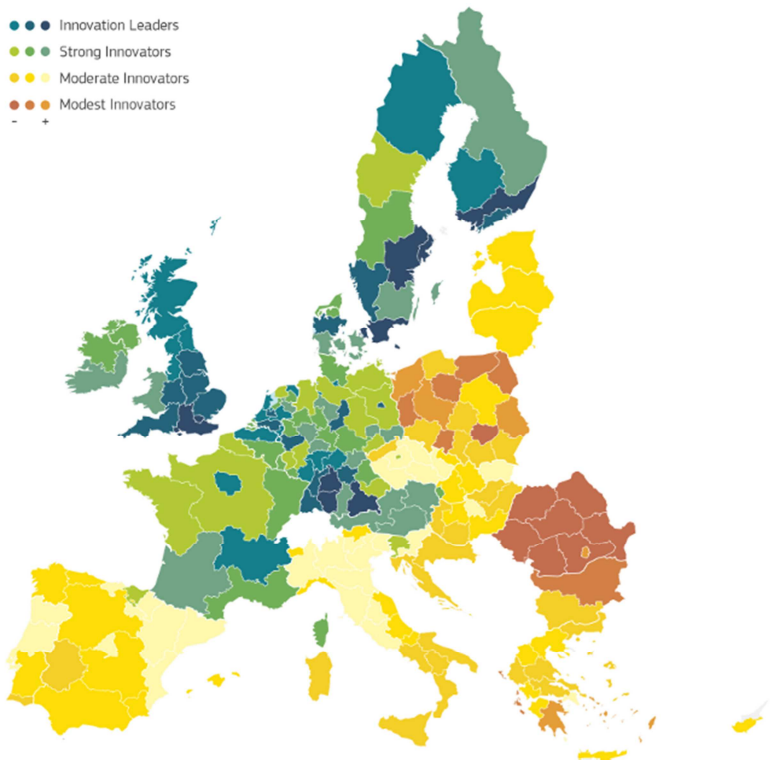
	Piemonte	Italy	EU 28
GDP per capita PPS	29 600 (2015)	27 800 (2015)	28 900 (2015)

R & D intensity — gross domestic expenditure on R & D (GERD)	2.27 (2014)	1.38 (2014)	2.04 (2014)
Share of human resources in science and technology (HRST) within the total population, by NUTS 2 regions	23.8% (2016)	22.7% (2016)	33.2% (2016)
Share within total employment of employment in high-tech sectors, by NUTS 2 regions	3.7 % (2016)	3,4% (2016)	4% (2016)

Source: Eurostat

The Regional Innovation Scoreboard assesses the innovation performance of European regions on a limited number of indicators. Piemonte is a Moderate + Innovator, and innovation performance has increased slightly over time. Most of the regions in Southern European countries perform relatively weak on Business R&D expenditures, except for some regions in the North of Spain, País Vasco (ES21) and Comunidad Foral de Navarra (ES22), and in the North of Italy, Emilia-Romagna (ITH5) and Piemonte (ITC1), which belong to the strong performing group.

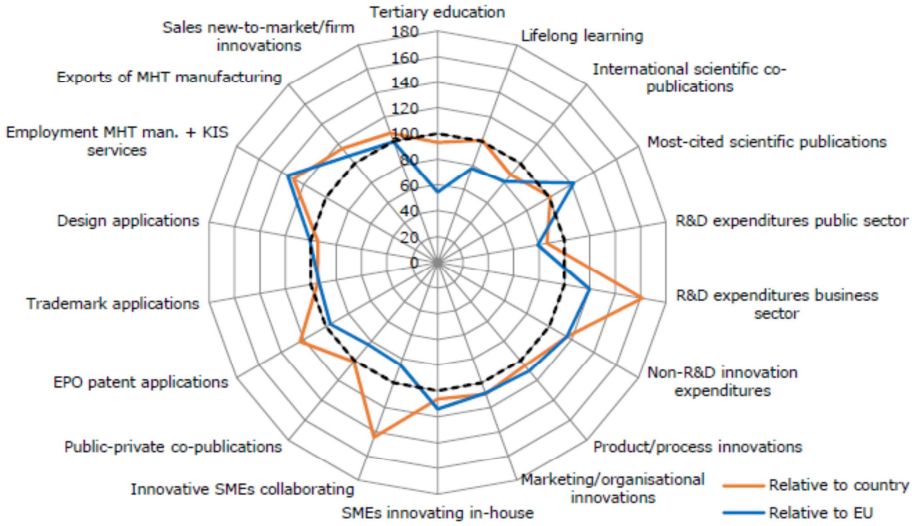
Figure 1. Regional Innovation Scoreboard



Source: Regional Innovation Scoreboard 2017

The radar graph shows relative strengths compared to Italy (red line) and the EU (blue line), highlighting relative strengths (e.g. Business R&D expenditures) and weaknesses (e.g. Public sector R&D expenditures).

Figure 2. Piemonte RIS Indicators.



Source: Regional Innovation Scoreboard 2016

2.1 Innovation Policy context

Piemonte Degree of autonomy

In accordance with the 1947 Constitution, the Italian Republic is 'unitary', while recognising the principles of local autonomy and decentralization. Nevertheless, today, Italy is considered as a 'regionalised' country. The original Constitution granted a special status to five Regions; the remainder of the fifteen Regions, recognised by the Constitution as having an ordinary status, were established at a later stage, in 1970. Administrative functions were transferred to them between 1972 and 1977.

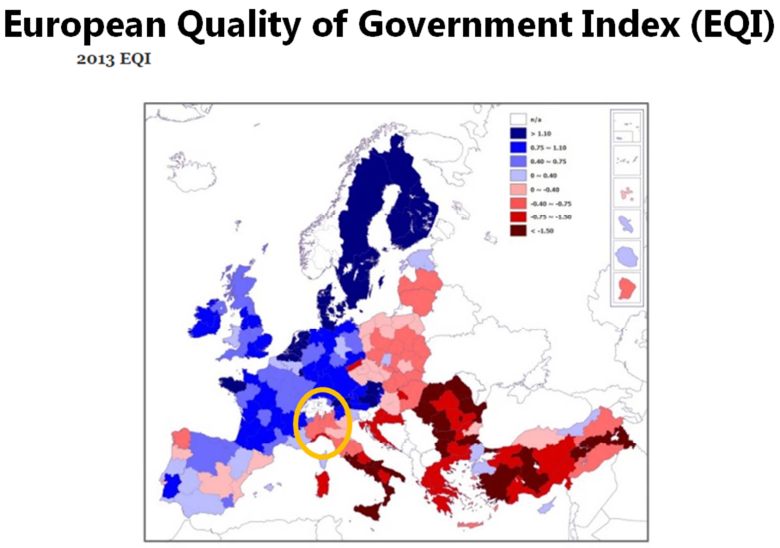
Regionalisation was strengthened in the 1990s; the so-called 'Bassanini' laws of 1997 (in particular, Law 59/1997) gave Regions residual administrative powers. A constitutional reform intervened in 2001 to modify the division of legislative competences between the State and the Regions, by distinguishing between exclusive competencies of the State, concurrent competencies, and exclusive competencies of the Regions. The regional statutory autonomy was also enlarged by a constitutional reform that intervened in 1999. In 2005, a major constitutional reform broadening the powers of the Regions was rejected by referendum. As regards Provinces and Municipalities, their statutory autonomy was recognised in 1990 and enshrined in the Constitution in 2001.

Piemonte has an ordinary status; every region has a statute that serves as a regional constitution, determining the form of government and the fundamental principles of the organisation and the functioning of the region, as prescribed by the Constitution of Italy. The ordinary statute is adopted and modified by regional law. The reform of Title V of the National Constitution of 2001 has increased the powers of ordinary statute regions, especially in subjects with concurrent jurisdiction between state and region. Since the 2001 constitutional reform, the central Government is no longer able to suspend regional legislation.

Institutional Quality Index

The European Quality of Government Index (EQI) is the result of a novel survey data on corruption and governance at the regional level within the EU, conducted first in 2010 and then again in 2013. The data focus on both perceptions and experiences with public sector corruption, along with the extent to which citizens believe various public sector services are impartially allocated and of good quality.

Figure 3. European Quality Government Index



Source: European Quality of Government Index[1]

The EQI 2013 contains 206 regions based on a survey that was answered by 85,000 citizen respondents. The data is standardized with a mean of zero, and higher scores implying higher quality of government; Piemonte has a score of –0,652 and is ranked as the 182 region (Italy is ranked 193).

Competences with regards to innovation

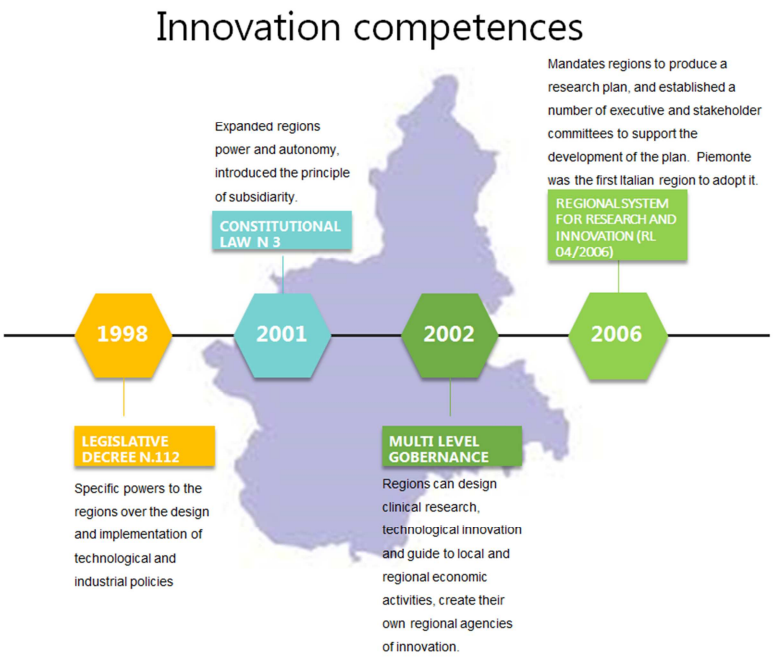
Since the 1990s, there has been greater power devolution in Italy. Legislative Decree No. 112 of 31 March 1998 gave specific powers to the regions over the design and implementation of technological and industrial policies. National government reserved a number of powers, including the right to define strategies and implementation guidelines nationally and retaining the exclusive competence for research support.

The Constitutional Law No. 3 of 2001 expanded the regions powers and autonomy, by defining all competences to either the state or regional level, or as- competences with a presumption that all non- reserved powers belong to the regions and introduced the principle of subsidiarity, established in EU law by the 1992 Treaty of Maastricht, limiting the exclusive legislative power of the national government to those areas of national interest (foreign policy, immigration, defence, monetary policy, customs, citizenship, etc.).

This reform extended multi-level governance, granting to regional councils, all of the administrative features that aren't in any other case reserved to better tiers of governance. Since 2002, Italian, local governments have one-of-a-kind legislative power in lots of regions, along with clinical research, technological innovation and guide to local and local economic activities. It follows that regional administrations are now responsible for policy making in the area of scientific and technological research and support for innovation for industrial sectors but have to observe some fundamental principles set by national law.

[1] Charron, Nicholas, Lewis Dijkstra and Victor Lapuente. 2015. 'Mapping the Regional Divide in Europe: A Measure for Assessing Quality of Government in 206 European Regions'. Social Indicators Research. vol 122 (2): 315-346.

Figure 4. Piemonte innovation competences evolution



A new specific regional framework law adopted in 2006 "*A regional System For Research and innovation (R.L. 04/2006)"* mandates the region to produce a Research Plan, and establishes a number of executive, oversight and stakeholder committees to support the development of that plan. The law's objectives, set out in article 2, including promoting research and innovation, consolidating the research system, and creating a culture of systematic evaluation and performance improvement within the field of innovation policy.

Piemonte had been the first Italian Region to adopt it. After the crisis of some large and important companies in Italy and in Piemonte, it was clear to policy makers that in a more complex and international environment the traditional R&D and Innovation model were no longer able to guarantee the competitiveness of an area.

The law, apart from promoting research and innovation also creates a culture of systemic evaluation and performance improvement within the field of innovation policy. This principle of evaluation is highly important in ensuring that the institutional reforms to the innovation system are paralleled by a wider learning region process creating knowledge about how the regional innovation system functions.

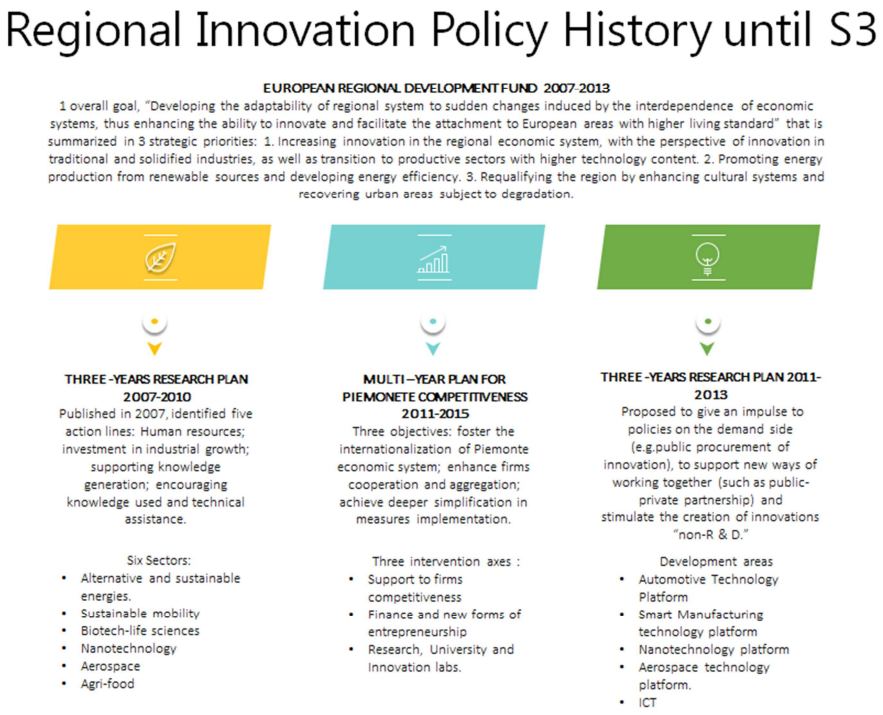
Regional innovation policy history

In Piemonte the regional development policy is mainly implemented via Structural Funds. The ERDF Regional Operational Programme is the main implementing program of the policy. The region itself is the main institution involved as Managing Authority in the Regional Operational Programme. The region involves in the design of the plan all the Regional public authorities, economic, social and institutional actors relevant for the implementation such as provinces, municipalities, chambers of commerce, trade unions, organisations of undertakings, universities, bank foundations.

In this strategic context, Piemonte has engaged a programming vision, defining and approving a long-term "field" strategic plans interrelated with the Regional Operational Programmes of EU funds with a structural

value, such as the Three-year Research Plan and the multi-year 2011-2015 Plan related to productive activities.

Figure 5. Piemonte innovation policy



Concerning the impact assessment of research and innovation policy the Regional Plan for Research and Innovation for the period 2007-2009 showed its main successes in three areas:

1. enhancement of the collaboration among SMEs and between SMEs and universities, research centres and the financial system
2. strengthening of the partnerships between regional beneficiaries of funded projects (knowledge generators and knowledge users)
3. fostering of knowledge transfer and strategic co-ordination among different R&D actors and sectors, and set up the frame for the ROP ERDF 2014-2020.

3. Piemonte Smart Specialisation Strategy

The elaboration of Piemonte RIS3 started in 2012-2013 with an analysis of the regional assets, carried out at national level by Invitalia, and a regional socio-economic context analysis carried out by the Regional Institute of Economic and Social Researches (IRES Piemonte).

Those first steps aimed at understanding what are the characteristics of the region that underpin the RIS3 specialisation. Then a round of consultations with the main regional stakeholders, representing the economic dynamics and concentrations of economic activity and knowledge that are the motors of innovation, supported the elaboration phase.

The elaboration process of Piemonte Smart Specialisation Strategy was based on a new vision for the future, focused on: Support and accelerate a process of transforming industry through research and innovation

policies into selected areas of innovation and addressing new challenges and new needs by investing and consolidating the skills in the health and well-being of citizens

The objectives of Piemonte S3 are: (1) valorising the work done by innovation centres and technological platforms so far; (2) concentrate investments in excellence fields; (3) adopting a real NETWORK approach and; (4) promoting SMART, SUSTAINABLE and INCLUSIVE growth.

Relationship with the ROP ERDF 2014-2020

The definition of the ROP ERDF 2014-2020 strategy led to the identification of regional challenges to be pursued and to priority areas of assistance to be provided.

Crisis factors, ongoing readjustment processes and existing potential, have oriented the construction of the POR architecture, through the declination in Thematic Objectives, Investment Priorities, Expected Results and Actions to be implemented, in order to achieve the expected changes.

In the formulation of the proposed operational plan to the European Commission it was attempted to explain the strategy adopted in a limited number of actions in order to create an appropriate “critical mass” (thematic and financial) capable of ensuring the effectiveness of the programmed action.

Based on the territorial reconnaissance, as well as on Community and national indications, the ROP ERDF 2014-2020 structure is centred on 6 “Themed Objectives“ (provided in article 9 of the 11 EU Reg. 1303/2013). In this context, the Region intends to give particular attention to the following issues: Research and Innovation (1 OT); Digital Agenda (2 OT); Competitiveness of productive systems (3 OT); Energy (4 OT); Environment and Culture (6 OT); Administrative Strengthening (OT 11).

It was approved by the EU at the beginning of 2015 and, in relation to research and innovation, will provide operational details on how the priorities envisaged in the S3 strategy will be pursued. It includes an intervention strategy, a description of planned measures, budgets, as well as a description of the monitoring and evaluation system.

Piemonte S3 main priority areas

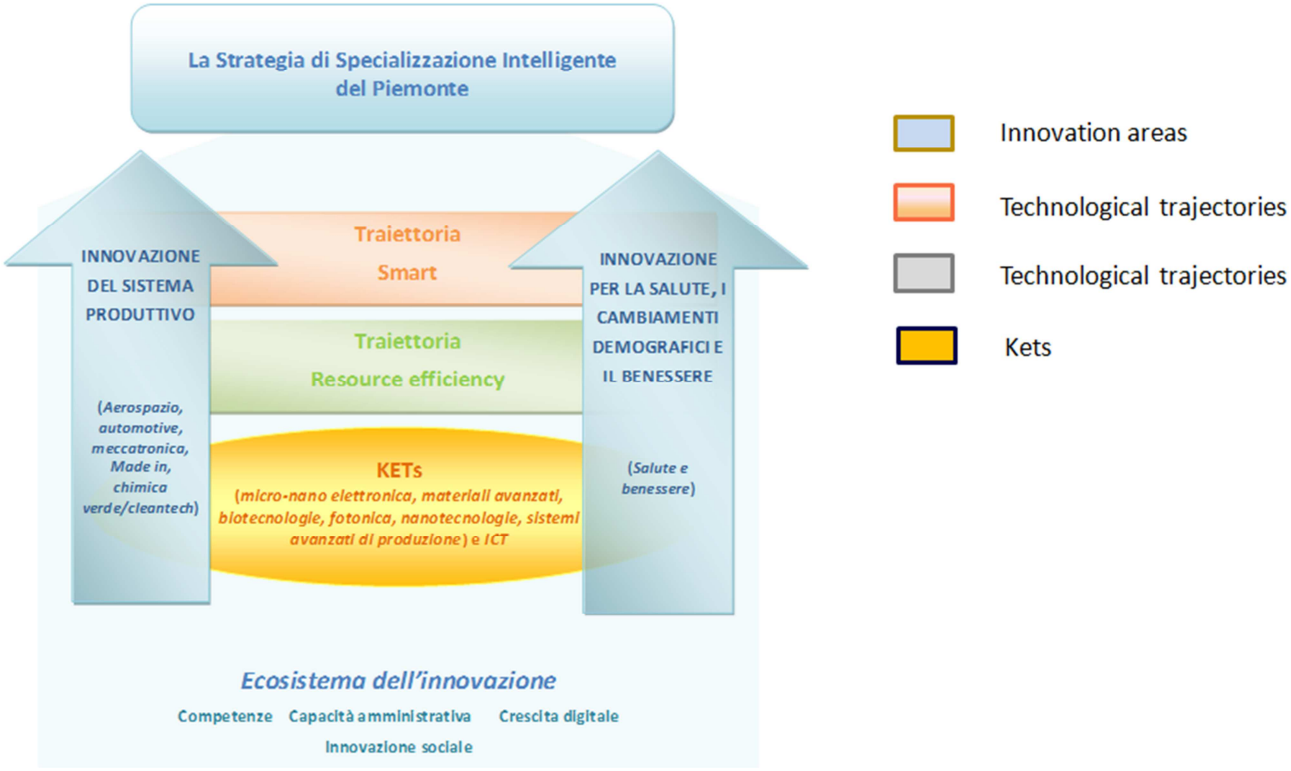
The innovation areas identified in the Smart Specialisation Strategy are the result of a selection that considers:

- Industrial sectors where a policy of clustering has been adopted (Innovation Clusters and Technological Platforms).
- The skills and competences expressed by companies and research bodies in response to regional calls and innovation policy evaluations.
- Piedmont's participation in national technology clusters policy.
- Focus group outcomes with key players in the Piedmont research system.

Piemonte S3 covers six innovation areas, related to:

1. **Industrial Innovation** in 5 excellence areas: automotive, aerospace, mechatronic, chemistry, “made in” (agrofood and textile).
2. **Health Innovation**: how to cope with demographic change and new health-care assistance services demand (, Health and wellbeing).

Figure 6. Piemonte S3



Source: Piemonte S3

Piemonte socio-economic relaunch is expected to be reached through two technological trajectories: Smart & Resource Efficiency. The combination of the factors will award those sectors who use all of them to reach the market becoming competitive.

- Smart: Enabling technologies for the production sectors, using recognized international expertise in ICT, but also in mechatronics, micro nanotechnologies, new materials, additive technologies, sensors, embedded electronic systems, advanced logistics in areas of priority innovation.
- Resource efficiency: The use of expertise and efficiency improvement processes in the innovation areas to support a more sustainable regional economy, contributing to the achievement of the objectives of the European Environmental and Energy Policies.

The main features associated to Piemonte STI are summarised in the following table:

Table 2. Piemonte main features

	Description	Comment
Degree of general regional autonomy	Ordinary status	Every Italian region has a statute that serves as a regional constitution, determining the form of government and the fundamental principles of the organisation and the functioning of the region, as

		prescribed by the Constitution of Italy (Article 123). The ordinary statute is adopted and modified by regional law
Degree of autonomy with regard to innovation policy	2006: Obligation to produce a research plan Regional authorities play a major role in designing and implementing innovation policy in Italy	Responsible for policy making in the area of scientific and technological research and support for innovation for industrial sectors but have to observe some fundamental principles set by national law
Set-up of regional governance system	Centralised	Regio Piemonte with public institutions as Finpiemonte SpA.
Nature of the process of RIS3 development	Participatory	S3 and ROP ERDF strategic design and rationales was discussed with regional stakeholders. S3 set up working groups focused on the specialisation domains and instruments.

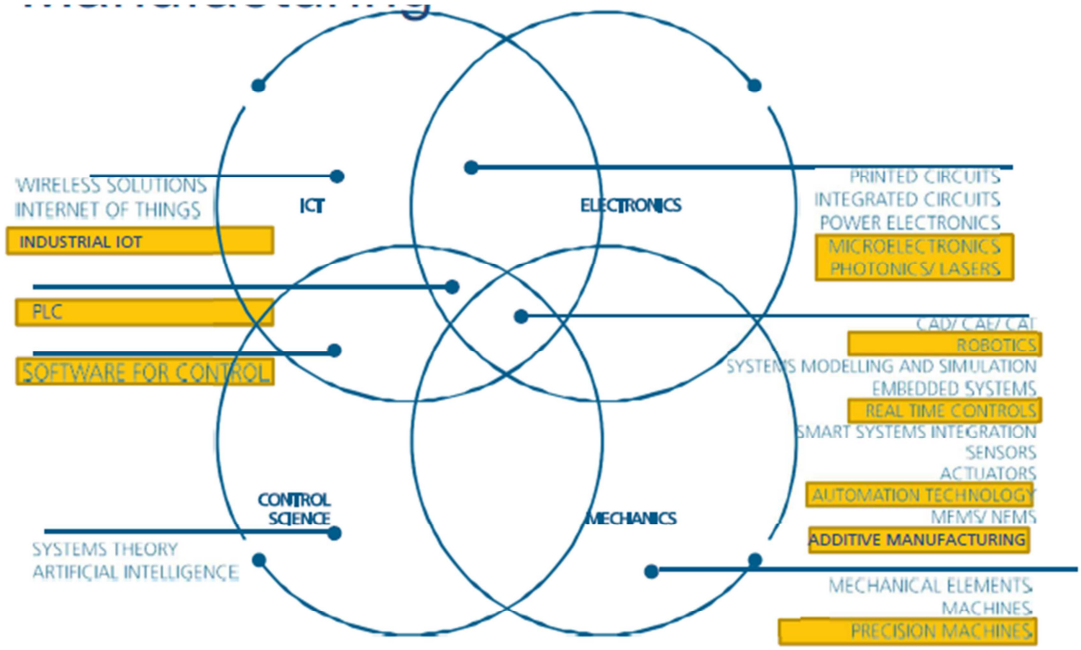
4. What is advanced manufacturing in the regional context?

Advanced manufacturing plays a key role in the new innovation strategy. Most of the strategic areas identified by the Smart Specialisation Strategy are priorities for advanced manufacturing. Piemonte Smart Strategy is systematized in six innovation areas: aerospace, automotive, mechatronics, "Made in" (agrofood + textile), green chemistry and cleantech, health and wellbeing, together with the following Key Enabling Technologies (KETs): micro-nano electronics, advanced materials, Biotechnologies, fotonic, nanotechnologies, Advance manufacturing systems and ICT.

Mechatronics innovation area is composed by a wide range of activities for 35,000 production units and represents 170,000 employees in the region. Mechatronics is defined as a multidisciplinary field of science, the integration of mechanics and electronics, control science and ICT.

Joining mechatronics and advances manufacturing, the areas of interest for Piemonte are presented in yellow in the following figure:

Figure 7. Piemonte S3: Mechatronics and Advanced Manufacturing.



Source: RIS3 Strategy of Piedmont, Manumix 1st. learning Journey

Piemonte historically has a tradition rooted in all core subjects related to the industrial applications of mechatronics and advanced manufacturing (mechanical, electrical engineering, electronics and computer science) and has over time developed excellent skills in their integration, often coming to form complete production industrial supply chains (from systems product / process development to the specific production of mechatronic components and systems).

The evolution of the engineering industry and related sectors in recent years has given a strong push to product diversification, with adaptive and flexible solutions that enable Piemonte to cope with the extreme variability of the markets and demand, by configuring an advanced manufacturing system both vertical and horizontal to the industrial sectors of Piemonte.

The leadership of Piemonte on the Italian manufacturing scenario is particularly evident in laser-based manufacturing, since in this region both technology leaders and lead users are located.

Many applications were experimented and developed in this Region, like 3D **laser** cutting or the remote laser welding for automotive and additive manufacturing for aerospace, texturing, laser metrology). Firms located in Piemonte, such as PRIMA and Comau are leaders at the European level in laser sources and laser systems and have primarily developed their specialisation on laser applications for the automotive and the aerospace industry (e.g. FCA, CNH, AVIO, IVECO, ALENIA). Piemonte industrial system also includes many SMEs using laser-based technologies, mainly job shop and tier-1 suppliers of aerospace and automotive companies.

Also, in the last years, Piemonte has seen the growth of several start-ups and high tech companies providing laser devices, for example monitoring and process control systems, scanner heads and beam delivery fibres. Also, solution integrators and software providers in terms of off line program and real time CNC software are traditionally located in this Region.

The region has a strong tradition in the use of advanced materials, for what an Innovation Cluster on polymeric materials was created (New Material Cluster, now part of Green Chemistry & Advanced Materials Innovation Cluster) and the Textile Cluster that has developed expertise in the search of new materials with horizontal impact as well as the activation of different policies resulting in the aggregation of local stakeholders such as companies, universities and research centres in the sector. The innovation process related to advanced materials refers to a complex system, where the goal is to get applications (devices) that have all the advantages for being competitive: technical quality / aesthetics, environmental sustainability and economic competitiveness. The advanced materials industry, as an enabling technology, has many fields of application, for example: packaging, automotive components, medical, electrical, electronic, construction, aerospace components, chemical and other industries.

Additive Manufacturing, as an emerging technology, is booming in the region, through the aerospace companies and the foundries whose are converting their business. This is the case of AVIO prop, acquired by GE, and many small companies who are investing in this new market in terms of new technologies and new business models based on this emerging laser application. Under the point of view of research and innovations, many companies located in this Region are part of European Associations and they participate to important EU collaborative projects. For instance, PRIMA and COMAU lead the EFFRA PPP and PRIMA is part of the board of Photonics21 European photonics platform and AM (Additive Manufacturing) European Platform. There is a wide participation to H2020

projects involving Piedmont's RTOs, large companies and SMEs (project LASHARE , APPOLO (I4MS programs), Borealis, Symbionica, MM tech, Mashes, Whiter, AMATHO)

Advanced Manufacturing stakeholders

MESAP (MEchatronics and Systems for Advanced Production) Innovation Cluster was appointed in 2009 by Regione Piemonte. Since 2016 MESAP changed to "Smart Products and Manufacturing"; all its activities are strictly coordinated with the regional innovation policy. Mesap Cluster Manager is Centro Servizi Industrie Srl, a service company from "Unione Industriale di Torino".

It covers the 2 main areas of specialisation (Smart Products and Advanced Manufacturing) that are split in 11 topics, in the field of methods and systems for the development of products and production processes (digital manufacturing), components and automation systems, HMI, micro/nanotechnology applications, photonics and manufacturing processes (additive manufacturing included).

The 236 Members consist of 191 SMEs, 33 Large Companies, 2 Universities (Università di Torino and Politecnico di Torino) and 10 Public and Private Research Centres, all with branches in the Piemonte region; most of the large companies are international corporations, especially active in manufacturing, automotive and aerospace industries. MESAP companies show top level of specialisation in integration of mechanics, electronics and control science and advanced mechanics and are located in all phases of the supply chain with different levels of integration; companies that offer enabling services are positioned along the entire supply chain. The main target sectors are: manufacturing plants and machines, robotics, automotive, aerospace, energy, railways, biomedicine, household machines, agro food, printers, textile, chemical, waterborne.

5. Innovation policy mix for advanced manufacturing

The policy strategy for the new regional program 2014-2020 and the S3 have been elaborated by means of a thorough analysis of the characteristics of the regional economic and innovation systems, taking into account the strengths and competitive advantages of the region and taking stock of previous policy experiences in the implementation of research and innovation policies. The new policy strategy focuses on a more limited set of actions with respect to the previous program and pays much attention to the results.

The aim of the new innovation policy strategy is to transform and/or strengthen areas of Piemonte industrial tradition, using innovation as a tool to develop new technological paths and enhance new skills, to address current societal challenges. Innovation in the production system refers to distinctive activities appropriately designed for a region with a high rate of industrialization and a strong manufacturing vocation. Within this framework, Piemonte has identified five different instruments for the policy mix related to advanced manufacturing.

Table 3. Instruments for the minimix

NAME OF INSTRUMENT	POLICY OBJECTIVE	OBJECTIVE	TARGET GROUP	GEOGRAPHICAL SCOPE	SECTORAL SCOPE	YEAR OF LAUNCH	ANNUAL BUDGET	MINIMUM PROJECT SIZE
IR2 - Industrializzazione dei risultati della ricerca. (Grant)	Increase business innovation activity. TRL 5 minimum (entrance),7 minimum (output)	Support strategic and close to market R&D projects, focusing on activities able to reduce time to market and connect R&D results with economic exploitation, primariliy on a pre-industrialization/pre-commercial phase	Industrial entities of medium-large size have been identified as priority targets. Universities, public research centres or other organisations institutions project are not the key target and they are eliogible with minor role..	Regional Rolling call up to exhausted fund	Horizontal (wide impact on AM)	2016	63M€ (increase budget is under assessment)	5 M€
POLI D'INNOVAZIONE (innovation cluster) - progetti imprese aggregate.	Increase collaborative R & D activity TRL 4 (entrance), 7 (output)	Support R&D projects concerning the specific innovation clusters topics (Agrifood, Energy and Clean Technologies, Life Sciences, ICT, Textile, Green Chemistry, Smart Products and Manufacturing) and their own	The projects must be presented by companies (small, medium, large) associated to the innovation clusters. RTO and Universities as subcontractors.	Regional Fixed call	Horizontal	2016 (partially in continuity with prevous ROP 2007-2013)	50M€ Of which approx 11M€ provisionally destinated to "Smart Products and A.M."	300 K€ (projects with SMEs) 600 K€ (Projects with

(Grant)		innovation "agenda".						Large Companies)
PROGETTI ERANET - MANUNET & INCOMERA (Grant)	Increase collaborative R & D activity TRL, 4,5 , 6	MANUNET: Support R&D projects concerning specific topic in the manufacturing field. INCOMERA: Support R&D projects concerning specific topic in the NMP field. Projects must be implemented by transnational partnerships.	SMEs, Research institutions, start-ups,	Regional (ERANET framework) Fixed call	A.M.	2016 (in continuity with prevous ROP 2007-2013)	MANUNET: approximately up to 2.000.000,00 € per each annual call INCOMERA: 1.000.000,00 € in call 2016	200 K€ for Piedmont Enterprises all together in each project
FABBRICA INTELLIGENTE – Technology Platform. (Grant + Soft Loan)	Increase collaborative R & D activity	Support to the creation of complex R&D projects (mature) in A.M	Large Companies and SMEs, joint in a consortium with,Innovation Hubs, universities, public and private research centres, research organizations, foundations and other public and private bodies in the field of R&D and technology transfer.	Regional but implemented in cooperation with some funding provided by the National Ministry for Research MIUR (new approach in Piemonte).	A.M	2015	14,3 M€ + 39 M€ (of which 22 M€ in the form of grant, 14.6 M € in the form of soft loan and 2 M € in the form of financial and technical assistance to ad hoc educational	5 M€

				Fixed call			programs provided to high qualified R&D profiles).	
INNOVAZIONE MPMI (Loan)	Supports the regional manufacturing SMEs in their fixed investments addressed to technological innovation of process and products	Aid for investments in machinery, equipment and intangible assets..	SMEs	Regional Rolling call up to exhausted fund	Horizontal (wide impact on AM)	2016 (partially in continuity with prevous ROP 2007-2013)	60 M€	50 K€ for micro and small enterprises 250 K€ for medium enterprises

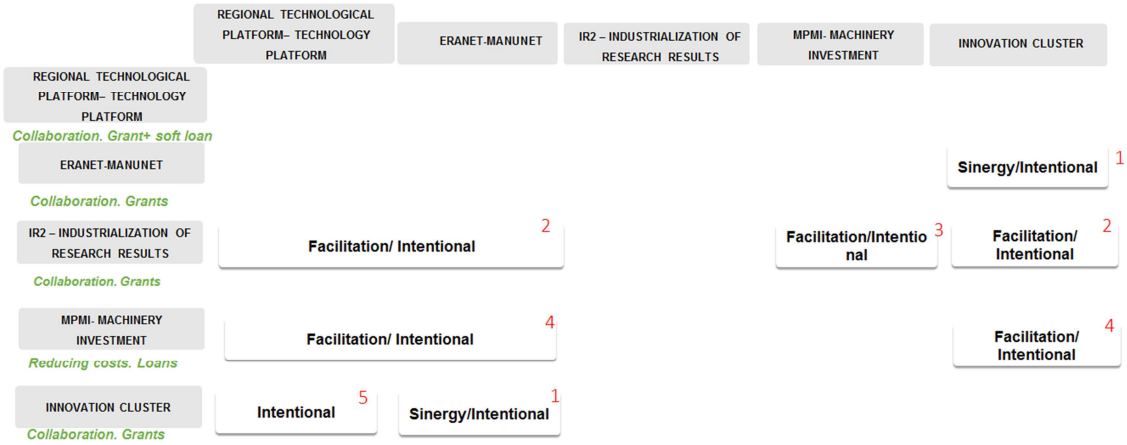
Practical Combination of instruments

The characteristics of the selected policy mix are:

- Business-oriented policy-mix
- Predominance of direct instruments (e.g. grants for collaborative R&D projects) and linkage instruments for aggregation of companies among them and with other parites (es. RTOs).
- Two of the instruments are implemented through Ministerial Agreements (multi-level approach), and also mobilise funding at national level.
- Combination of horizontal instruments aimed at the R&D collaboration domain with instruments aimed to Advanced Manufacturing.
- Strong focus on direct measures (grants and loans) targeting firms (mainly SMEs, but also big companies).
- Instruments have different and complementary objectives; their rationale is to establish a policy mix supporting the whole process, from R&D to industrial investment. On these bases, three instruments are aimed to sustain manily Industrial Research (TRL 4-7) and one instrument is aimed to sustain mainly experimental development (up to TRL 5-7 or higher).

Figure 8 presents Piemonte minimix combination, for example, ERANET/MANUNET instrument (on the left hand side) presents a combination with Innovation Cluster Instrument (on the top rigth hand sice). The type of combination is synergie and this policy mix has been intentionally designed.

Figure 8. Piemonte minimix combination



The rationale behind the interaction is:

1. Both instruments support collaborative R&I targeted to SMEs at different levels (Clusters mainly at regional level and ERANET at European Level). .

2. This interaction is considered a sequence, since IR2 instrument supports close-to-market R&D activities, which can take on board results of collaborative R&D funded under the other three instruments: Technology Platform, ERANET and Innovation Clusters.
3. This interaction begans in an integrated approach between research results and their industrialization towards actions oriented to support SMEs investment for innovation in productive processes.
4. This interaction is also considered as a strategic sequence aimed at supporting SMEs from research to investments: (1) collaborative and market-oriented research; (2) support to SMEs investment for innovation in productive processes.
5. Both instruments support complementarity measures related to Piemonte innovation clusters and technology platforms; leaded by big players (or involving them) and focused on medium-long term strategic research agendas.

Policy mix responding the regional challenges

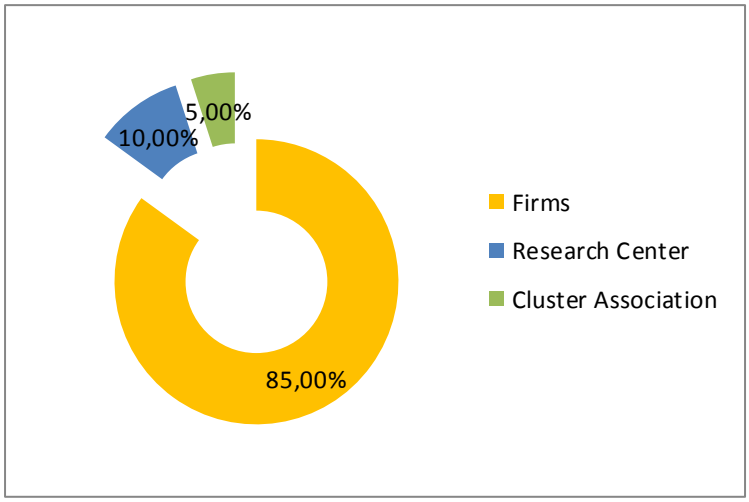
The regional challenges addressed by the selected policy mix are:

- Reinforce SMEs capacities in advanced manufacturing through collaboration with driving-force companies in R&D and training activities.
- Strength the collaboration among research providers (university and research centres) and enterprises in a costumer-supplier way.
- Foster innovation-driven, close-to-market research and development projects in manufacturing; encouraging cross-border value chains that emerge from advancing technologies.
- Raise the industrialization of research activities results.
- Support Piemonte manufacturing SMEs in their fixed investments addressed to technological innovation of process and products

How beneficiaries combine the instruments

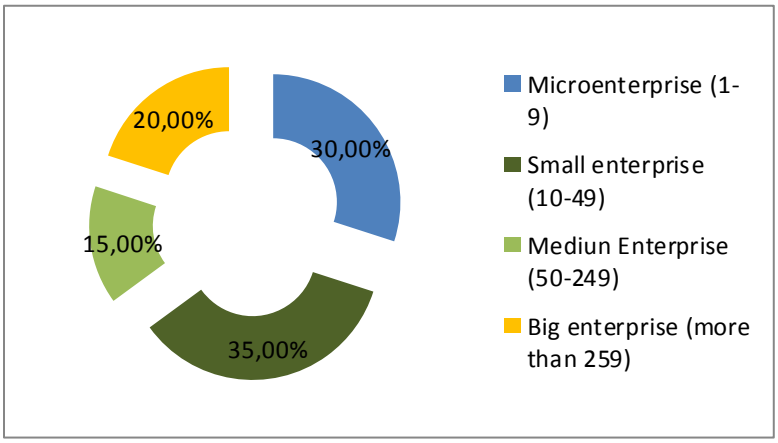
An exploratory survey has been conducted in order to have an approach about how the beneficiaries combine the instrument. In Piemonte 20 entities has participated in the survey; 85% are firms, 10% are research centres, and a Cluster Association has also participated in the survey.

Graph 1. Type of organisations



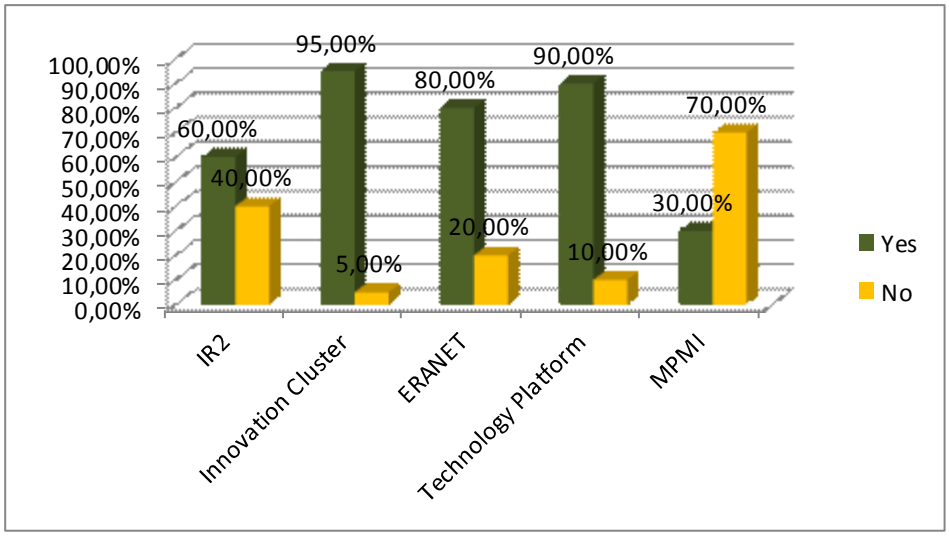
More than one third (35%) of the organisations are small enterprises, one third are microenterprise, and almost a quarter are big enterprises.

Graph 2. Size of organisations



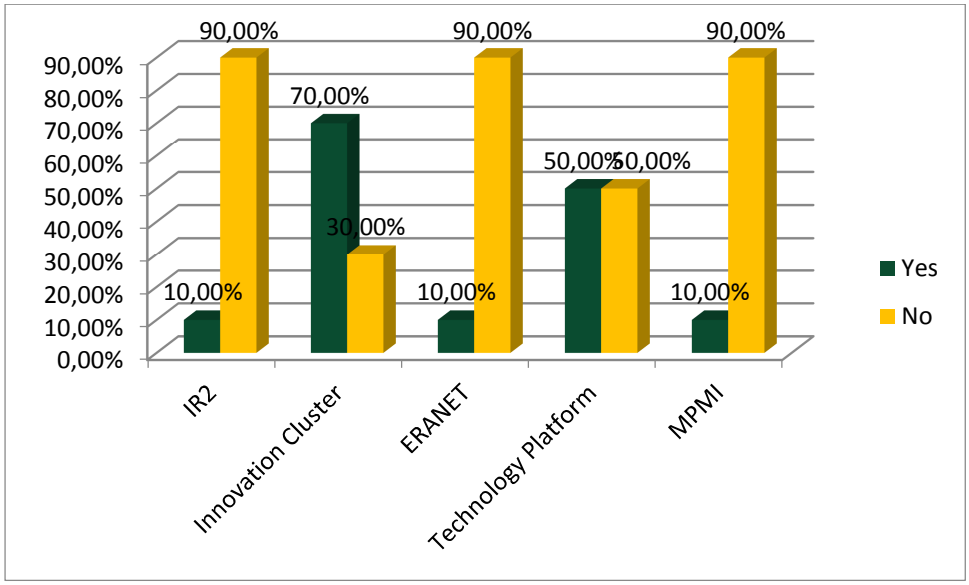
The best known instrument is Innovation Cluster, 95% of the participants organisations know it. The Technology Platform instrument is known by 90% and 80% of the respondents has knowledge of the ERANET programme. IR^2 instrument is known by the surveyed organisations. Finally, the MPMI is the less known instrument given that only a 30% of the participant's organisations know it.

Graph 3. Knowledge about minimix instruments



Talking about the use of this instruments for innovation during the last 5 years; Innovation Cluster instruments has been used by the 70% of the surveyed companies. Half of the surveyed companies have used the Technology Platform in the last 5 years. Only 10% of the participants have used ERANET, IR^2 and MPMI instruments during the last five years and this is probably due to the fact that some ofthese instruments open in 2016 only. The Cluster Association is the only beneficiary which has used all the instruments.

Graph 4. Use of minimix instruments



The reasons to use the instruments have been mainly for financing the R&D and to collaborate with other organisations. The combination of the instruments has been done intentionally by the respondents, with the final aim of covering different R&D topics.

The main results or benefits (real or expected) that the use of the minimix instruments by the surveyed organisations have generated are:

- to design new products and/or services
- development of new technologies
- increase collaboration between business and scientific actors in the regional innovation system (joint projects) and expanding to new markets.

The three main reasons for not using the instruments are:

- instruments do not cover my specific needs or challenges
- bureaucratic difficulty during the application process
- the timetable for the call of the programmes/funds is inadequate regarding companies interests.

On the other hand, the surveyed companies have clear that the instruments have made possible to carried projects, that without that support would not otherwise have the same scope or the same time frame.

The participant organisations have also stated the three main challenges that their organisation will face in the next 5 years related to innovation and advanced manufacturing:

- lack of resources for research and development investments
- necessity to increase the size of the firm/organization to look for new markets
- lack of resources to acquire high-tech machinery

Talking about the future, suggestions about new program(s)/fund(s) that would contribute to organisations to face its main challenges in advanced manufacturing have been made: regional funding for agile R&D projects addressing directly to R&D players or H2020.

Due to the novelty of the instruments included in the Manumix project it is no possible to see clearly what is the combination done by the beneficiaries. Nevertheless, the companies that have used the instruments combine the instruments intentionally following the combination pattern designed by the Region and consider that the instruments have been useful to fullfill their R&D strategy for building partnerships. The challenges that have been detected for the following five years can be properly addressed with a wise use of the selected intruments. Finally, the surveyed organistaions ask for a lees bureaucratic process and dynamism in the application process and instrumnets timetable.

6. Governance of the innovation policy mix

The same regional directorate is responsible for all the instruments considered in the Policy Mix: Regione Piemonte - Direzione Competitività del Sistema Regionale. The responsibility for the strategic design of the instruments lies in this directorate. Nevertheless, the design and rationale of the instruments was discussed and shared with main regional stakeholders, through an extensive dialogue when drafting the ERDF ROP and the S3. In particular, the S3 foresees the set-up of Working Groups, which can be focused on the specialisation domains or on specific measures to be designed. They concern both the design and implementation phase and have the task to collect useful data, information and good practices and to propose initiatives. All concerned stakeholders are involved (companies, research centres, universities, local communities and public administrations).

The coordination mechanisms are adequate and working well thanks to a coordination centred in a single Directorate which has pursued an inclusive governance methodology able to involve all relevant stakeholders in all phases of the process in a continuous dialogue and exchange from design to implementation.

In a broad sense, the same mechanism described above for the design of the instruments applies also for the implementation phase. In a strict sense, there's a close coordination between the Directorate and Finpiemonte, which is the in-house regional agency acting as Intermediate Body and supporting the Region in the practical management of the funding measures.

The various forms of coordination/cooperation are effective as they allow a continuous exchange between the Regional Government/Managing Authority, the stakeholders and the Intermediate body, leading to the early identification of critical issues in the implementation of the policy mix and, if needed, of consequent adjustments/reorientations.

ESF and ERDF Regional Operational Programmes have one common Evaluation Plan. The Evaluation Plan of the ESF and ERDF ROPs established a Steering Group, involving the Managing Authorities, the S3 Responsible Unit, the NUVAL (Regional Evaluation Unit) and other interested parties, included Finpiemonte. The Steering Group is aimed at: fostering the coordination between evaluation and implementation processes; define specific evaluation activities; involve all relevant stakeholders.

Thanks to a structured exchange relationship among the ESF and ERDF ROP Managing Authorities, the NUVAL (Regional Evaluation Unit) and the other relevant parties involved, it is ensured an adequate coordination mechanism working well in order to produce a continuous and proper evaluation.

Table 4. Piemonte minimix main features

Stage of regional policy-mix	Responsible	Brief description of the process	Other stakeholders involved
Design of individual instruments	Piedmont Region, Finpiemonte SpA (in specific cases), MANUNET/INCOMERA Network. Recently, as pilot case: cooperation with the National Ministry of Education, University and Research.	Instruments design is made by Regione Piemonte - Direzione Competitività del Sistema Regionale with the support of Finpiemonte SpA. Regional stakeholders are also involved through S3 and ERDF ROP 2014-2020 working groups.	Local players and stakeholders. In the case of INNOVATION CLUSTER (Poli d'Innovazione) a cooperation with Regione Valle d'Aosta was set-up, which also mobiled additional funding.
Implementation of individual instruments	Piedmont Region, Finpiemonte SpA,	Strong coordination between the Region and Finpiemonte SpA.	CSI (responsible for the information service and online application platform), external partners (ERANET). Recently, as pilot case: cooperation with the National Ministry of Education, University and Research.
Evaluation of individual instruments	Piedmont Region, Finpiemonte SpA.	The Region has defined one single Evaluation Plan for both ERDF and ESF Operation Programme 2014-2020; following different levels: A. Process analysis (procedural/operational): aimed to check the appropriateness of the management of funding measures with respect to	Ministry of Economic Development; External experts; MANUNET/INCOMERA Network; NUVAL ("Nucleus for the Evaluation and Verification of

		their objectives B. Consistency analysis to the objective: aimed to check, through specific indicators, the achievements, outputs and results related to the granted funds. C. Impact analysis (quantitative): aimed to check, through rigorous evaluation methodologies, the real effect of the granted funds and provide feedback to drive the "success" of a funding measure towards its expected objectives, targets and expected external impacts. D. In-depth analysis (qualitative): aimed to provide specific in depth knowledge on a selected number of involved beneficiaries and funded projects (direct interviews, questionnaires, focus groups). A, B and possibly C will be run for all instruments of the policy mix. Furthermore, in relation to Instrument IR2 - Industrializzazione dei risultati della ricerca it is supposed to run also the In-depth analysis (qualitative). The decision on the specific evaluation activities to be conducted is still ongoing and will be planned into details throughout the programming period, backed by a decision to be taken by the Piloting Group. Data are collected through the online platform that is used to manage the whole funding measure. At the beginning of the project, beneficiaries must insert their expected objectives with respect to each indicator. Beneficiaries will then have to indicate the achieved results at the end of the project. This data insert is compulsory to proceed with the final	Public Investments"); Piloting Group of the Evaluation Plan

		financial reporting.	
Coordination/management of the innovation policy mix	Finpiemonte SpA: Area Agevolazioni e Strumenti Finanziari; Piemonte Region.	-Inclusive governance methodology: The rationale and design of the instruments was shared with main stakeholders, while drafting ERDF ROP 2014-2020 and Piemonte S3. S3 working groups are a key asset since they collect useful data, information good practices and propose initiatives. -Continuous coordination and cooperation with the regional government and the Managing Authority, leading to an early identification of critical issues in the implementation of the policy mix and if needed, a consequent adjustments or reorientation.	Local players and stakeholders, Managing Authority.

7. Evaluation practices and management

The Region has defined one single Evaluation Plan for both ERDF and ESF Operation Programme 2014-2020, which has been drafted by the NUVAL ("Nucleus for the Evaluation and Verification of Public Investments"). The operational responsibility for the Monitoring and Evaluation activities of the ERDF ROP, as well as for the qualitative and quantitative Monitoring of the S3, has been assigned by the Managing Authority to IRES Piemonte (Regional Institute of Economic and Social Researches)[2].

The set-up and specific definition of the evaluation and monitoring methodologies of the S3 is still ongoing. Nevertheless, both the ERDF ROP Evaluation Plan and the S3 define a set of indicators aimed at verifying and measuring the effectiveness of the strategy and its policy mix.

The objectives of the evaluation activity are clearly expressed in the official documents of the European Commission (Reg. UE 1303/2013) and are recalled in the Evaluation Plan:

- Improve the quality of design and execution of programmes
- Verify effectiveness, efficiency and impact
- Estimate the effects
- Identify strengths and weaknesses in the deployment phase and contribute to redesign public policies.

IRES Piemonte is expected to take into consideration the evaluation of results and effects of the development actions that will be funded, applying an approach aimed to better understand the return (direct or indirect) on the territory, and define the real effectiveness of the funding measures and the impacts that they have produced. As a results, IRES Piemonte is asked to give major importance to evaluation activities focusing on results rather than on processes, thus requiring qualitative analysis, also through tools like in-depth interviews and case studies.

Further than the exchange with actors institutionally touched by the evaluation process of ERDF, IRES will strengthen the cooperation with other tecnical-scientific actors which are part of the regional system, such as CSI Piemonte, Finpiemonte, Ceipiemonte and public research centres in Piedmont.

IRES will also develop the appropriate contacts with European authorities and National actors, useful to improve the quality of the evaluation and to contribute to the dissemination of results.

Within IRES it will also be possible to activate synergies with other activities of the observatory and with other evaluation tasks run by the Institute, with the aim to set up a unitary evaluation approach.

[2] DGR 22-4230 of November 21, 2016, which identifies IRES Piemonte as the independent evaluator of programs funded by European funds.

The evaluation activities refer to three main categories:

- **Transversal evaluation**, dealing with the whole domain of the regional development policy, and transcending single programmes.
- **Evaluations referring to a single operational programme** (ERDF or ESF), thus focusing on general themes and objectives of the programme or on single and specific measures.
- **Studies, analysis and research supporting the design and the evaluation of programmes**, thus dealing with the support to policy design through background knowledge, which represent the bases for the set-up, deployment and subsequent evaluation of measures.
- **Analysis in support to S3**, being an intensive analytical activity run by the independent evaluator, it will enrich the evaluation of regional policies funded through ERDF.

  It is about an activity of study and in-depth analysis aimed at the set-up of single measures, at their monitoring and their subsequent evaluation. The idea behind this activity is that the process to build "good" policies is based on the collection of sound empirical evidences, that would favour both the early diagnosis of problems to be solved, and the identification of effective solutions (maybe already experimented elsewhere).

  Among the activities aimed at designing public policies, the monitoring of S3 covers a relevant role. In facts, in addition to the evaluation of measures which have more direct link to the strategy (and their evaluation is included in the above listed activities), the evaluation of the strategy will imply a constant monitoring, On one side, in order to verify the implementation status of actions, but also, on the other side, an analysis of the context with specific reference to the evolution of the regional system towards the structural transformation that the strategy itself supports.

  The monitoring activity will necessarily be extended also to the single areas of specialisation identified in the strategy in order to give evidence of the positioning of Piedmont towards the objectives and the evolutions of the competitive context of the relevant value chains, to provide a framework knowledge to the public administration in order to sustain their process of entrepreneurial discovery, and to support the process of revision of the strategy.

The outputs expected from the evaluation activity are:

- **Inception report,** describing the activity that will be run in the medium/long term and defining the workplan for the running year. It will be updated yearly.
- **Yearly monitoring updating.** Short documents which take into account the entire operational programme and include a description of actions, outputs and first consequences for the beneficiaries.

Such reports will be articulated according to the different components of the programme (axis, priorities, actions) and specific attention will be dedicated to the monitoring of the "set of indicators applied to the ERDF ROP".
This activity will provide a synthesis on the performance of the ROP for the running year.
Each report will include: analysis on the status of actuation; analysis on achievements; situation analysis of the regional economy and productive system.
In the period 2017-2022 6 reports of this kind should be drafted, one each year.

- **Intermediate evaluation report**, which is expected to provide a synthesis on the deployment status of the different actions activated, as well as the main outputs and achieved results in the first year of actuation of the ROP. In addition to the content of the yearly monitoring reports, this document will allow to verify in which measure the target objectives of the ROP have been reached, and to collect the lessons learnt during the first phase of the programming implementation.
  The intermediate report will be drafted by December 2018. An updated version is planned by December 2020 in order to draft the preliminary recommendations for the subsequent programming period.
- **Thematic reports**, which will describe the outcomes of the single thematic evaluations, both about process and policy results. Piemonte Region expects to have at least one thematic evaluation per investment priority, which means approximately 2 thematic evaluations per year. It is most likely that thematic evaluations will be more frequent in the last period of the programming cycle.
- **Final evaluation report**, which will collect the lessons learnt throughout the entire programming cycle and will offer the main recommendations for the subsequent programming.

Among the activities assigned to IRES Piemonte there are also dissemination activities towards stakeholders, in order to share the data collected during the evaluation and to promote the "culture of evaluation" Every evaluation or monitoring report is required to include a section on lessons learnt and policy recommendations.

Table 5. Piemonte minimix evaluation features

Scope of the evaluation system	-ERDF and ESF Operation Programme 2014-2020 -Piemonte S3 -Financial Instruments (ex-ante)
Purpose of the evaluation system	-Obtaining data on effects and impacts for the benefit of the territory. -The evaluation allows Policy makers to gain more knowledge and

	decisional inputs about the effects of policies on Piemonte economic and productive system.
Ex- ante evaluation	-Only for financial instruments -The methodology used follows the guidelines in ERDF ex- ante evaluation methodologies given from the European Commission.
Monitoring	-The monitoring is run by a technical structure (IRES Piemonte) which provides updated information on the regional scenario for research and innovation, as well as on the national and international reference context.
Ex-post evaluation	-The methodology will follow the guidelines in ERDF ex- post evaluation methodologies given from the European Commission. -The objective is to obtain a view of the programming period as a whole

8. Conclusions

Most of the strategic areas identified by the Piemonte Smart Specialisation Strategy are priorities for advanced manufacturing. Piemonte Smart Strategy is systematized in six innovation areas: aerospace, automotive, mechatronics, "Made in" (agrofood + textile), green chemistry and cleantech, health and wellbeing, together with the following Key Enabling Technologies (KETs): micro-nano electronics, advanced materials, Biotechnologies, fotonic, nanotechnologies, Advance manufacturing systems and ICT. Laser and Additive manufacturing have a key importance.

Piemonte S3 presents both hard and soft governance structures and presents a strong intedepertamental cooperation. Stakeholders have a valuable government leardeship both in Piemonte S3 and ROP.

Piemonte selected policy mix for Manumix is composed of a wide range of instruments with a specific focus on economic instruments. Among the instruments chosen are two specific instruments of A.M. and three horizontal instrument with strong impact on A.M. The challenge of including horizontal instruments is that A.M. can rarely be independently analysed. IR2 instrument includes multi-level governance involving also the Nationa Ministry and national funds. Piemonte minimix looks for intentional effects among five different instruments with facilitation and synergy interaction.

The operational responsibility for the Monitoring and Evaluation activities of the ERDF ROP, as well as for the qualitative and quantitative Monitoring of the S3, has been assigned by the Managing Authority to IRES Piemonte (Regional Institute of Economic and Social Researches).

IRES Piemonte is expected to take into consideration the evaluation of results and effects of the development actions that will be funded, applying an approach aimed to better understand the return (direct or indirect) on the territory, and define the real effectiveness of the funding measures and the impacts that they have produced.

The set-up and specific definition of the evaluation and monitoring methodologies of the S3 is still ongoing. Nevertheless, both the ERDF ROP Evaluation Plan and the S3 define a set of indicators aimed at verifying and measuring the effectiveness of the strategy and its policy mix.

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FINPIEMONTE SPA, PROGETTI ERANET - MANUNET & INCOMERA CALL

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Annex 1. Types of relations among policy measures.

Table 1. Five types of relations among policy measures.

Relation	Description
Precondition (P)	Defined as a relation that is strictly required for the successful implementation of another policy measure. For instance, if policy measure B is a precondition to policy measure A, the successful implementation of policy measure A can only be achieved if policy measure B is successfully implemented beforehand. The precondition relation is a direct relation.
Facilitation (F)	In a case where a policy measure 'will work better' if the outcome of another policy measure has been achieved, the relation is considered as a facilitation relation. For instance, policy measure B facilitates policy measure A when policy measure A works better after policy measure B has been implemented; however, policy measure A could still be implemented independently of policy measure B. The facilitation relation is also a direct relation.
Synergy (S)	A special case of facilitation relation in which the 'will work better' relation is bidirectional (undirected relation). It can be argued that such a relation can be treated as a two-way facilitation; however, we believe that treating this relation as a separate type is advantageous, as it suggests a higher effectiveness of both of the policy measures having the synergetic relation vis-à-vis the overall policy.
Potential contradiction (PC)	A potential contradiction exists between policy measures if the policy measures produce conflicting outcomes or incentives with respect to the policy target under certain circumstances, hence the contradiction is 'potential'. This relation is undirected.
Contradiction (C)	In contrast to the conditional nature of potential contradiction, the contradiction relation is defined when there are 'strictly' conflicting outcomes of incentives between policy measures. Similar to the potential contradiction relation, this relation is undirected.

Source : Araz Taeihagh, Moshe Givoni, René Bañares-Alcántara (2013)