

# Smart Specialisation Strategy

FVG

Abstract

## 1. The Vision

The Smart Specialisation Strategy is based on a global vision of the critical aspects and the potential of the regional economic system and derives from the outcomes of the SWOT analysis and the results of the dialogue with the territory. The analysis in fact highlights some specific features of the regional economy that at the same time represent the challenges on which industrial and research policies should focus in order to achieve concrete changes.

In particular, from the combined analysis of the strengths of the area, which can be summarised as follows:

- *Excellence in scientific research and training*
- *High innovation capability*
- *Intensive manufacturing*

and from the additional elements that emerged from the context, it is possible to discern the following specific features of the regional economic system:

- **Positive innovation performance of SMEs**, even if mainly produced in the absence of a structured activity of research and development within the enterprises and despite a significant reduction in investment.
- **Prevalence of "traditional" sectors** as driving forces behind the regional economy that, despite having been affected by the competitiveness of developing countries, show a few segments with higher added value that can be the catalysts for innovation and should be targeted by specific investments in research and development.
- **The presence in the Region of R&D centres of international standing**, which represent a significant added value, despite the gradual reduction of public resources and the limited capacity of enterprises to offer adequate job opportunities.
- **The average size of companies**, representing a strong limitation to the ability of investing in innovation.
- **Low propensity to cooperate** between **businesses** and the **research** world - despite the presence of an important range of scientific and technological expertise in universities and regional research centres - that can be counterbalanced by the presence of clusters, technological districts and innovation intermediaries, such as regional science and technology parks.
- **Diminished ability to export** by enterprises and their limited presence in the most dynamic sectors.
- **Presence of strong global and social challenges**, which increasingly require innovative solutions, likely to be stimulated by the demand from the public sector, using the territory as a living lab for the testing of innovative solutions for products and services.

The Strategy is an integrated response to the characteristics of the economic system, which present some very critical aspects, but at the same time also a significant potential in terms of competitive advantage that can be created and supported.

The distinctive elements of the regional economic system can therefore be summarised as follows:

- *Innovative manufacturing vocation*
- *Presence of scientific excellence*

The changes expected as a result of the Strategy are:

- a) The **consolidation and repositioning of the industrial** and production sectors in the Region towards segments that offer higher added value and are specific to the regional economic system.
- b) The **shift of the regional economic and production systems** towards **new areas** capable of generating new jobs, new markets and new industries, starting both with "traditional" sectors and with high-tech ones. In both cases, the shift will be triggered by investments in innovation, promoting collaborative processes with the world of research and the contamination with Key Enabling Technologies (KETs), in order to respond to emerging social challenges.

The process of entrepreneurial discovery, which accompanied the drafting phase of the S3, has identified a number of methodological intervention priorities, aimed at achieving the expected changes summarised here:

- **Developing collaboration and synergy between enterprises** and between enterprises and **scientific structures**, increasing the quality and dissemination of innovation.
- **Promoting investments by the enterprises in innovation and industrialisation** of research results, also through innovation services.
- **Promoting the new innovative entrepreneurship**, through the support for innovative start-ups and cultural and creative enterprises.

In a complementary way, the Regional Administration intends **to support the creation and expansion of advanced capabilities** to support technology investments and consolidate SMEs with an innovative approach.

The areas of regional specialisation have been therefore identified through a process of entrepreneurial discovery and involvement of the territory, which has resulted in the definition of five areas:

- *Agribusiness*
- *Strategic productions chains (metalworking and home sectors)*
- *Maritime technologies*
- *Smart Health*
- *Culture, creativity and tourism*

The five areas will be provided with financial resources through the selection of a limited number of projects evaluated for their quality and impacts, highlighting their trajectories and enabling technologies (in other words, the KETs). Within this framework, the Regional Administration intends to encourage and promote mutual contamination between sectors as a key to maximising the impact of its investment.

## 2. Trajectories of development in the Areas of specialisation

### 2.1 AGRIFOOD

#### 1. Characteristics of the area of specialisation

The agri-food area is one of the most significant segments of the Italian and regional economy, both for its size and for its strategic value in connecting several productive sectors, including tourism. The sector shows a remarkable internal structure, divided into groups of very different sizes and characteristics, including: baked and farinaceous products, other food products, processing and preserving of meat and production of meat products, dairy products, wines from grapes, distilling, rectifying and blending of spirits and production of beer.

Various top producers operating in the Region have consolidated significant market shares, also thanks to their constant attention to research and innovation. Just to mention a few: Illycaffè SpA, Birra Castello SpA, Principe di San Daniele SpA, Roncadin SpA, Quality Food Group SpA.

- At the end of 2014, the sector included **810 companies**, of which 735 belong to the food segment and 75 to the beverage segment, with a **contraction of 7.1%** compared to 2009, higher than in the overall regional economy (6.1%). It should be emphasised that a significant share of food processing pertains to an agricultural context not detected by the ISTAT Census on productive activities.
- From the employment point of view, in 2011 in Friuli Venezia Giulia **the total stock of employed people was 8,326 units (2.2% of the regional total and 7.3% of the manufacturing sector)**, of which 92% related to the food segment and the remaining 8% related to the beverage segment.
- In the decade 2001-2011, the sector suffered a decline of 20.6% in terms of local units and 10.5% in terms of employment: **the decrease in employment is anyway significantly lower than that recorded by the manufacturing sector as a whole**.
- The **employment data from INPS** recorded a trend reversal with **an increase of 159 units (2.2%)** in the period 2008-2013.

- In 2013 food and beverage were seventh out of 14 in the ranking of exports by sector, with a value of **EUR 455 million in the first three quarters of 2014 and a share of 5.2% of the total**, with an overall growth rate of **+ 6.8% in the period 2011-2013** (in contrast with the exports of the manufacturing sectors -10.3%). The figures for the first three quarters of 2014 recorded a further and convincing **growth of 10.7% compared to the same period of 2013**, putting the sector in second place among the most dynamic ones.
- Among the most representative export products we can mention **coffee** (Trieste is one of the centres of European excellence in this sector), **wines** and **cured meats**.
- The largest importers of food from Friuli Venezia Giulia are located exclusively in European countries, with **Germany** on top, and in the **USA**, top of non-EU countries, with 6% of the total. The export of the **beverages** sector, however, **has the US on top, with 26.6% of the market**, and Germany only second. Top importers are also other non-EU countries, like **Canada, Japan, Australia and China**.
- Presence on the territory of **strategic resources**, such as: **2 Consortia for the protection of Montasio cheese**, based in Codroipo, and of Prosciutto di San Daniele, based in San Daniele del Friuli; **9 Consortia for the Protection of Designation of Origin** (Annia, Aquileia, Carso, Collio, Colli Orientali, Grave, Isonzo, Latisana and Ramandolo) of Friuli Venezia Giulia wines, in addition to the Regional Federation (FederDoc), established in 2002; **2 Industrial Districts**: the "Agribusiness Park of San Daniele" in the hill region and the "Trieste Coffee Cluster"; the planned Regional Agribusiness Cluster starting from the Agribusiness Park of San Daniele; the **University of Udine**, with its Department of Food Science and the University of Trieste, with the Department of Life Sciences, which integrates expertise in the chemical, biochemical, biological and biomedical fields; the **Area Science Park of Trieste**, also active in the Life Sciences sector, with a number of local enterprises operating in fields of interest for the food production chain (the coffee chain in particular); **the Regional Agency for Rural Development (ERSA)**, which among its missions has also the coordination and promotion of research in support of rural development.

Looking at the future, such positioning can be maintained and improved only through:

- The **protection of rights and image** of regional food products, undermined by counterfeiting and food imitation (the so-called Italian sounding products) that erode a significant share of the sector's turnover.
- **The adaptation to the new food consumption habits** (e.g. the prevalence of ready-to-eat food products and the development of functional foods) and purchase styles (leading, for instance, to the strengthening of large scale retail and private labels), which threaten to marginalise regional craft productions that mainly fall into the typical products category.
- The increase in **average company size**, also through the network aggregation in the supply chain, to promote access to innovation, exports and large-scale retail.
- The promotion of **valorisation strategies** regarding typical regional products and food distribution, increasing the use of quality certifications and finding a solution to the absence of regional supply chains of European or worldwide scale, elements that threaten to undermine the high potential for exports of the sector.

## 2. The development trajectories

At Italian and European level, in recent years, a growing cooperation network between companies and research centres aims at increasing the innovation potential of the food sector. A fundamental innovation factor for the sector will be the drivers of innovation of **products, processes and organisation**, as detailed below:

### PRODUCT INNOVATIONS.

- **The improvement of health, wellness and longevity** of consumers, through informed choices that are healthier and more affordable. In this respect, we can mention the development of foods with positive effect on people's health (the so-called "nutraceutical" science, the development of functional foods or "medical foods"), such as hypoallergenic foods, probiotics, antioxidants, etc.
- The guarantee of **higher quality and safety of foods**, which has led to the development, for instance, of certified organic products.
- The adaptation to new lifestyles that involve increasingly reduced budgets and less time dedicated to food consumption and that, for instance, have boosted the demand for **ready-to-eat foods** (e.g. fourth and fifth range foods) and single portions.

### PROCESS INNOVATIONS:

- The guarantee of maintaining the quality and health of products along the food production chain, for example through the development of **new packaging** and conservation technologies.
- Food processing technologies that are more efficient, have a **lower environmental impact** and are designed to keep the characteristics of raw materials intact.

- Technologies for the **direct traceability of foods** in the various phases of the supply chain, in order to guarantee the integrity of the organoleptic characteristics and safety of foods.
- Technologies for the **recovery and reuse of by-products and processing waste**.

#### ORGANISATIONAL INNOVATIONS

The transition from a vision of organisational management limited to a single company to a **vision of the supply chain that extends upstream and downstream** to logistics, distribution, etc. (for example the maintaining of the cold chain).

- The development of **horizontal and vertical relationships between companies in the food industry** in order to develop "segment associations" and other forms of valorisation of local typical productions.
- The development of **labels and production specifications** to ensure traceability along the supply chain and the safety and wholesomeness of local food products.

The process of entrepreneurial discovery, through the involvement of a large number of stakeholders in thematic groups, has allowed us to define the set of science and technology trajectories that the various players in the sector consider a priority, since they are relevant for the Region and/or can be implemented immediately. The results do not differ from the recommendations made by the main relevant literature. Moreover, the issues identified are fully consistent with the strategic priorities emerging from the documents relating to European and Italian technology platforms in the food sector.

Drawing on the results of the "entrepreneurial discovery" process and the thematic groups of stakeholders, the Region has defined a set of four science and technology trajectories that are relevant for the territory and can be implemented immediately:

- 1) **INDUSTRIAL DESIGN:** The application of **industrial design techniques to the food sector** (food-design combination), in particular the sustainable design (eco-design) and the so-called "food design". The aim is developing a more effective design approach to make the act of assuming an edible substance easier and more focused (the so-called "food acts" in a specific contexts, environments and circumstances of consumption, in connection with a sociological, anthropological, economic, cultural and sensory analysis, with repercussions not only on production technologies but also on marketing and communication, also for the protection of local products).
- 2) **INNOVATIVE PRODUCT STORAGE SYSTEMS:** The development of **innovative systems for the conservation of products**, with the aim of prolonging **shelf life and marketability**, reducing the energy bill and environmental impact, in addition to minimising the losses in nutritive value and changes in the organoleptic characteristics of the food. Purely by way of example we can mention the new cold storage technologies, the processing at high pressure, the storage in a protective atmosphere or under vacuum.
- 3) **SMART PACKAGING:** The development of **active and intelligent packaging systems** (the so-called *smart packaging*). "Active packaging" involves all physical, chemical or biological actions aimed at changing the interactions between the packaging and the product, so as to achieve the desired result (generally extending the life of the food product and preserving its nutritive and organoleptic characteristics). "Smart packaging" describes the solutions adopted to monitor some aspects of the food products (e.g. time, temperature, biosensors, etc.) and provide such information to the consumer (e.g. intelligent labels).
- 4) **CHEMICAL ANALYSIS:** The **development of innovative techniques for the chemical analysis of food and the reuse of waste** (e.g. chromatographic and spectroscopic techniques, etc.) to facilitate the traceability and determination of qualitative characteristics, also in order to prevent fraud and adulteration. In addition, the development of technologies for waste management and waste production, technologies for the containment of the plants' external facilities, technologies for the recycling of materials.

## 2.2. STRATEGIC PRODUCTIONS CHAINS: Metalworking and home system

### The metalworking chain

#### 1. Characteristics of the area of specialisation

One of the most important segments of the productive fabric of Friuli Venezia Giulia is the metalworking sector that, in the stricter sense of the term, coincides with the metallurgical sector, the manufacture of metal products and the production of machinery and equipment<sup>1</sup>.

There are several top entities operating in the Region that have consolidated significant market shares also thanks to constant attention to research and innovation, including - but not limited to - Danieli & C. SpA, which specialises in the design and supply of industrial facilities globally, Wartsila Italia SpA (large marine engines), Savio Macchine Tessili SpA, Ferriere Nord SpA, Officine Tecnosider Srl.

- In 2014, this sector in the Region **includes 2,705 active companies**, jointly accounting for 28.4% of the manufacturing segment and characterised by **different sizes** (larger metallurgical and steel industries and SMEs dealing with the manufacturing of metal products and machinery).

- In 2011, the sector employed **more than 39,000 workers**, for the most part in the provinces of Udine (49.0%) and Pordenone (35.0%). In addition, of the total number of workers in the manufacturing sector, 34.3% are employed in a metalworking company, a number that is clearly higher than the performance recorded in the Northeast (33.7%) and at the national level (28.9%).

- At the end of 2013, the **value added produced by the sector reached EUR 39,497 million, 34.3% of the total produced** by the regional manufacturing sector.

- Looking more in depth at the entire production chain, at the end of 2013 there were 6,438 units operating in Friuli Venezia Giulia able to employ almost 73,000 workers, of which 50,791 in production (figure related to 2011).

- The **companies working in this industry** are constantly investing in innovation and research (both for processes and products). Often these innovations concern the production stages, are aimed at solving problems associated with execution and in some cases are transformed into patents.

- Despite the economic crisis, **the sector shows a strong and steady inclination towards exports. At the end of the third quarter of 2014, the exports of machinery, equipment and metal products amounted to a total of EUR 4,202.2 million** (current values) equal to 48.2% of the total regional exports: 27.2% for machinery and 21% for base metals and metal products.

- A positive trend (+ 2.0%) in exports compared to the same period of 2013. This data is quite comforting, particularly when compared with the figure for overall exports of Friuli Venezia Giulia that, in the same period, shows a slight increase of 0.1%.

- Importing countries vary according to the goods sold. In the metalworking sector, the most important export area is represented by **Germany** with 21.1% and **Austria** with 11.4%; for metal products the most important trading partner is the **US** (17.3%), while for the manufacturing of machinery, buyers are not limited to Europe (Germany, in particular), but are also located in the Far East (China 9.1%).

- Between the third quarter of 2013 and the same period of 2014, there was a slowdown in exports to China (- 3.1%) and a strengthening of exports to Russia (machinery in particular).

- Local presence of important **strategic resources**, such as: the **Universities of Trieste and Udine**, with the faculties of engineering and the related departments (e.g. Electrical, Management and Mechanical Engineering and interdepartmental research centres); **Science and technology parks** among which Area Science Park, Friuli Innovazione, the Technological Centre of Pordenone, Agemont Spa, with innovation and research centres or innovative start-ups focused on the production/marketing of metal products; **Districts and Consortia**, mainly aggregations of companies operating in the metalworking sector. By way of example, we can mention the COMET.

With respect to the future, the metalworking sector will face the following challenges:

- **Protect** its products also internationally (intellectual property protection).

- **Increase** its competitiveness (also through the increased efficiency of production processes, with the reduction of costs and production time).

- **Support** research and innovation processes. Also through "contamination" with other productive sectors.

- **Facilitate** the aggregation of enterprises. In particular, both to encourage work-sharing processes and support the exchange of best practices and knowledge.

<sup>1</sup> As identified by the Centro Studi Unioncamere of FVG, 2014.

## 2. The development trajectories

The innovations that have affected the metalworking sector are based on two macro aggregates: on one hand, the organisational and commercial dimensions, on the other the more technological aspects.

### 1. ORGANISATIONAL INNOVATIONS

Organisational innovations mainly concern the methods of construction of the enterprises of reference. Below the main changes occurring in the metalworking sector are briefly described:

- **Customer-enterprise integrated design.** This operational mode is particularly common in the metalworking sector and constitutes a new approach to the relationship between company and customer, as well as to leveraging the supply chain and the network.
- **Spread of a new business model.** The most successful companies within the metalworking sector can be categorised as enterprises of limited size, high-tech, highly internationalised and with an internal organisational model able to ensure production flexibility and a dynamic approach to their markets of reference.
- **Use of a new model of production site:** the digital and widespread factory. These organisations have adopted a completely new way of organising production. The individual components can be designed off premises and physically reproduced through 3D printers in a single site. This avoids the physical transportation of components that can be made directly in the factory downloading the design files. Also maintenance can be ensured by remote control systems that, through the network (also wireless), can intervene on individual machines and correct any malfunctions.

### 2. TECHNOLOGICAL INNOVATIONS

Technological innovations are linked to the production process of the manufactured items, be they of the "hard" type (i.e. determined by the use of new techniques, technologies and materials) or of the "soft" type, i.e. connected with the use of specialised computer programs.

Among the main innovations introduced recently, we can mention:

- **Different ways of manufacturing components.** By way of example, we can mention vacuum brazing, laser cutting and/or high-speed cutting, dry cutting, powder metallurgy, the use of new materials such as composites or the new formulas for coatings and the treatment of metal surfaces.
- **New programming and simulation techniques.** These, in most cases, are software systems that have the very important task of maintaining the performance of mechanical products. Among the different procedures, we would like to mention high-speed machining, in which a primary role is played by simulations (with specialised software) of heat resistance and wear of guides and spindles. Another example is represented by all safety management software (with the related automatic controls and the scheduling of routine maintenance work). Or the complete computerisation of design through CAD/CAM systems or the use of specific programs for the management of production such as Product Lifecycle Management and Manufacturing Process Management systems (MPM and PLM, respectively);
- **Integration of mechanics and electronics.** In this regard, we can mention some innovative examples of integration between the two departments, such as control systems (new modes of operation of the machines, and remote control) and sensors (integration of different and/or new types of sensors).

The process of entrepreneurial discovery, through the involvement of a large number of stakeholders in thematic groups, has allowed us to define the set of science and technology trajectories that the various players in the sector believe to be a priority, since they are relevant for the Region and/or can be implemented immediately. The results do not differ from the recommendations made by the main relevant literature. By way of example we can mention:

- AIRI - Italian Association for Industrial Research (2013).
- Technological Platform Manufuture Italy (2013).

**In addition, the priorities highlighted by the operators in Friuli Venezia Giulia are fully consistent with the strategic roadmap prepared by the European Commission, in particular with the objectives related to ICT - enabled intelligent manufacturing.**

Drawing on the results of the "entrepreneurial discovery" process and the thematic groups of stakeholders, the Region has defined a set of three science and technology trajectories that are relevant for the territory and can be implemented immediately:

- 1) **TECHNOLOGIES FOR THE NUMERICAL MODELLING OF PROCESSES AND PRODUCTS.**

This area includes all CAD/CAE/MDO systems that can produce in a virtual way machine parts and/or assemble sections, testing their quality and resistance in different conditions. This aggregate also includes all rapid prototyping systems, also connected with 3D printers that, in a single machine, are able to melt, turn, drill and mill metals.

## 2) **METHODS AND TECHNOLOGIES FOR INTEGRATED DESIGN.**

These technologies are used in the industry to implement, jointly with the end customer, activities related to the design, service/maintenance (even remotely) of plants. This category includes all the technologies used to support the customisation of products in the metalworking sector (according to the "tailor made" model) and the development of innovative approaches to design (e.g. design for dismantling and disassembling).

## 3) **INTELLIGENT MACHINES.**

This aggregate encompasses all technologies that can support the production of machines or mechanical parts able to interact with humans and/or with other machines. For instance, special high-productivity machines that use flexible forming technologies, machines for the control and management of systems, mechatronic components that are capable, incorporating several types of technological knowledge (e.g. sensors, mechanics, telecommunication, robotics, etc.) to put on the market innovative products that can revolutionise the way of producing.

### The "home system" chain

#### 1. Characteristics of the area of specialisation

An industry that traditionally in Friuli Venezia Giulia has a major role is the segment of the so-called "home system". It includes all activities that manufacture/create goods for home improvement<sup>2</sup>. Its most important components are the timber industry, the manufacturing of wood products and the production of furniture.

Various top producers operating in the Region have consolidated significant market shares, also thanks to constant attention to research and innovation. Just to mention a few: Friul Intagli Industries SpA, Calligaris SpA, Snaidero Rino SpA, Valcucine SpA, Moroso SpA.

- In 2014, in Friuli Venezia Giulia there were **2,890 companies** active in this segment, representing about **30% of the entire manufacturing sector**. A considerably high percentage if compared to the figure shown by the Northeast, where the home system accounts for 24.6% of total manufacturing.

- In 2011, the home system (limited to the wood industry and furniture manufacturing) employed just over **22,500 workers**, about **20% of workers employed by manufacturing enterprises** in Friuli Venezia Giulia.

- The "specialisation" of the regional district in the "home system" is confirmed by the analysis of the sectoral concentration of workers with respect to the national share. In Friuli Venezia Giulia, compared to the rest of Italy, the **concentration of workers** employed by the timber, wood and furniture industries is particularly high (2.0 points higher in almost the entire Region).

- According to data from the Mise - Italian Ministry for the Economic Development - (year 2012), the **total turnover** of this sector amounted to over **4,329,443 thousand euros**.

- Looking at the entire supply chain (i.e. including the activities upstream and downstream), the data appears to be much higher. At the end of 2013, in fact, in Friuli Venezia Giulia the "home system" chain recorded a total of 5,231 operational sites, mainly active in the production of furniture (29.8%) and in the trade of furnishings and household products (36.7%), able to absorb almost 28,000 workers.

- The **companies working in this industry** are constantly investing in innovation and research (both for processes and products). Despite the economic crisis, at the end of the third quarter of 2014, **exports of furniture** in Friuli Venezia Giulia amounted to **EUR 909.2 million** (third place in terms of volumes sold abroad, after machinery and metal products), with a 5% **increase** compared to the same period of 2013. Equally positive is the trend of the **export of wood products**, which in the third quarter of 2014 records an export value of just over **EUR 300 million**, with a 4% increase compared to 2013.

- Altogether, **exports of furniture and wood products represent for Friuli Venezia Giulia 13.9%** of sales made abroad by the manufacturing enterprises in the Region.

- The areas to which the regional companies export more are the eurozone, the US and emerging countries. Considering, for instance, only the furniture manufacturing component, the production system exports the bulk of its production to the **United Kingdom** (19.0%), **Germany** (18.4%) and **France** (13.5%). Also important is the share of sales

<sup>2</sup> As identified by the Ministry of Economic Development - Department for the enterprise and internationalisation (2012).

to the **US** (about 5.4%) and to the BRIC countries (**Russia** in particular, which accounts for almost 6% of total exports of furniture).

- Local presence of important **strategic resources**, such as: the **Universities of Trieste and Udine**, with the faculties of engineering and their departments of physics and architecture; the **Science and Technology Parks** (e.g. The Area Science Park, Friuli Innovazione, the Technological Centre of Pordenone, Agemont Spa) with centres of innovation and/or research or innovative start-ups focused on the implementation/marketing of innovative products related to the home system, in particular the study and analysis of design; the **districts and consortia**, aggregations of companies operating in the home system (e.g. the Chair and Furniture District, now under revision).

With respect to the future, the metalworking sector will face the following challenges:

- **Protect** its products also internationally (intellectual property protection, especially in connection with design).
- **Increase** its level of competitiveness, especially with respect to emerging countries (both through the increased efficiency of production processes and through investments in innovation and of "cross-fertilisation" processes between different production aggregates).
- **Facilitate** the aggregation and internationalisation of enterprises. In particular, both to encourage work-sharing processes and to support the exchange of best practices and knowledge.
- **Increase** research and innovation in the field of eco-design and environmental sustainability of products and production processes.

## 2. The development trajectories

The innovations that have affected the "home system and technologies for living environments" are based on two macro aggregates: on one hand, the organisational and commercial dimensions, on the other the more technological aspects.

### 1) ORGANISATIONAL INNOVATIONS

Organisational innovations mainly concern the methods of construction of the enterprises of reference. The main changes occurring in the "home system" are briefly described below:

- **Repositioning**, linked to the development of commercial and marketing strategies for many of the companies as a result of declining demand and intensified price competition.
- **Internationalisation**, which has involved primarily the intensification of commercial efforts in foreign markets - also due to the great weakness of the domestic market - and, marginally, direct investment abroad dedicated to the creation of production or commercial facilities.
- **Development of commercial and marketing strategies**, concerning companies that are more structured and better equipped with managerial resources. The transformations, in this case, are mainly related to the extension of the indirect sales network abroad and the strengthening of trade marketing functions. An important role is played by the creation of products and collections dedicated to new functions (outdoor furniture, for instance) or to particular channels like online contracting and selling, currently being tested.
- **Evolution of distribution, with the growth of specialised large scale retail** able to offer the full range of products for the house system at reasonable prices (Ikea, for instance) and the simultaneous appreciation of the contract channel, in which the firms offering furniture systems and services for large public and private structures (hotel, restaurants, shopping centres, airports, hospitals, banks, public offices, etc.).

### 2) TECHNOLOGICAL INNOVATIONS

Technological innovations are linked to the production process of the manufactured items, of the "hard" type (i.e. determined by the use of new techniques, technologies and materials) or of the "soft" type, i.e. connected with the use of specialised computer programs.

Among the main innovations introduced recently, we can mention:

- **Process innovations**. The underlying trends concern, on one hand, the modernisation of production facilities, prompted by the need to recover productivity and, in this way, **lower unit production costs per unit** and, secondly, the **reduction of the environmental impact of processing**. The technology in this case is consolidated, and innovations are merely incremental. Process innovations must also be considered to include those aimed at acquiring a higher level of environmental sustainability by replacing harmful substances (mostly resins, adhesives, solvents and paints), promoting innovative forms of **energy recovery** from waste materials, pursuing greater energy efficiency as well as

experimenting with environmental management systems according to the EMAS standard or proposing a new eco-label.

- **Product innovations.** In this case there are definitely broad margins for improvement. Regional companies in the supply chain have always been attentive to innovation processes triggered by those companies being more market-oriented, more structured in terms of managerial skills and having a presence also outside the Region. Therefore, these companies give particular attention to the "concept" (deconstruction of the environment, modularity, integration or combination of functions), to the **design of specialised lines of products** so far not fully imagined by regional producers (outdoor furniture) and to the use of **new materials**, not only in the chair segment, and the testing of **new compound materials** (with an increased use of plastics and composites), or to the introduction, in the production of furniture and/or appliances, of electromechanical and electronic components (e.g. home automation, use of wireless systems).

- In the "home system and technologies for living environments", product innovation often involves the use of computer aided design and/or three-dimensional modelling with the help of specialised software (CAD/CAM, in particular).

The results provided by the **discussion groups organised with the stakeholders**, in relation to technological and scientific trajectories considered a priority, do not deviate from the recommendations made by the main literature. By way of example, we can mention (AIRI - Italian Association for Industrial Research - 2013): **i)** CAD - CAM tools for the design and manufacture of high quality and high variability products, **ii)** technologies for photovoltaic applications, **iii)** integration of electronic systems on silicon and new structural materials improving performance, energy consumptions and environmental impact.

Moreover, the technological areas identified as priorities for the development of the Italian industry include: **i)** energy-related innovative technologies, **ii)** new materials and **iii)** nanotechnology.

The elements highlighted by AIRI, by the Manufature Italia Technology Platform and by The European House Ambrosetti are in line with the observations made by the stakeholders from the Region.

**In addition, the priorities highlighted by the operators in Friuli Venezia Giulia are fully consistent with the strategic roadmap prepared by the European Commission.**

Drawing on the results of the "entrepreneurial discovery" process and the thematic groups of stakeholders, the Region has defined a set of four science and technology trajectories that are relevant for the territory and can be implemented immediately:

**1) TECHNOLOGY RELATED MATERIALS.**

In the "home system and technologies for the living environments", materials acquire a key role in relation to product innovation processes. This area encompasses all technologies adopted to improve the physical and chemical characteristics of the materials used for the production of goods related to the living environment (such as the treatment of the surfaces, for example for sound absorption, insulation, ecology) through **nanotechnology** or the so-called **smart materials**. These technologies are able to improve the performance and durability of materials (and consequently of the products) and find application, for instance, in the construction of intelligent furniture components (able to interact with their user - e.g. appliances) and in home automation, including the management of domestic systems and the management/production of energy.

**2) Methods and technologies for rapid design.**

This area includes all CAD/CAM systems aimed at producing parts and/or components of furniture, appliances, integrated management of domestic systems. This aggregate must also include 3D printers, which can manufacture parts and/or items of furniture using different materials (plastic, stainless steel etc.).

**3) Technologies for energy efficiency of buildings.**

These include all technologies used to improve the energy performance of buildings. In particular, the production of systems/plants for the production of solar and photovoltaic energy, particularly insulating materials able to substantially reduce the use of energy for cooling and heating living spaces.

**4) Cloud computing technologies.**

This area includes all technologies that allow assistance and remote control of facilities and appliances. By way of example, we can mention the so-called "Smart Grid" technologies, which take advantage of integration with electronics through the use of "intelligent" systems connecting, for instance, a washing machine with a smartphone.

## 2.3 MARITIME TECHNOLOGIES

### 1. Characteristics of the area of specialisation

The "Maritime Technologies" area of specialisation includes traditional sectors in Friuli Venezia Giulia that, over time, have created strong ties and interdependencies with other sectors of the regional economy. Specifically: shipbuilding and boat construction, offshore, including its specialised chains, transport, logistics, navigation services and yachting. This area, while maintaining its traditional character, has been able to develop and implement in its activities knowledge and technology that have allowed it to achieve an international standing and represent a distinctive factor in the economy of the Region.

- In 2013, the Region accounted for 1,350 active companies<sup>3</sup> in the field of maritime technologies, representing a total 1.25% of active businesses: 63 % of the enterprises operated in the shipbuilding sector while 24% were active in maritime transport and logistics. Research, regulation and environmental protection accounted for 11%, while marine mining for 2%. From a comparison with other aggregates local, regional companies active in the field of maritime technologies represent 17.3% of the total of the same companies in the Northeast and in the amount of 3% of the Italian total.
- With regard to entrepreneurial dynamics, in the 2001-2013 period Friuli Venezia Giulia saw a 1.8% increase in the number of companies in the sector, in sharp contrast with the national average, -0.7%, and with the data related to companies in the other economic sectors of the Region, which recorded a decrease of -2.2%.
- Maritime technologies account for 5% of the national total, while, on the employment side, in 2013 the sector employed about 28,200 workers, representing slightly less than 5% of the employment at the regional level (4.9 %).
- The value added of the sector consists in no less than 1.7 million, with an impact on the overall regional economy of 5.2% and an income per capita of EUR 1,375.
- As for the number of employees engaged in R&D activities, considering only those working in shipbuilding, seabed mining, handling of goods and passengers by sea, research, regulation and environmental protection (and excluding accommodation and catering, sports and recreation, fishing industry), the number is just under 1000.
- The activation ability of maritime technologies confirms the strategic value of this segment: just considering, on a national scale, for every euro produced, the impact on the rest of the economy is 1.9 euros. The largest contribution is provided by maritime transport sector, with 2.9 euros per euro produced, and the shipbuilding sector, with 2.4 euros per euro produced. In terms of activation ability, the Northeast and Northwest areas have the highest multipliers, respectively equal to 2.3 and 2.2 per euro produced by maritime sectors. Among the coastal regions of Northern Italy, Friuli Venezia Giulia and Liguria stand out, both with a 2.5 multiplier.
- In 2012, with reference to the production of ships and boats, of about EUR 2.7 billion exported almost 1.5 come from just three provinces, two in Northern Italy and one in Central Italy. In terms of shipbuilding, the largest specialised sectors in foreign trade follow the data already highlighted in absolute terms: Gorizia is again in first place, with an export share of 40.5% of the provincial total.
- The development of the sector was able to leverage multiple actors and stakeholders, by number and type, with good interaction capabilities. As an example, we can identify the regional naval and nautical Technological district FVG - DITENAVE, the commercial ports and tourist marinas (especially Trieste and Monfalcone, Grado, the area of the Aussa-Corno consortium, the Foci dello Stella Reserve, Marano Lagunare, Aprilia Marittima and Lignano), the regional research centres and the Universities of Trieste and Udine, the Higher Education Institute for Advanced Studies (ISAS), the CONFORM training consortium, whose participating agencies have contributed to the establishment and implementation of a training centre on maritime economy.

Looking at the future, such positioning can be maintained and improved only through:

- **Strengthening the competitive edge** of the sector, developing new solutions characterised by ambitious cost/performance ratios and expanding its shares in key markets, also with continued investment in research and development.
- **Leveraging the specific skills of the sector** creating a synergy between training institutions and companies in the area and enhancing the cooperation between scientific and industrial skills for the transfer of knowledge from the research sector to the enterprises.
- **Developing new financing methods** by resorting to private capital (i.e. venture capital) or public funding and promoting the self-financing capacity of enterprises.
- **Promoting a cooperative model of capacity building** within the framework of EU cohesion policies.

<sup>3</sup> <http://www.unioncamere.gov.it/P42A2264C189S123/Presentato-il-Terzo-Rapporto-sull-economia-del-mare.htm>

## 2. The development trajectories

The consolidation of interventions promoting research and development and technological and organisational innovation, to help create a sustainable value chain by leveraging the scientific knowledge and industrial skills of the territory and their possible interactions, is an essential factor to maintain high competitiveness and open up to international competition based on innovation in the field of maritime technologies.

The priority development trajectories for maritime technologies have been identified during the process of entrepreneurial discovery, based on **relevance and immediacy**.

In this context, there is a need, on the part of the industrial sector, to develop new generations of products able to meet the target set by European and international strategies in the field of maritime transport (increased transport capacity, reduced environmental impact, increased safety)<sup>4</sup>. Special consideration has been given to the fact that the Region features a world-class scientific capability in areas closely related to the technologies to be developed and, in particular, engineering, naval architecture, automation and home automation, environmental technology and mathematics applied to the industry developed by the regional academic and scientific system (especially the Universities of Trieste and Udine, Sissa and OGS). The selection of the trajectories has taken into account the fact that the territory includes the most important centre of naval and nautical design in Europe, a growing engineering network related to the off-shore, a leading European centre for the development of marine engines using alternative fuels, as well as a significant industrial sector encompassing shipbuilding, nautical construction, offshore and motoring, with the addition of one of the leading port-logistics systems in Italy with leading international connections and good nautical port structures.

The territory also includes, as evidenced in the other fact sheets, entrepreneurial and scientific sectors specialising in areas closely related to maritime transport, such as home automation, automation, material technologies, technologies related to Ambient Assisted Living, furniture and furnishings, environmental technologies.

In relation to the priority criteria and in line with the findings of the process of entrepreneurial discovery, the trajectories of development are those mentioned below:

### 1) **METHODOLOGIES FOR THE DESIGN AND DEVELOPMENT OF NEW PRODUCTS, PROCESSES AND SERVICES**

The indicated trajectory provides for investments in research and development for:

- The development of innovative approaches to design (methodologies and tools for alternative design, Life Cycle Design, design for dismantling and disassembling, etc.).
- The definition of new concepts for products, processes or services.

### 2) **"GREEN" TECHNOLOGIES AND ENERGY EFFICIENCY**

The indicated trajectory provides for investments in research and development for:

- Technologies and methods for the management and production of energy and the management of the on-board energy balance.
- Technologies geared at reducing the carbon footprint of the construction and management of maritime products.
- Processes geared at reducing the environmental impact of maritime transport (noise, vibration, chemical impact, recycling/reuse).
- Automation and home automation technologies and systems for on-board systems and living areas.
- New materials and/or new applications of environmentally sustainable materials, for the lightening of maritime means and energy saving.

### 3) **TECHNOLOGY FOR SAFETY**

The indicated trajectory provides for investments in research and development for:

- Technologies and systems for the safety of maritime vessels, infrastructure and transport systems.

<sup>4</sup> Main European and international strategy documents:

- EUROPE 2020 A strategy for smart, sustainable and inclusive growth - COM (2010) 2020 final
- A resource-efficient Europe - Flagship initiative under the Europe 2020 Strategy - COM(2011) 21
- WHITE PAPER Roadmap to a single European Transport Area - Towards a competitive and resource efficient transport system - COM(2011) 144 final
- IMO: AIR POLLUTION AND ENERGY EFFICIENCY - MEPC 63/INF.2; MARPOL Annex VI Energy efficiency amendments - RESOLUTION MEPC.203(62)

- Methods and systems for predicting the behaviour of the vessel in various operating conditions, even if extreme.
- Integrated on-board and sea-land navigation systems, port operations, management of offshore vessels.
- Technologies and systems in support of the human operator and for the reduction of human error.

## 2.4 SMART HEALTH

### 1. Characteristics of the area of specialisation

The **BioHighTech** sector is represented in the Region by more than 150 companies operating in the field of healthcare (*Smart Health*) within three closely related Bio sectors: Biomedical (BioMed), Biotechnology (BioTech) and Bioinformatics (BioICT), including some large enterprises like Bracco Imaging, TBS Group and Lima Corporate, along with those of small and medium size, with large worldwide markets holding good potential for increased turnover.

This is a field of specialisation that can be partially connected to the chemical industry, a sector that includes a wide range of productive activities - broken down into the following three categories: manufacturing of coke, oil refineries, treatment of nuclear fuel; manufacture of chemicals and man-made fibres; manufacture of rubber and plastics - and involves a complex system of skills in different domains. **At the regional level**, the sector has a **number of workers amounting to 5.3%** of the total in manufacturing activities. It is characterised by a **relatively small number of production companies**: 285 companies in 2011<sup>5</sup> between craft and industry, with 145 local units on the territory. The enterprises in the sector are: **79 relating to the manufacture of chemical products, 11 related to the manufacture of basic pharmaceutical products and pharmaceutical preparations, and 195 related to the manufacture of rubber and plastic products**. As of 2010, the industry accounts for **6,649 workers** and represents about 12% of the regional turnover.

Of particular importance is the **spending on innovation per employee**, which at the regional level is among the highest of the entire industrial sector: EUR 29,338 for pharmaceuticals (second only to the spending of the paper industry); EUR 8,802 for chemicals and EUR 2,212 for rubber and plastics (year 2012).

In 2010, the chemical sector in the Region registered **exports for over EUR 980 million (8.6% of the total)**, against a volume of **imports of about EUR 836 million**. This is the only sector in the Region that seems to have gone through the recession unscathed. However, it presents balances between exports and imports that are structurally passive, with specific reference to medicinal chemistry. In 2010, the export of Chemicals<sup>6</sup> of Friuli Venezia Giulia presented the following percentage distribution by province: Gorizia (9.2%), Udine (44.7%), Trieste (14.6%) and Pordenone (31.5%).

Specifically regarding the BioHighTech segment, the following is a more in-depth study of the three Bio sectors.

- **Biomedical (BioMed)**: - This sector includes the Italian companies operating in the biomedical field leveraging methods and concepts derived from biomedical technologies in order to meet the needs of healthcare professionals. They are represented in Italy by Assobiomedica, established in 1984, which in Europe, through Eucomed, is part of MedTech Europe from 2014, with sales in Europe of around EUR 100 billion/year with about 25,000 companies (95% are SMEs), 575,000 employees and an average annual growth rate of 4%, also registered in recent years of crisis (2010-2012) and a European market corresponding to about 1/3 of the global market<sup>7</sup>.
- **Biotechnology (BioTech)**: - This sector includes the companies working in biotechnology, represented nationally by Assobiotec, an association established in 1986 within Federchimica for the development of

<sup>5</sup> M.Passon, F.Buiatti, M.Cappello, "Il settore della Chimica nell'economia del Friuli Venezia Giulia" (The chemistry sector in the economy of Friuli Venezia Giulia", Chamber of Commerce of Udine, 2011

<sup>6</sup> Chemical substances and product, Pharmaceutical products, medicinal chemicals and botanical products, Rubber and plastic products and other products involving the processing of non-metallic minerals.

<sup>7</sup> <http://www.assobiomedica.com/static/upload/pri/pri-2013.pdf>; <http://www.eucomed.be/>; [http://www.medtecheurope.org/uploads/Modules/MCMedias/1379401982406/medtech\\_graphic\\_130912\\_portait\\_small.png](http://www.medtecheurope.org/uploads/Modules/MCMedias/1379401982406/medtech_graphic_130912_portait_small.png); [http://www.eucomed.org/uploads/Modules/Publications/the\\_empti\\_in\\_fig\\_broch\\_12\\_pages\\_v09\\_pbp.pdf](http://www.eucomed.org/uploads/Modules/Publications/the_empti_in_fig_broch_12_pages_v09_pbp.pdf)

biotechnology in Italy. It also includes Scientific Enterprises and Parks operating in the field. At the end of 2013, 422 biotech companies engaged in research and development were recorded in Italy. The total turnover of BioTech is stable at around EUR 7.0 billion, with 52,000 employees and a global investment in R&D of EUR 1.5 billion; for pure biotech companies, the turnover is EUR 1.3 billion with 8,300 employees and an investment in R&D of EUR 557 million. The vast majority (77%) of Italian biotech companies are very small (<10 employees) or small (<50 employees).

- **Bioinformatics (BioICT)**<sup>8</sup>: - This sector includes companies working in the field of Bioinformatics, represented within Confindustria by Assinform (Italian Information Technology Association). In Italy in 2010, the Medical Informatics market amounted to EUR 0.8 billion compared with EUR 2.3 billion in Germany and France and EUR 4.0 billion in the United Kingdom.

- Below is some key data of BioHighTech in the Region: **67** companies operate in **BioMed**, **64** in **BioTech** and **20** in **BioICT**: BioMed and BioTech are almost equally represented, with percentages respectively of 44.4% and 42.4% of the total, while BioICT represents a smaller share, 13.2%.

- The development trend of the industrial enterprises in the BioHighTech sector in Friuli Venezia Giulia saw an increase, from 2010 to 2013, in the number of its **employees** and, consequently, of the turnover: from a survey conducted on 31 companies in the sector, the number of workers increased as much as about **27%**, going from **876** to **1,111**, while the turnover underwent a positive change of **14%**, in absolute terms from **EUR 129 million** in 2010 to **EUR 147 million** in 2013.

- Companies in FVG operating in the **BioMed** sector recorded a turnover of around EUR 330 million, with an export ratio on production volume of around 35% with peaks represented by large companies such as LIMA Corporate, Brovedani Group and Bracco Imaging, which export more than 70% of their productive volume. Also in the regional **BioTech** sector, the total turnover of SMEs is around EUR 300 million, with an exported volume of production of around 35% (e.g. Tecna 40% and Biofarma 25%). The regional **BioICT** sector consists of SMEs and a few large companies such as Eurotech and Insiel Mercato, with a turnover respectively around EUR 80 and 25 million. The export of this sector recorded a percentage of around 30%. This specific and important industrial reality in the BioHighTech field is closely linked to the excellence of scientific research and training carried out in the Departments of the three Universities (Trieste, Udine and SISSA), in the Research Institutes (Synchrotron, ICGEB, CIB, ICTP, CNR, etc.) and healthcare and social structures (University Hospital of Trieste and Udine, IRCCS-Burlo Garofalo of Trieste and CRO-IRCCS of Aviano di Pordenone, ITIS- Public Company for Social Services of Trieste, etc.).

- Since 2014 an ITS - Higher Technical Institute on "New Life Technologies" has been operating in the Region, with the State Technical Institute "A. Volta" of Trieste as the educational institution of reference, offering post-graduate non-academic technical study courses for the training of highly skilled technicians dealing with the management and maintenance of biomedical equipment, diagnostic imaging and biotechnology as well as highly skilled technicians for the development and management of systems and solutions applied to medical informatics and bioinformatics, and is a unique entity in Italy for the content of the training courses it offers.

- As part of the regional healthcare and social policies, the Regional Administration has invested in policies for the active promotion of home care, by taking steps to strengthen social and healthcare services at home, to create integrated care procedures guaranteeing the continuity of care between the hospital and the Territory (Healthcare Districts, Family doctors, Social Services of Municipalities), to establish the Possible Self-Sufficiency Fund and the Fund for at home support of people in need of intensive home care (Art. 10 of Regional Law 17/2008). In general, the issue of improving the quality of life of the elderly or of people with disabilities, along with active aging, represent challenges that the Region in recent years has translated into practical actions, both in terms of support for research and innovation, and in terms of services related to healthcare and welfare (<http://www.wecare.fvg.it/casa-e-ambient-di-vita>).

MedTech is a European market amounting to about EUR 100 billion per year, with about 25,000 companies (95% SMEs) employing about 575,000 employees with an annual growth of 4%, even in the recent years of crisis (2010-2012). The Friuli Venezia Giulia Region has an incidence of turnover and employment rate per capita in the sector higher than the European and Italian averages and an estimated growth in the same period (2010-2012) similar to the European and Italian average. Projecting these results on the entire sector (151 companies), we can calculate a production value of around EUR 800 million for 5,800 employees and, assuming the current trend with the addition of support for public investment in research, development and innovation, we can assume that in 2020 the regional

<sup>8</sup> For the original definition: [http://cordis.europa.eu/fp7/ict/fet-proactive/bioict\\_en.html#what](http://cordis.europa.eu/fp7/ict/fet-proactive/bioict_en.html#what)

sector may reach nearly one billion euros in revenue and 8,500 employees<sup>9</sup>, also with the promotion of new start-ups. Market development can be fostered by innovative public demand by the regional healthcare and social sector. Considering the fact that Friuli Venezia Giulia is one of the oldest regions in Italy and the world<sup>10</sup>, the entire Region with its main stakeholders (companies, research centres, science and technology parks, non-profit organisations, local authorities and others) can be considered a *living lab* for the development of new technologies and services in a perspective of smart & active aging.

With respect to the future, companies will have to focus their attention on the following challenges:

- Create and promote **associations and networks of enterprises**, thereby increasing technology transfer and reducing fixed management costs.
- **Prevent delocalisation** outside the Region, a possible consequence of the difficulty of finding skilled human resources with previous working experience and the logistic isolation of scientific facilities.
- **Find alternative funding** for new investments, considering the decline in the availability of public funds and the lack of knowledge of the mechanisms and risks of investment in the field of BIO of the private sector, including the credit system.

## 2. The development trajectories

The specialisation includes biomedical technologies, in vivo and in vitro diagnostics (trajectory 1); medical informatics and bioinformatics (trajectory 2); innovative therapy (trajectory 3); *technologies for Ambient Assisted Living (AAL)* (trajectory 4).

The priority trajectories for the development of the "Smart Health" sector have been identified during the process of entrepreneurial discovery, based on relevance and immediacy. The trajectories of development are mentioned below:

### 1) BIOMEDICAL, IN VIVO AND IN VITRO DIAGNOSTICS

The biomedical and in vivo diagnostics fields include the production of innovative technological solutions for the development of *medical devices*, including *diagnostic imaging* systems, for the development of new products for *advanced biosensors* and for *prosthetics*. In the latter area, an important role is also played by regenerative medicine, with the related creation of *biomaterials and bioreactors* for which top level research is under way, with the development of prototypes ready to reach the market. Additional factors are the innovative support services for the outsourcing of the technologies mentioned above.

In vitro diagnostics, however, includes the research and development of technology platforms for *human diagnostics and clinical evaluation of the patient*, for *food diagnostics (quality, traceability and safety)*, for *veterinary and environmental diagnostics*. The expected technological innovations will be based on the most advanced knowledge in biochemistry and biotechnology, as well as the skills related to *biosensors and advanced microscopy*.

This trajectory can stimulate the creation of added value in a particularly innovative sector like personalised and translational medicine. Translational medicine focuses on the ability to quickly transfer new knowledge from basic science to biomedical research, in order to generate advanced diagnostic and therapeutic applications while offering new diagnostic instruments.

### 2) MEDICAL INFORMATICS AND BIOINFORMATICS

Medical informatics and bioinformatics go increasingly towards an integrated and holistic vision of care levels, making sure to really put the patient at the centre and combining hospital and residential assistance with the health and social services in the territory and home care, in view of increasing social and health integration.

<sup>9</sup> CBM - BioHighTech: unified strategic plan for the integrated industrial development of the BioMed, BioTech and BioICT sectors in a context of growth synergic and coherent with the system that includes Universities, Research, Training and Healthcare and Social care, in Friuli Venezia Giulia - 2014.

<sup>10</sup> Reference can be made to the context analysis in Chapter 1, according to which long-term care will be a burden on families getting increasingly smaller and older (in 2011 the average number of members per household was 2.21 and families with two components are 29.5% of the total).

This trajectory provides for the integration of the technological solutions for **hospital informatics, social and health informatics, informatics for bio-imaging, informatics for the medical laboratory and blood bank**, to arrive to more advanced fields like the implementation of innovative software systems and solutions for personalised medicine, integrated with the software systems and solutions of biomedical and biotechnology instrumentation (bioinformatics).

### 3) INNOVATIVE THERAPY

The innovative therapy field includes the productions of **biotech drugs or customised biopharmaceuticals** (e.g. in the fields of oncology, neurodegenerative and inflammatory diseases), the development of advanced biotechnological platforms for the production of drugs aimed at the treatment of **rare diseases**, the production of technologies for **cell therapies, gene therapies, small molecules**, as well as the production of **bio-materials** and the implementation of **advanced services to support these productions**.

With regard to emerging industries in the Region, these mainly arise from academic start-ups and public research, which are very innovative and competitive also for the ability to interact with the large chemical and pharmaceutical industry and other small and medium regional companies operating in the sector.

### 4) AMBIENT ASSISTED LIVING - AAL

This trajectory includes the both *indoor* and *outdoor* set of technological solutions, designed to make the personal living environment active, intelligent and cooperative, both in relation to the person and the community, effective in supporting independent living, able to provide increased safety, simplicity, well-being and satisfaction in the performance of daily activities. This trajectory appears to be a priority for the Region, as it integrates well with the regional policies on social health, aimed at containing public health spending by increasing health literacy. A real chain can be imagined, which, starting from prevention, goes to the treatment of the disease, in acute cases in hospitals and in chronic cases in public or private residential facilities and/or in households. The areas of application are products and services related to *telemedicine, telecare, home automation, nutraceutic, health aids*, as well as other products and services for the prevention and the welfare of citizens. The different areas of AAL concern the technologies for improving the HEALTH of the person in terms of supervision, care and prevention, for the improvement of ASSISTANCE, for increased WELLNESS AND COMFORT and for the management and optimisation of SAFETY in indoor and outdoor spaces.

## 2.5 CULTURE, CREATIVITY AND TOURISM

### 1. Characteristics of the area of specialisation

Identified as relating to the management of cultural heritage, non-industrial artistic productions and all those activities that draw their creative nourishment from culture and contribute to the diffusion of its meanings and values in the production of goods and services, the **regional creative and cultural system is**, by its definition and composition, a **fabric connecting companies, territories, universities and the Administration**.

The dissemination of culture and the strengthening of the cultural and creative system constitute for the Region a **prerequisite for overall growth of the individual and the whole community** and an area of specialisation in which to employ, in the most profitable way possible, the financial resources available. The action is strategic for a smart and sustainable growth in the Region, because the cultural and creative sectors have a strong potential for development and interconnection with advanced services and ICT, particularly regarding the fields of architecture, design and graphics applied to the home system chain, but also all the crosscutting technologies with various uses in the entertainment areas in general.

The **enterprises working in this sector and based in Friuli Venezia Giulia** are 8,622, 1.9% of the Italian total. Trieste, with 1,484 companies, representing 8.9% of the total active businesses, ranks ninth in the provincial list. The entrepreneurial phenomenon is characterised by a growing presence of young people, women and foreign citizens. In reference to young enterprises, the "doing business" concept is affected by the higher degree of innovation that normally characterises cultural enterprises and by the shortage of employment, which pushes large sections of the population under 35 towards self-employment. Also in the case of women-owned businesses the barriers to entry into the labour market is the main lever that turns a woman into an entrepreneur (15% of cultural companies have a female connotation). Finally, with regard to foreign companies, representing 4% of cultural enterprises, self-employment is motivated by the desire to improve the person's employment status.

The sector is characterised by a remarkable vitality and a structural anti-cyclical capability, demonstrated **by the increase in cultural enterprises of 3.3% compared to 2011**, about three percentage points higher than the figure recorded for the entire Italian entrepreneurial sector. **The system of cultural industries is one of the few that has continued to grow even during the crisis**. In fact, in terms of added value and employment by the cultural production system, data as of 2013 shows that cultural and creative enterprises, in Friuli Venezia Giulia, produce 5.7% of the added value (slightly higher than the national average and the average of the Northeast, both at 5.4%), while in 2012 it was 5.4%. Also in terms of employment, the regional figure is higher than the national figure and that of the Northeast: FVG 6.2% (5.8% in 2012), Italy 5.8%, Northeast 6.1%. At the provincial level, Pordenone is in second place in the national rankings with regard to the percentage of added value (7.9%) and in fifth place with regard to the incidence of employment (8.6%), showing that the "culture" factor is an element of growth for the whole economy.

To better understand the potential of the creative cultural system in FVG, suffice it to mention some numbers regarding audiovisuals and media: in the territory there are 102 cinemas (8.4 per 100,000 inhabitants) for a total of 82,571 shows with an income of nearly EUR 27 million (2012 data). This means 6,769 shows every 100 thousand inhabitants, compared with 5,011 at the national level.

Significantly higher than the national average is also the **ability of regional cultural companies to create networks**: 17.3% of the companies have signed a network contract against 13.8% at the national level (FVG is in fourth place behind Molise, Toscana and Umbria).

Moreover, we should consider the **multiplier effect of the cultural sector**, understood as the ability to "move" other productive activities that contribute, upstream, to the production of its inputs and, downstream, facilitate the dissemination of the products/services up to the placement on the reference markets (e.g. transport, trade, etc.), along with anything related to marketing and the more general business services (management consultancy, financial and professional services, etc.) The Italian average is 1.7, while **the regional ranking is led by Friuli Venezia Giulia, where the multiplier effect reaches 2.1**, followed by Veneto (2.0), Tuscany, Lombardy and Marche (all with a value of 1.9). Practically speaking, in Friuli for every euro invested in the culture sector there is a return of 2.1 euros.

With regard to **the relationship between culture and tourism, the artistic and cultural heritage is for many tourists the driver as well as the starting point of their holiday experience**. The cultural sector becomes a key component in the development of the area when, along with the presence of attractors, such as museums and historical and cultural

heritage in general, there is an adequate offer of tourist accommodation and services and the ability to integrate a cultural stay with other activities, ranging from food and wine to folklore, and that are aimed at making the tourist an active participant in the travel experience. This makes the multiplying and transversal effect of culture truly effective. The statistical processing of Unioncamere on tourism expenditure linked to the cultural factor shows that **in Friuli Venezia Giulia almost 50% of tourist spending (49.7%) is connected to culture**. The Region is in second place just after the Marche (49.8%) and 13 percentage points above the Italian average (36.5%). Regarding tourism expenditure connected to the cultural industry in the different urban areas, by analysing the relationship between population size and tourist spending we can better understand the propensity of each territory to be active in the cultural sector, regardless of its more or less touristic connotation. This analysis shows an important role of the cultural component in the municipalities with up to 2,000 inhabitants, and then there is a decrease and again an increase in medium-large urban centres (50-100 thousand inhabitants), with the highest levels in large metropolitan areas with more than 500,000 inhabitants.

Another indicator showing the importance of the sector is provided by the **propensity to cultural export**, e.g. the ratio between exports of the cultural production system and the value added to the economy. At the national level, this index has grown, between 2009 and 2013, by nearly one percentage point, amounting at 3%. This growth is linked to the increase in cultural exports (+ 5.5% between 2012 and 2013, in contrast with total exports stable at 0.1%) and a fall in imports (- 5.1%). In the two-year period mentioned above, the leading role was played by creative industries (+ 6.2%) more than by cultural ones (-3.2%). At the regional level, Tuscany is in the leading position, thanks to an index of 7.9%. Veneto is in second place (7.2%), while **Friuli Venezia Giulia is in third position, with 6.0%**. The regional figures, between 2009 and 2013, have remained almost stationary (in 2009 the index was 6.2%), in contrast with other regional competitors (Tuscany: + 2.9% and Veneto: +1,8%). At the provincial level, among the first 20 we find Gorizia (third place) and Pordenone (seventh). Friuli Venezia Giulia is in third place also in relation to the total export: the cultural sector accounts for 17.3% of total regional exports. In this case there was a decrease compared to 2009, when the index was 18.2%.

The growth of an industry depends not only on the entrepreneurial capabilities of the operators, but also on the local presence of adequate professional skills and highly trained human resources, able to support innovation and research processes.

In the case of culture, the development of the industry has enjoyed the contribution of a **large number of players**; in particular, 142 museums and similar institutions, of which 123 museums, galleries and collections, 3 archaeological areas or parks and 16 monuments and historic complexes. Considering only the state owned museums and art galleries, the active units in FVG are 11: 8 with free admission and 3 with paid admission. In 2013, they received a total of almost 1 million 220 thousand visitors, of which more than 160 thousand paid an admission fee. The paid admissions produced a (gross) income of about 600 thousand euros, with an average expenditure per paying visitor of about 4 euros.

## 2. The development trajectories

### **Technologies for the conservation and enhancement of goods and products**

These are the technologies required for carrying out any intervention, also at the operational level, to assess the state of conservation of cultural assets and analyse the morphological and structural properties of the materials that make up that asset.

This applies, for instance, to technologies used for the survey of the cultural assets, risk assessment, the definition of interventions and diagnostics aimed at arresting the processes of damage and decay, and the restoration of information supports and the related content.

### **Geomatics and image processing**

This includes all techniques related to the electronic processing of images, such as, for instance, the capturing and rendering of computerised drawings, or video-graphics.

These are the technologies used to acquire, measure, classify, integrate, process, analyse, store and distribute georeferenced spatial data in a digital format.

#### **Social platforms and sharing**

This refers to all platforms that "manage" the main social tools (such as Facebook, Twitter and Google+). These are technologies that, for instance, are able to analyse and optimise the performance of websites in addition to managing and moderating the discussions in the various networks.

These technologies are especially applied in the tourism sector (e.g. the reviews about hotels, the many Facebook pages dedicated to the satisfaction of tourists in relation to their stay).

### 3. The Action Plan

The implementation of the Strategy is achieved through the use of financial resources from different sources and with different instruments: the action plan is based on the "*policy mix*" concept and follows the indications of the JRS "*RIS3 Implementation and policy mixes*". The goal is to integrate the different tools and resources within a framework consistent with the methodological priorities and expected changes. This involves 3 different types of instruments: those providing direct support, indirect support and contextual support, summarised as follows:

- **Direct:** actions supporting directly and only the Areas of Specialisation and their development trajectories.
- **Indirect:** Actions that, while not concerning S3 Areas, support measures in support of Research, Innovation and Development of the regional economy.
- **Context related:** measures strengthening the competitiveness and the overall regional context, and complementing or stimulating the prospective implementation of the S3, but not directly connected to it.

Direct actions amount to EUR 105,710,315, indirect actions to EUR 110.65.487 (prospective/expected values as at 2023).

The **beneficiaries** of the planned measures can be identified by type, such as companies, research centres and training organisations or can be individuals specifically identified as competent to carry out the activities covered by the measures, such as, for instance, scientific and technological parks and districts (for technology transfer initiatives).

The following table shows the matrix of financial resources by funding source (Table 1).

Table 1 - Financial resources by funding source

FUNDING SOURCE	DIRECT	INDIRECT	CONTEXT	TOTAL
ERDF OP 2014-2020	77,120,653		39,000,000	116,120,653
ERDF OP 2007-2013		15,287,062		15,287,062
RDP 2014-2020		63,650,000		63,650,000
ESF ROP 2014-2014	16,191,496			16,191,496
RIP FDC 2007-2013	400,000			400,000
Horizon 2020	38,566			38,566
National resources	507,000			507,000
Regional resources	11,452,600	30,767,000	73,700,000	115,919,600
Private resources		961,425.24		961,425.24
<b>TOTAL POLICY MIX</b>	<b>105,710,315</b>	<b>110,665,487</b>	<b>112,700,000</b>	<b>329,075,802</b>

The matrix highlights a mix of policies and tools that involve the use of resources from both the Structural Funds (ERDF, ESF, EAFRD) and national, regional and community resources (such as cooperation or direct management programs).

By way of example, among the **resources of regional origin** aimed at **direct actions** we can mention:

- Funding of industrial research, experimental development and innovation for companies in the domestic appliance industry (Regional Law 3/2015).
- Activities of local promotion of Technological Districts.
- Funding of the activities of the Naval Technology District (MARE TC FVG).
- Funding of application activities of studies and research works of the Institute of Oceanography and Experimental Geophysics (OGS).

The following table shows the totals for each area of specialisation and the related development trajectories deriving from the mix of instruments described above. The information will be subject to periodic evaluation and monitoring, aimed at the possible revision of the S3. It should be noted that the area "Culture, Creativity and Tourism" has been identified as a privileged experimental sector for the fertilisation of new enterprises, with an allocation of EUR 4 million.

Table 2 - Financial support to the areas of specialisation

<b>AREAS OF SPECIALISATION AND DEVELOPMENT TRAJECTORIES</b>	<b>AREA (ML) 2015-2017</b>	<b>AREA (ML) 2018-2023</b>	<b>AREA (ML) Total</b>
<b>Maritime technologies</b> - Methodologies for the design and development of new products, processes and services - "Green" technologies and energy efficiency - Safety technologies	<b>5.730</b>	<b>13.980</b>	<b>19.710</b>
<b>Smart health</b> - Biomedical, in vivo and in vitro diagnostics - Medical informatics and bioinformatics - Innovative therapy	<b>5.880</b>	<b>13.980</b>	<b>19.860</b>
<b>- Strategic productions chains (metalworking)</b> - Technologies for the numerical modelling of processes and products - Methods and technologies for integrated design - Intelligent machines	<b>9.980</b>	<b>13.990</b>	<b>23.970</b>
<b>Strategic production chains (home system)</b> - Technologies related to materials - Methods and technologies for rapid design - Technologies for the energy efficiency of buildings - Cloud computing technologies	<b>9.590</b>	<b>13.990</b>	<b>23.580</b>
<b>Agribusiness</b> - Industrial design - Innovative product storage systems - Smart packaging - Chemical analysis	<b>4.480</b>	<b>14.110</b>	<b>18.590</b>
<b>TOTAL</b>	<b>35.660</b>	<b>70.050</b>	<b>105.710</b>

As regards the **indirect actions** supported by regional funds, we can mention as an example:

- The ERMES Program, dedicated to the implementation of broadband connections for the industrial areas in the Region, which is part of the three-year program for the development of ICT, e-government and electronic infrastructures of FVG and is partially supported by the ERDF OP 2014- 2020
- The financing of managing bodies of Science and Technology Parks
- The coordination of Research Institutions

Then there is the category of the so-called **context actions**, which stem from a series of measures in the form of incentives dedicated to young and female entrepreneurs, industrial development, the attractiveness of the economic system, which are complementary to the S3 also through the European programming.

The **European resources** are mainly generated by the actions under the **ERDF, ESF, RDP funds** and in part from the **FDC RIP**.

By way of example, **among the direct actions** supported by funds from the European Community we can mention the 77 million euros made available by the **ERDF OP 2014-2020** in support of:

- Collaborative R&D activities for the development of new sustainable technologies, new products and services.
- Economic valorisation of innovation through the experimentation and adoption of innovative processes, products and organisational forms, as well as through the financing of the industrialisation of research results.
- The creation and consolidation of innovative start-ups with intensive application of knowledge and research spin offs.

The **ESF ROP** supports (for a total of EUR 16 million) direct actions such as the development of higher postgraduate education and the outgoing and incoming mobility of researchers, lifelong learning for the promotion and activation of cultural processes in terms of innovation in the enterprise and the initiative IMPRENDERÒ 5.0, while the **FDC RIP** will support the laboratory of mechatronics (action line 3.1.2).

A significant share of indirect actions will be funded by the RDP 2014-2020, such as the investments for the processing, marketing and development of agricultural products, the efficiency of water use, the consulting and information activities to improve the skills of farmers.

The framework described above concerns the extent of public intervention in support of the areas of specialisation and, more generally, the improvement in competitiveness of the regional economy. This system also aims at acting as a lever for a greater stimulus of **private investment**, also through greater coordination of regional policies in support of research and development and innovation, regarding both supply and demand. The set of coordinated measures envisaged by the European programming and by the regional legislation may also encourage **private investment** in the following areas:

- Research, development and innovation, through dedicated incentives or through policies focusing the attention to the issue of intellectual property.
- The acquisition of advanced external expertise and/or the start of research, development and innovation projects thanks to the innovation vouchers and the financing of machinery, equipment and tools.
- The creation and growth of new enterprises, also supported by national measures such as Legislative Decree 179/2012 supporting the creation of innovative businesses, also with coworking services and the emergence of fab labs.
- The rooting in the Region of companies investing in R&D also thanks to fiscal policies, as envisaged by the plan *Rilancimpresa FVG*, promoting the attractiveness of the Region through fiscal levers, the adoption of a regional marketing program, the simplification of settlement procedures and the conclusion of regional contracts.

These measures will be supported by other interventions that, in various ways, directly or indirectly, will help strengthen this leverage effect on private investment aimed at improving the context in which businesses operate. This has been happening for some time through established tools supporting the economy such as the **promotion of the cooperation between enterprises, universities and research centres, the clustered organisation and aggregation network, the reduction of administrative burdens** and the law on **State aid** for those aspects in which this may affect the activities of research and development. A specific mention should be made of the Administrative Strengthening Plan through which the regional structures aim to improve their operating performance and the introduction of the

"SME test" in accordance with the provisions of the Small Business Act for the systematic evaluation of the impact of legislation related to SMEs.

## 4. The Governance

The *governance* of the S3 is closely linked to its strategy definition process. The process of entrepreneurial discovery initiated during the identification phase of the areas of specialisation and related technological trajectories, facilitated outlining a model of public-private partnership, structured as a permanent dialogue between the actors of the quadruple helix. The involvement of the stakeholders and the phase related to the collection of contributions was integrated with the institutional process, which by its nature has a "*Top-down*" approach, facilitating closer cooperation between the different levels and creating a model of *governance* that is both **inclusive** (since it is open to the participation of different subjects) and **durable** (since it is intended to continue also in the implementation phase of the S3).

The decision-making process that drives and enables the implementation of the model consists of several stages and involves the activities of the four bodies listed below, which represent different levels of stakeholders, including institutions and economic or social partners.

- **Steering Committee of the smart specialisation:** as a management body in charge of executing the guidelines provided by the Regional Government, the steering committee is made up of the directors of the coordinated Services of the smart specialisation strategy, who guide and direct the work, and representatives of other relevant Services in specific fields. This is the only body authorised to propose to the Regional Government any changes to the document, it is responsible for the practical implementation of the S3, driving the activities of the Services and ensuring the coordination between funds, the communication with the territories, the transparency of processes and the evaluation of results. It is conceived as the body delegated to apply the strategic guidelines of regional policies, in order to ensure maximum effectiveness of the implementation of the strategy.

- **Strategic Committee:** the liaison between the Regional Administration and the stakeholders, with the task of providing elements related to the individual areas of specialisation in the implementation and revision stages of the Strategy. The Committee includes the coordinators of the regional Working Groups, the representatives of trade associations and the CER, respectively representing the entire productive system and the regional scientific system, and the Services coordinating the Strategy.

- **Technical Secretariat:** supports technically and operationally the functions of the Steering Committee and the Strategic Committee, performing tasks such as the convening of the groups, the collection of information, the preparation of reports, the contacts with the JRS, the organisation of the General Meeting.

- **General stakeholders' meeting:** the representation of the regional community of innovators that make up the quadruple helix. It is responsible for the discussion and debate between the various representatives of the production, research and institutional worlds, in order to actively contribute to the implementation of the Strategy by facilitating knowledge sharing and cross-fertilisation.

These bodies work in conjunction with the **Regional Council**, the decision making and policy making body with the right to approve and amend the Strategy document, and with the regional **Working Groups**, as representatives of the regional economic and knowledge systems. The Tables guarantee the involvement of the enterprises and enable the participation of stakeholders in the areas of specialisation of reference, which also include representatives of the social partnership. This way, all of them can significantly contribute to the implementation and revision of the Strategy, supporting the Steering Committee and making use of facilitators as *liaison* between the decision-making strategic level and the operational one that, thanks to constant animation activities, ensure the highest involvement of the stakeholders, and foster inter-sectoral and interdisciplinary dialogue. Among the facilitators it is worth mentioning the **CER** (Coordination of Regional Research Institutes) with the task of facilitating this dialogue fostering primarily the involvement of the regional scientific institutions, also through the creation of multidisciplinary Working Groups, as well as supporting the Regional Administration in the continuous process of entrepreneurial discovery.

## 5. Monitoring and Evaluation.

The monitoring, evaluation and peer review of the Strategy have been planned as distinct but complementary activities: the monitoring will be an ongoing process, the evaluation will be implemented at certain points in the life of the program and the *peer review* will take place in accordance with the deadlines set by the JRC in Seville. These activities share a system of indicators as a fundamental tool, which should ensure a flow of consistent and meaningful information aimed at understanding the performance of the interventions and allowing them to be re-oriented if needed.

The **monitoring system** consists of 4 sets of indicators: context, implementation, results and impact. The decision to provide 4 different sets of indicators aligns the of monitoring and evaluation activities of the Friulian S3 to the new European guidelines for the 2014-2020 programming period.

Impact indicators aim in particular at identifying the net effect of the intervention of the S3 with respect to each of its priorities. This information will be collected and processed by an independent evaluator that will be identified for this purpose. For better understanding of the impact evaluation of the S3, the indicators will be further broken down for each area of specialisation.

The monitoring information will be collected in the Annual Implementation Report (RAA) prepared by the Technical Secretariat. The main source of the monitoring indicators will be the monitoring systems of the ROPs. This because most of the interventions will be implemented through structural funds, and also to avoid unnecessary duplication of requests for information made to businesses and the relevant regional services. The main objective of the RAA, however, is to keep, the regional stakeholders and the entire governance structure informed and thus involved, as illustrated above.

As for the **evaluation** of the impact of the S3, this fulfils two major needs:

1. Understanding if the measures put in place have been effective and efficient.
2. Understanding whether the government and governance mechanism have guaranteed the necessary level of inclusiveness and, at the same time, operational capacity and the specific objectives of the S3 have been achieved as a whole.

The first need will be addressed in the evaluation of the individual ROPs when assessing of performance and impact of the individual Thematic Objectives as laid down in Regulation 1303/2013 (art. 47 et seq.). The evaluation, carried out as part of the ROPs, will assess if and how the Thematic Objectives (above all, the Thematic Objective No. 1) have been achieved within the framework of the specific indicators.

The second need (solely focused on the S3) will be addressed through a specific evaluation activity that will also cover the interventions not supported by the EIF. The activity will be essentially a meta-evaluation that will include the results of evaluations carried out under the Operational Programs aimed at verifying that the specific policy objectives of the S3 have been achieved.

In both evaluation activities, the combination of a *theory-based* qualitative approach with a counterfactual methodology appears to be particularly useful. The monitoring system will of course be the starting point of all planned evaluation activities.

The evaluation of the S3 will be integrated into the Regional unified evaluation system.<sup>11</sup>

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<sup>11</sup> Unified evaluation plan for the regional policies of development and cohesion of the FVG Region for the 2014-2020 period pursuant to Regional Council's Deliberation no. 2140 of 29.10.2015