



European Union
European Regional
Development Fund

Smart Chemistry Specialisation Strategy

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

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1. Description of partner region

1.1 General Description

Asturias, located in the northwest of the Iberian Peninsula, is a region of 10,604 square kilometres and 1 million inhabitants. It is one of the 17 Autonomous Communities that make up the Spanish State. With 354 km of coastline, it has two ports: the goods port of Avilés, and the port located in Gijón, El Musel, which is the principal bulk-carrier port of the Spanish port system.

The Asturian population and the economic activity are grouped in the central metropolitan area of the region. The strong industrial activity contrasts with its extraordinary natural beauty. It is renowned as a Natural Paradise, which is reflected in its major extension of natural landscapes located in the wings of the territory (30% protected areas, 20% reserve of the biosphere).

DESCRIPTOR		SOURCE	UNIT	2014
Land, climate and population	Land area	SADEI	km ²	10,604 km ²
	Climate	SADEI	°C	max: 16.8 °C / min 8.9 °C
	Population	INE	Inhabitants	1,051,229
	Students University	Ministry for Education, Culture and Sport	People	23,358

Table 1: Land, climate and population of Asturias

DESCRIPTOR		SOURCE	UNIT	2014
Infrastructures	Roads, dual carriageways and motorways	SADEI	km ²	5,007 km ²
	International airport	SADEI	Passengers	1,065,570
	Industrial ports	--	Number of ports	Gijón and Avilés broadband network across the entire region

Table 2: Infrastructures of Asturias

1.2 Economic Indicators

The evolution of the economic activity in Asturias in recent years had been positive overall during the 2000-2008 period with an average growth of 2.7%. The start of the crisis was felt both in Asturias and Spain nationwide, with a drop in activity that was reflected in a negative growth rate of -5.0% and -3.6% respectively. Over recent years and until 2014, in Asturias, as in the rest of Spain, a negative average growth was maintained, though a change in this trend can be seen from this date onward in which economic activity enters a shifting trend with positive annual growth ¹.

With regards to the structural make-up of the economy, industry plays an important role in the economy of Asturias with 21%: a percentage that clearly sits above the Spanish average. Asturian industry figures reflect a clear sectorial specialization. 70% of the GVA is concentrated in three branches of activity: extractive activities, energy, water and waste; metallurgy and the manufacture of metal products; and agrifood industries.

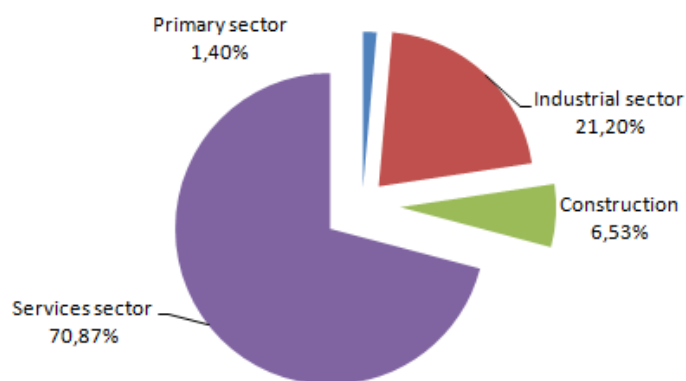


Figure 1: Distribution of GVA by sectors in Asturias 2014

¹ 1.4% in Asturias in 2015 and 3.2% in Spain. In terms of GDP per capita, given the different evolution of the population in Asturias and the rest of Spain, this figure has not suffered and has even improved in position when compared to Spain as a whole.

DESCRIPTOR		SOURCE	UNIT	2014
Economic information	GDP	INE	Million Euros	20,793
	GDP per capita		Euros	19,727
	Regional GVA Distribution			
	Primary sector	INE	%	1.40
	Industrial sector	INE	%	21.20
	Construction	INE	%	6.53
	Services sector	INE	%	70.87

Table 3: Economic Information of Asturias

The number of companies in Asturias grew in 2014, reaching 67,451, the regional business fabric is mainly composed of individual companies, with 96.48% of Asturian companies being Micro-SMEs.

DESCRIPTOR		SOURCE	UNIT	2014
Companies	Total of companies	INE	Number	67,451
	Industrial companies		Number	3,496

Table 4: Companies of Asturias

In recent years Asturias has experienced sustained growth in both purchases and sales in the foreign market, which has enabled the region to moderately activate its local economy. In 2014, the export of zinc and its manufacturing, iron and steel smelting and its manufacturing contributed 44.65% of all exported products from Asturias.

DESCRIPTOR		SOURCE	UNIT	2014
Foreign commerce	Exports	ICEX	Million Euros	3,838
	Imports		Million Euros	3,342
	Coverage rate		%	114.85

Table 5: Foreign Commerce Asturias

R&D expenditure in Asturias ascended in 2014 to 171.6 million Euros, of which 51.88% was borne by Private companies and Non-Profit Institutions (PNPI) and which rose to 88.9 million Euros. From 2011 R&D expenditure began to fall until it reached 171.6 million Euros in 2014, below the expenditure made in 2006. 2010 registered the highest value with 238.1 million €.

DESCRIPTOR		SOURCE	UNIT	2014
R&D	Total investment	INE	Thousand Euros	171,612
	Private investment		Thousand Euros	88,901
Innovation	Investment	INE	Thousand Euros	124,541

Table 6: R&D and Innovation Indicators in Asturias

Year	Total	Companies	%	Public Administration	%	Higher Education	%
2009	226,156	94,196	41.65%	38,360	16.96%	93,600	41.39%
2010	238,127	98,211	41.24%	36,940	15.51%	102,976	43.24%
2011	218,119	98,377	45.10%	32,594	14.94%	86,192	39.52%
2012	195,892	101,587	51.86%	28,566	14.58%	65,483	33.43%
2013	183,717	96,662	52.61%	27,810	15.14%	59,108	32.17%
2014	171,612	88,901	51.88%	26,808	15.62%	55,764	32.49%

Table 7: Statistics on R&D activities. Information in thousands of Euros.
Source: INE

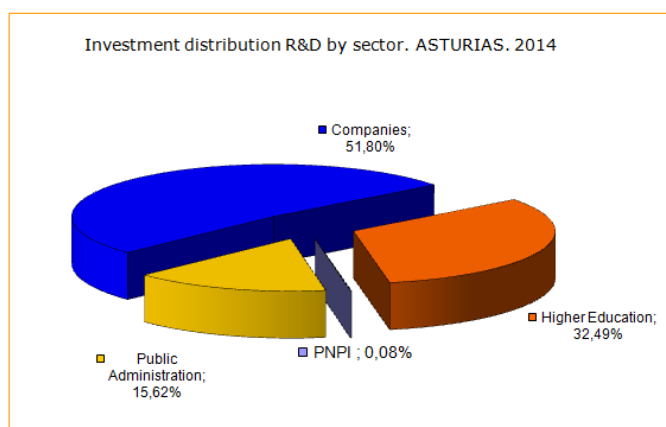


Figure 2: Investment distribution R&D by sector in Asturias

2. Challenges for the region

2.1 Demographics

The region of Asturias is characterised by its ageing population, with a high life expectancy (82.15) and a low birth rate. This region is among the group of European regions with the lowest birth rate, a feature that is not circumstantial given that it has remained unchanged throughout history. In 2014, 6.3 births per thousand inhabitants were registered in Asturias.

EU-28=10.1 per thousand (0.1)

Spain= 9.2% / Asturias= 6.3%

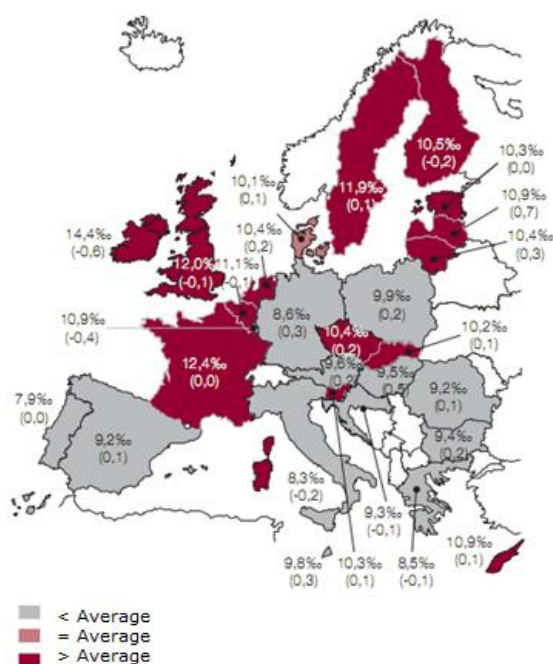


Figure 3: Gross Birth Rate 2014

Source: Eurostat. Population and social conditions.

Created by the CES

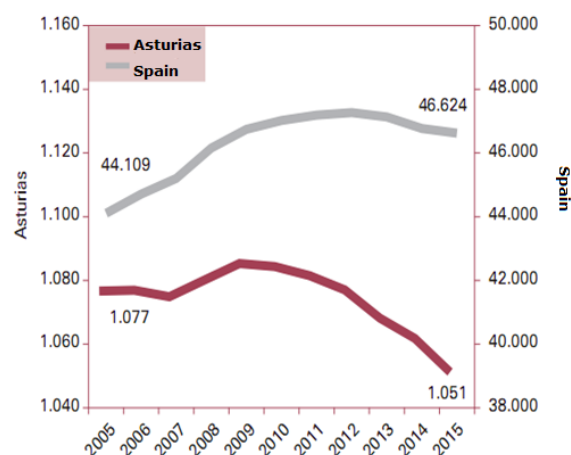


Figure 4: Evolution of the population in Asturias and Spain 2005-2015

Source: Municipal Register, various years. INE.
Created by the CES

Unit: thousands of inhabitants.

In 2014, 1,051,229 people resided in Asturias². Last year Asturias lost 10,527 inhabitants, almost 1% of its population, marking the sixth consecutive fall. The overall population of Spain also decreased for the third year running following decades of population increase.

Analysing the evolution over the past ten years, this region, along with Castile and Leon and Galicia, were the only areas to reduce their populations over this period.

In terms of the structure in age parameters, the shape of the population pyramid is configured with a much accentuated narrowing at the base which is indicative of a low birth rate, and a broadening from 74 years, particularly among women, which reflects the ageing population.

² Representing 2.3% of the population residing in Spain (46.6 million inhabitants)

**POPULATION PYRAMID.
ASTURIAS-SPAIN, 2014**

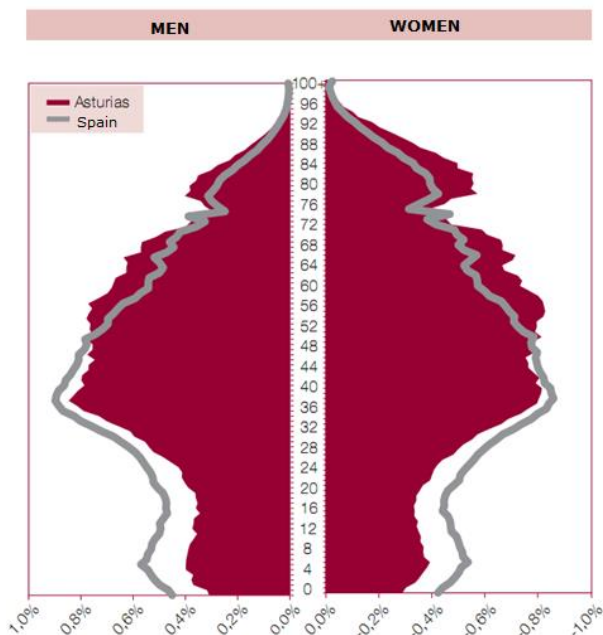


Figure 5: Population Pyramid 2014
Source: Municipal register. 2015. INE. Created by the Asturias Economic and Social Council

**EVOLUTION OF MIGRATORY,
DOMESTIC, FOREIGN AND NET
BALANCE.**

Asturias 2004-2014

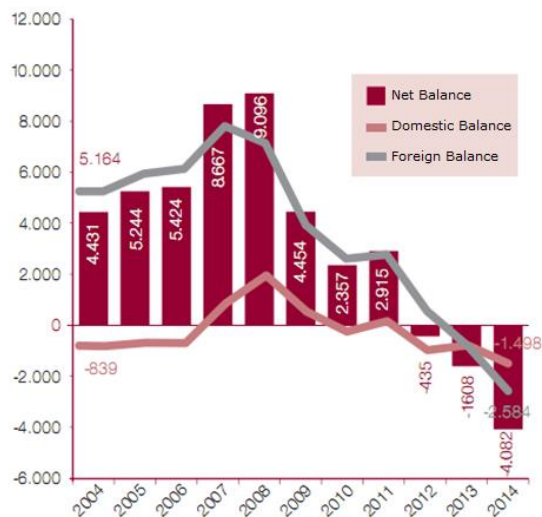


Figure 6: Domestic, Foreign and Net Balance Migration
Source: INE. *Residential Variation Statistics*, various years / Unit: inhabitant

Note: The domestic balance refers to the outcome of the exchanges of populations with other autonomous communities, and foreign refers to exchanges with other countries.

Throughout 2014 32,913 people left Asturias and 28,831 people arrived, leaving a negative net balance of 4,082 people, continuing the trend that began in 2012.

DESCRIPTOR		SOURCE	UNIT	2014
Demography	Total migration	INE	Inhabitants	4,082
	Migration to other regions		Inhabitants	1,498
Innovation	Migration abroad	INE	Inhabitants	2,584

Table 8: Migration in Asturias

2.2 Employment

The unemployment rate sat at 21.1%, a high figure, though slightly lower than the national average. The best labour market improvement during the 2014 tax year was reflected in the unemployment figure, which decreased following its maximum historical value reached in 2013 and after 6 years of uninterrupted growth. Despite the considerable decrease, the balance remains negative, as there are still around 61,000 more accumulated unemployed people compared to figures from 2007.

In 2014 Asturias had an average working population of 477 thousand people. The active population reduced further and with more intensity than the potentially active population, which brought with it a decrease in activity rates up to 51.8%, widening the difference with the Spanish rate.

DESCRIPTOR	SOURCE	UNIT	2014	
Employment	Active population	INE	Thousand Inhabitants	477.15
	Working population	INE	Thousand Inhabitants	376.30
	Unemployment rate	INE	%	21.1

Note. Average information

Table 9: Employment indicators 2014

Spain = 24.4% / Asturias = 21.1%

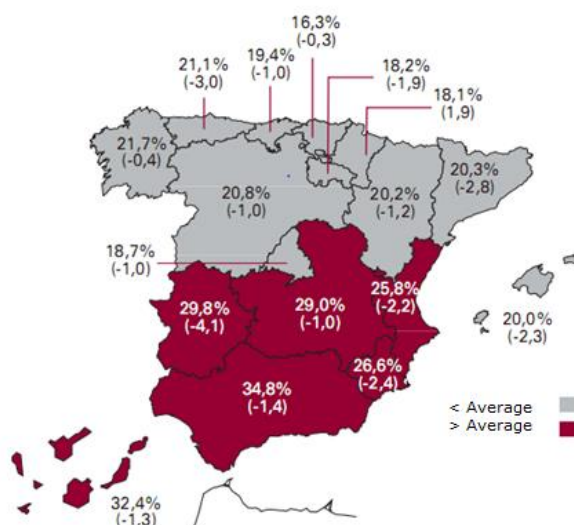


Table 10: Average unemployment rate 2014

Source: EPA.INE. "Economic and Social Situation of Asturias. 2014" created by the CES

Note: information in brackets indicates the annual variation (in percentage points)

ACTIVITY RATE 2014.

Spain = 59.6% (-0.4) / Asturias = 51.8% (-0.6)

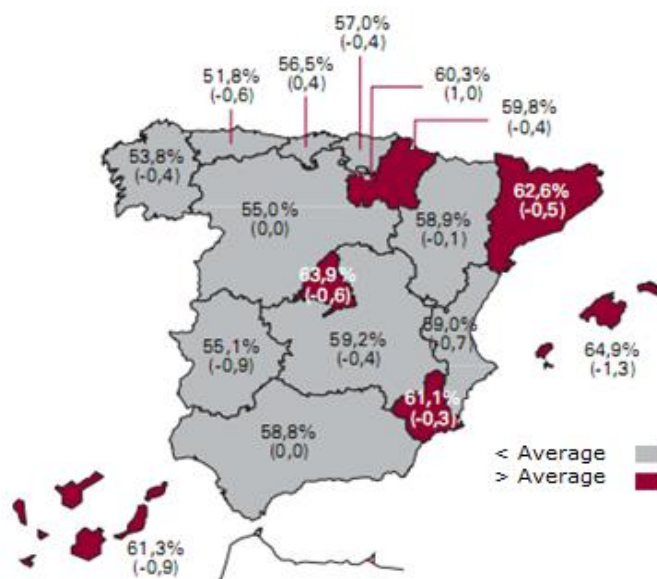


Table 11: Activity Rate 2014

Source: EPA.INE. "Economic and Social Situation of Asturias. 2014" created by the CES

Note: information in brackets indicates the annual variation (in percentage points)

3. Descripton of the chemical/bioeconomy industry

3.1 General Description

3.1.1 Chemical and process industry

Asturias is a material manufacturing region. The main driving companies in Asturias are those that develop their activities in the field of basic bulk materials or in the manufacturing of intermediate or end products in which their chemical composition or internal structure is determining and well-known within the market. Many of these companies form a part of the region's industrial history and have emerged and developed within the scope of firstly the coal and then later steel sectors, which grew in Asturias at the end of the 18th century.

Major multinational groups have industrial sites in the region, some of which have a strong international influence: ArcelorMittal (steel), Asturiana de Zinc (Zn), Alcoa (Al), Saint Gobain Cristalera, DuPont (fibers and plant-protection products), Bayer (aspirin and veterinary products), Linpac Packaging (food packaging) and CEASA (paper pulp).

Asturias is the home to the only steel plant in Spain where the entire steel production process is undertaken. Furthermore ArcelorMittal has an acclaimed R&D Centre in Asturias. The Asturiana de Zinc plant in Asturias is the largest electrolytic zinc plant in the world

The sector also has a group of medium-large companies with considerable strength, that are characterised by their deep-rooted link to the land, whilst simultaneously undertaking diversified and globalised activity. The main exponents are Industrial Química del Nalón (carbo-chemical products) and SA Tudela Veguín (cement).

Industrial Química del Nalón , stands out in the field of coke production, as well as for its contribution to the carbo-chemical sector with other products, such as pitch, naphthalene and technical oils. It has a pilot plant for the manufacturing of the precursors to advanced carbonaceous materials and an experimental plant for the synthesis of nanoparticles, preferably oxides and mixed oxides.

	FIRMS	EMPLOYEES	TURNOVER (Thou. EUR)	EXPORTS* (Thou. EUR)
CNAE 17 Manufacture of paper and paper products	15	508	290,337	149,220.71
CNAE 18 Printing and reproduction of recorded media	238	585	64,784	0,24
CNAE 20 Manufacture of coke and refined petroleum products	1	N.D.	N.D.	45,437.07
CNAE 20 Manufacture of chemicals and chemical products	45	1,753	508,890	285,028.95
CNAE 21 Manufacture of basic pharmaceutical products and pharmaceutical preparations	4			32,207.60
CNAE 22 Manufacture of rubber and plastic products	48	962	157,595	41,875.52
CNAE 23 Manufacture of other non-metallic mineral products	156	2,997	564,795	110,838.12
CNAE 24 Manufacture of basic metals	41	7,941	3,450,382	1,525,110.34
Total	548	14,746	5,036,783	2,189,718.55

Table 12: Chemical and process industry 2014

Source: Fuente utilizada para datos de empresas: DIRCE. INE; Fuente utilizada para datos de empleo y facturación: Encuesta Industrial del Empresas. SADEI / INE ; Fuente utilizada para datos de exportación: ESTACOM. ICEX (*2015); Created by IDEPA

3.1.2 Chemical industry (National Classification of Economic Activities - CNAEs 20, 21 and 22)

Spain's chemical sector has over 8,600 active companies, of which 1.1% has their headquarters in Asturias, equivalent to 97 companies; 49 correspond to the chemical and pharmaceutical subsector and 48 to the manufacture of rubber products and plastic materials.

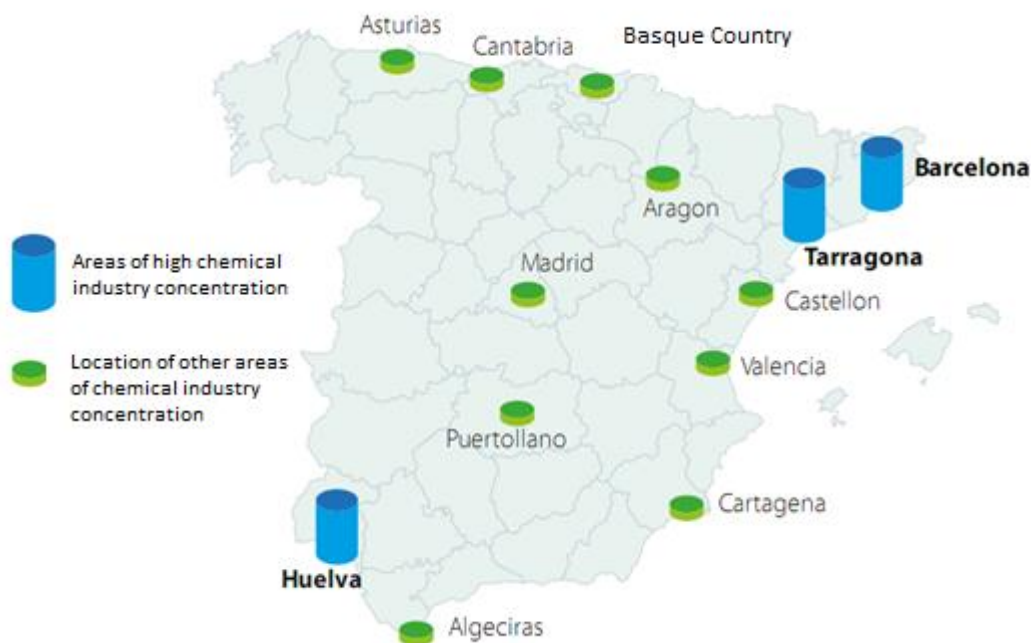


Table 13: Geographical Establishment of the Spanish Chemical Sector - Main production areas
Source: Radiography of the Spanish Chemical Sector 2016. FEIQUE

Despite the low number of companies and employment, the chemical industry constitutes an important part of the Asturian industrial structure, in particular due to the presence of medium and large enterprises that have a long-standing tradition in the region and thanks to the arrival of significant foreign investment.

A large part of the chemical companies established in Spain, and also in Asturias, already have a history of over 20 years, which is a clear indication of the maturity of this sector.

The sector is made up of a small number of medium or large production facilities, the vast majority of which are owned by non-Asturian industrial groups. The location of some of these companies in the region is due to their auxiliary nature in other industrial activities, or in the use of raw materials that are produced in the community. In other cases, this establishment is due to investment decisions through the acquisition of existing production plants or new facilities. In any case, Asturian chemical production fundamentally manufactures intermediate goods.

The chemical sector comprises 4.6% of the turnover/activity figure and 5.4% of industrial employment. With a turnover of 642 million Euros and with 2,675 direct job positions generated in 2014, the Asturian chemical sector generates 1.2% of the Gross Industrial Product, which rose to 20.8 million Euros in 2014.

In terms of the evolution of the sector's main figures, if we focus on the reference period (2009 – 2014), growth can be seen in the chemical sector activity, measured in the turnover, of over 41%. However, it should be noted that in 2009 there was a considerable downturn (-30%). With regards to employment, there was a 3% drop in employment between 2009 and 2014, with 2012 being the year when the greatest labour adjustments occurred.

In the 2009-2014 period, exports grew by around 40%, reaching 359.1 million Euros by that year, indicating its level of international competitiveness and its ability to access markets. During this period exports remained above imports, thus producing a positive trade balance with a coverage rate that exceeded 147% in 2010.

Sum of chemical production and rubber and plastic products

		2009	2010	2011	2012	2013	2014
Firms	Number	100	104	98	100	94	97
Employees	Number	2,994	2,966	2,766	2,665	2,712	2,675
Turnovers	Thou. EUR	542,376	681,122	685,729	742,251	654,105	641,451
Foreign turnovers	Thou. EUR	257,083	345,914	401,337	372,082	385,295	359,143
Productivity*	EUR/L	181,154.3	229,643.3	247,913.6	278,518.2	241,189.2	239,794.8
Export rate**	in %	47.40	50.79	58.53	50.13	58.90	55.99

* Calculation based on Turnovers/Employees

** Calculation based on (Foreign Turnovers/Turnovers)*100

Table 14: Chemical Industry (CNAEs 20, 21 and 22)
Source: DIRCE.INE.ESTACOM.ICEX. Created by IDEPA

4. Indicators

4.1 Distribution of the Gross Value Added

In the 2009-2014 period, a significant drop of over 16% occurred in the gross value added of the industrial sector in Asturias that was not reflected in the chemical sector, which experienced a 39% improvement, recovering from the major fall during the year of the crisis, which reached -23.5%.

The Asturian chemical sector contributes around 9% of the Gross Value Added of the industrial sector as a whole, considerably more than in 2009 which was around 4% (it was 7% in 2008). In this development, the chemical and pharmaceutical industry is the sector that has contributed the most, in comparison to the rubber and plastic material sector.

GVA/Branch of activity	2014	%	2009	%	2014/2009
CNAE 20+21. Chemical and pharmaceutical industry	197,236	7.09%	115,002	2.54%	71.50%
CNAE 22. Rubber and plastic materials	48,020	1.73%	61,655	1.36%	-22.11%
Total chemical sector	245,256	8.81%	176,657	3.91%	38.83%
Total Industry	2,783,121	100.00%	3,338,461	100.00%	-16.63%

Table 15: Chemical industry gross value addition

Source: Spanish Regional Accounts (CRE). Base 2008. INE. Created by SADEI

4.2 Number of companies in the CHEMICAL SECTOR

The Asturian CHEMICAL sector comprises 97 companies that represent 2.8% of the region's total industrial sector companies.

In Asturias, as in the rest of Spain, there has been a major decrease since the economic crisis in the number of companies in the industrial sector in general, with a particularly heavy impact on the Chemical sector with a reduction of 3% compared to 2009 (compared to 2008 the reduction was -12.5%).

The analysis by branch of activity reveals a 50% distribution between the chemical and pharmaceutical industry and the rubber and plastics industry, with 49 and 48 companies respectively in 2014.

COMPANIES/Branch of activity	2009	2014	2014/2009	2014/2008
CNAE 20+21. Chemical and pharmaceutical industry	51	49	-3.02%	-18.33%
CNAE 20. Chemical industry	48	45	-6.25%	-19.64%
CNAE 21. Pharmaceutical industry	3	4	33.33%	0.00%
CNAE 22. Rubber and plastic materials	49	48	-2.04%	-5.88%

Total Chemical	100	97	-3.00%	-12.61%
Total industrial sector companies	4,075	3,496	-14.21%	-18.92%

Table 16: Companies chemical industry
Source: DIRCE. INE. Created by IDEPA. Millions of Euros

The chemical sector is characterised by a clear predominance of SMEs, which make up 97% of the total, with only 3% employing over 200 workers.

COMPANIES. Branch of activity	2014/	No employees	Micro SMEs (1-9)	SMEs (10-199)	Large Enterprises (>=200)	Total
CNAE 20+21. Chemical and pharmaceutical industry		8	28	11	2	49
CNAE 22. Rubber and plastic materials		8	24	15	1	48
Total Chemical		16	52	26	3	97

Table 17: Company structures chemical industry
Source: DIRCE. INE. Created by IDEPA

Note: According to the methodology used by the INE, Large Enterprises are considered to be those with 200 or more employees

4.3 Employment in the chemical sector

The CHEMICAL sector in Asturias employs over 2,600 people, representing 5.4% of the region's total industrial sector. The main body of employment is in the chemical and pharmaceutical industry, representing 64% of total employment in the chemical sector.

In Asturias, as in the rest of Spain, since the beginning of the economic crisis there has been a significant drop in employment in the industrial sector in general, with a particularly heavy impact on the chemical sector with a reduction of over 10%, though less than the industrial sector figure (-12.22%).

If we widen the analysis period to the last decade, 2004-2014, employment in the Asturian chemical sector maintained a growing trend, reaching its maximum value in 2007 with over 3,800 people, a trend that inverted from 2008.

EMPLOYMENT/Branch of activity	2009	2014	2014/2009	2014/2008
CNAE 20+21. Chemical and pharmaceutical industry	1,767	1,713	-3.06	-4.52%
CNAE 20. Chemical industry	1,590	1,613	1.45	-2.42%
CNAE 21. Pharmaceutical industry	177	100	-43.50	-29.08%
CNAE 22. Rubber and plastic materials	1,227	962	-21.60	-20.36%
Total Chemical	2,994	2,675	-10.65	-10.89%
Total industrial sector companies	56,455	49,555	-12.22	-21.41%

Table 18: Employment in the chemical industry
Source: DIRCE. INE. Created by IDEPA

4.4 Turnover in the chemical sector

The turnover generated in the Asturian CHEMICAL sector in 2014 was 642 million Euros, representing 4.64% of the Asturian industrial total and a percentage figure that has remained stable over recent years. The chemical and pharmaceutical industry with 3.50%, the rubber and plastic materials industry representing 1.14%.

If we widen the analysis period to the last decade, 2004-2014, the Asturian chemical sector turnover maintained a growing trend, reaching its maximum value in 2007 with over 1.2 billion Euros. This trend inverted in 2008 with the start of the crisis (-40%) and began to recover from that point on.

As such, during the 2009-2014 period, there was an 18.45% increase in the chemical sector turnover, particularly marked in the chemical industry with over 45%, as opposed to the rubber and plastic materials industry which experienced a fall of 21%.

TURNOVER/ Branch of activity	2009	2014	2014/2009	2014/2008
CNAE 20+21. Chemical and pharmaceutical industry	342	484	41.52%	-1.02%
CNAE 20. Chemical industry	327	477	45.87%	0.63%
CNAE 21. Pharmaceutical industry	15	7	-53.33%	-53.33%
CNAE 22. Rubber and plastic materials	200	158	-21.00%	-32.48%
Total Chemical	542	642	18.45%	-11.20%
Total companies industrial sector	12,456	13,815	10.91%	-8.29%
Chemical/Industrial Weight	4.24	4.64		

Table 19: Turnover chemical industry
Source: DIRCE. INE. Created by IDEPA

4.5 Productivity

Due to the aggregated nature and the weight of large enterprises, the information provided by the Industrial Companies Survey regarding the evolution of the main sector figures should be considered somewhat tentatively. However, it reveals a strong drop in activity in 2009, which deteriorated productivity in the companies. This recovered in 2012 to fall once again, to reach almost 240 thousand Euros per employment in 2014.

EVOLUTION OF PRODUCTIVITY (2009-2014)

2009	2010	2011	2012	2013	2014
181,154.3	229,643.3	247,913.6	278,518.2	241,189.2	239,794.8

Table 20: Productivity development
Source. Created by IDEPA with data from the INE

4.6 Trade balance of the chemical sector

Exports within the CHEMICAL sector in Asturias represent 9.35% of the total exports whilst imports comprise 11.6% of the total.

In the 2009-2014 period, exports grew by around 40%, by which time they reached 359.1 million Euros, revealing the degree of international competitiveness and their capacity to

access markets. During this period exports continued to exceed imports, thus producing a positive trade balance with a coverage rate that surpassed 147% in 2010.

According to information corresponding to 2015, exports fell slightly in comparison to the previous year, whilst imports grew with greater intensity, for the first time resulting in a negative balance and coverage rate (92.66%).

Chemical sector foreign trade (thousands of €)

	Exports	Imports	Balance	Coverage (%)
2009	257,082.77	224,209.06	32,873.71	114.66
2010	345,914.36	235,196.71	110,717.65	147.07
2011	401,336.85	277,535.84	123,801.01	144.61
2012	372,082.36	266,610.25	105,472.11	139.56
2013	385,294.67	325,643.46	59,561.21	118.32
2014	359,143.14	338,659.02	20,484.12	106.05
2015	359,112.07	387,574.85	-28,462.78	92.66

Table 21: Foreign trade chemical sector

Source: ESTACOM. ICEX. Created by IDEPA. Information in thousands of Euros

The evolution of exports since 2009 reveals different trajectories: the increase in the exportation of chemical products (65.59%) and a drop in pharmaceutical products (-12.69%). A breakdown of exports by chemical products allows the identification of the most dynamic sectors, which are mainly basic chemical products, nitrogenous compounds, fertilisers, plastics and synthetic rubber in raw form, which in 2015 comprised 92% of the sector's exports in Asturias. The main receiving countries are France (25%), Brazil (22%) and the USA (13%).

With regards to the rubber products and plastic materials manufacturing sector, despite the trade balance reflecting a decrease in exports since the beginning of the crisis, in 2014 there was a 24% improvement on the previous year. Growth until 2010-2011 and the subsequent drop may be due to a slowing in demand in the main markets in this sector, which are countries from the European Union: France (30%), Portugal and Germany (17%), the main destinations for exportations in 2015.

	CNAE 20. Chemical industry	CNAE 21. Pharmaceutical industry	CNAE 22. Rubber and plastic materials
2009	172,005.21	51,654.83	33,422.73
2010	215,024.95	91,524.12	39,365.29
2011	277,905.06	87,409.30	36,022.49
2012	299,548.30	50,324.54	22,209.52
2013	323,381.65	38,376.00	23,537.02
2014	284,820.37	45,100.48	29,222.29
Var.	-11.92%	17.52%	24.15%

2014/2013			
Var. 2014/2009	65.59%	-12.69%	-12.57%
2015	285,028.95	41,875.52	32.207.60

Table 22: Foreign trade chemical sector. Trends

Source: ESTACOM. ICEX. Created by IDEPA. Information in thousands of Euros.

4.7 Research and Development in the CHEMICAL sector

In terms of R&D expenses made by companies according to the different branches of activity in Asturias, the chemical industry is positioned among the highest rankings, with 9.17%, levelled with “Computing and information service activities” (9.98%) and further removed from the “Research and development” branch (24.43%).

It retains its leading position, just as in Spain globally, where this sector accumulates 20% of R&D investments in its companies and 24% of researchers from the national industry overall.

2014	%	Domestic expenditure (thousands of Euros)
Total	100.00%	88,901.23
1. Research and development	24.43%	21,717.61
2. Computing and information service activities	9.98%	8,873.50
3. Chemical industry	9.17%	8,147.93
4. Metallurgy industry	7.21%	6,410.62
5. Telecommunications	7.05%	6,263.50
6. Other non-metallic mineral products	6.35%	5,641.83
7. Manufacture of metal products	6.34%	5,636.25
8. Architecture and engineering services	4.18%	3,713.31
9. Construction	3.52%	3,132.98
10. Dairy product industries	3.18%	2,826.49
11. Machinery and equipment manufacturing	2.13%	1,889.40
12. Electric, electronic and optic materials	1.95%	1,730.93
13. Manufacture of rubber and plastic materials	1.79%	1,593.82

Table 23: Research and Development expenditures

Source: SADEI. Created by IDEPA

Despite the evolution of company’s domestic R&D expenditure decreasing by 5.6%, the trend in the chemical sector has been favourable across the entire sector and, in particular, in the chemical and pharmaceutical sector with 240.92%.

DOMESTIC R&D EXPENDITURE OF COMPANIES. CHEMICAL SECTOR IN ASTURIAS (thousands of €)

	2009	2014	2014/2009	2014/2008
TOTAL	93,954	88,901	-5.38%	-10.26%
Chemical industry	2,390	8,148	240.92%	167.13%
Rubber and plastic product manufacture	1,038	1,594	53.56%	89.68%

Table 24: Domestic R&D expenditures
Source: SADEI. Created by IDEPA

The evolution of people employed in R&D is reflected in the following tables:

COMPANY R&D PERSONNEL. CHEMICAL SECTOR IN ASTURIAS

	2009	2014	2014/2009	2014/2008
TOTAL PERSONNEL IN R&D	14,850	13,906	-6.36%	-4.47%
Personnel in the chemical sector	652	740	13.50%	1.65%
Chemical industry	397	614	54.66%	11.79%
Rubber and plastic product manufacture	255	126	-50.59%	-29.47%

Table 25: Company R&D Personnel
Source: SADEI. Created by IDEPA

COMPANY RESEARCHERS. CHEMICAL SECTOR IN ASTURIAS

	2009	2014	2014/2009	2014/2008
TOTAL R&D RESEARCHERS	8,169	7,987	-6.36%	-0.46%
Researchers in the chemical sector	206	223	8.25%	-11.50%
Chemical industry	162	162	54.66%	-28.05%
Rubber and plastic product manufacture	44	61	-50.59%	71.07%

Table 26: Company Researchers
Source: SADEI. Created by IDEPA

5. Challenges for the industry

Its main feature, with major economic and competitive repercussions, is that industrial companies are all big energy consumers. Another important characteristic is that they cause a significant impact on the environment and, more specifically, produce large amounts of waste³.

These companies are subjected to major technology requirements, either to minimise waste and energy use, or to provide new solutions to increasingly emerging challenges from society regarding lighter, longer-lasting and more efficient materials, etc.

Furthermore, they operate in very competitive markets: some in a local market governed by multinationals, such is the case of refractory companies; and others in a global market, such as steel, zinc or aluminium, which list on international-level raw material markets. They are all highly sensitive to production factors, such as labour, supplies and raw materials and technology, facing the need to differentiate from products from emerging countries.

On the other hand, Asturias as a material producing region has historically supported the region's acquisition of skills. The educational offer from the University of Oviedo covers a wide range of scientific and technical subjects to meet the human resources requirements of these companies. It has contributed to the consolidation of multinational R&D centres in the region and has been considered an important location factor.

The University of Oviedo has at least 20 research groups and teams working in material science and engineering that have aligned with the demands of the sector's business fabric. However, they have also looked for their own channels of diversification, such as the health market, despite the scarce specialisation in the region. Another clear display of the important commitment made by Asturias to the sector is the presence of research and technology bodies promoted by different governments. The creation of the National Coal Institute (INCAR) in the 1940s, the Asturian Materials Technology Centre (ITMA) in the 1990s and the Nanomaterials and Nanotechnology Research Centre (CINN) in the first decade of the 21st century, are an example of this.

Finally, it should be noted that the concept of a circular economy has led to the establishment of a way to get value out of sub-products and waste from industrial processes, thus prolonging the duration of raw materials on the supply chain whilst opening the door to secondary raw materials and bio-products.

³ As a result of these characteristics, they are affected by far-reaching legislations such as IPPC, the Kyoto Protocol, the Emission Trading System and the REACH Regulation.

5.1 SWOT Chemical and pharmaceutical industry

<p>WEAKNESSES</p> <p>Few small and medium enterprises, and in decline</p> <p>Large enterprises positioned in the initial phases of the value chain</p> <p>Scare development of underlying activities of large enterprises</p>	<p>STRENGTHS</p> <p>Large corporate groups integrated within global value chains</p> <p>Logistics infrastructures for the supply and export of products</p> <p>Very globalised sector</p> <p>Access to highly-trained human capital</p> <p>Industry with strong awareness of environmental issues and health and safety in the workplace</p> <p>Collaboration between companies in safety and environmental training</p>
<p>THREATS</p> <p>Trend in concentrating the sector in clusters</p> <p>Limitations to the possibility of expansion or the installation of large industries due to a lack of suitable spaces</p> <p>Growing impact of regulations (REACH Regulation, CLP Regulation)</p> <p>Competition from developing countries with fewer regulatory costs</p> <p>Acceleration of technological change that may render older technology obsolete</p>	<p>OPPORTUNITIES</p> <p>Collaboration with research centres to promote downstream activities</p> <p>The chemical and processes industry is transversal with many sectors</p> <p>Growing incorporation of knowledge to the industry</p> <p>Development of the bio industry (bio-products and bio-processes)</p>

Table 27: SWOT chemical industry Asturia
Source: *Industrial Strategy for Asturias*

5.2 SWOT Plastics and Rubber

<p>WEAKNESSES</p> <p>Size of the companies</p> <p>Scarce internationalisation of companies that do not belong to international groups</p>	<p>STRENGTHS</p> <p>Sector with diversified markets both geographically and in terms of sectors</p> <p>Proximity to large industrial facilities</p>
<p>THREATS</p> <p>Very competitive sector with numerous suppliers</p> <p>Competition from manufacturers in countries with low labour costs</p> <p>Environmental requirements, especially in production and recycling requirements, including the adaptation of the REACH regulation</p>	<p>OPPORTUNITIES</p> <p>Product specialisation</p> <p>New materials, mixed metal-plastic materials, composites, etc.</p> <p>Incorporation into global value chains.</p> <p>Development of local solutions that can be applied globally to meet industrial needs</p> <p>Increased recycling of plastics and the development of alternative uses</p> <p>New 3D printing technologies</p>

Table 28: SWOT Plastics and Rubber

Source: *Industrial Strategy for Asturias*

6. Description of regional innovation strategy

6.1 General description, challenges and objectives

Asturias RIS3 was approved by the Governing Council on 2nd April 2014 and was thus communicated to the European Commission.

Asturias RIS3 2014-2020 established three strategic objectives:

1. Recovering industrial leadership through technology.
2. Orientating towards markets and diversification.
3. Designing a new territorial management model based on network collaboration and organised around hubs that incorporate social challenges.

On the other hand, Asturias RIS3 2014-2020 continues to concentrate its resources on 16 priority topics grouped into 6 Fields of Specialisation.

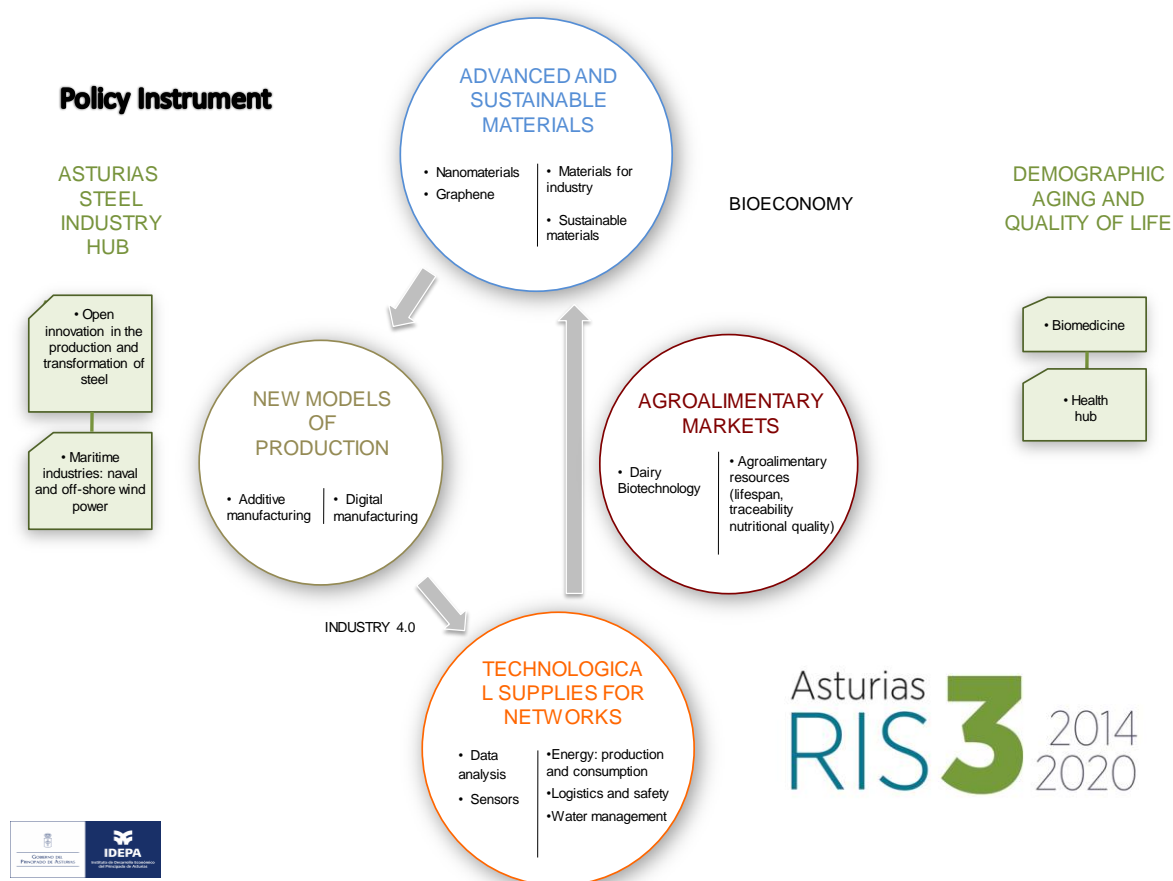


Figure 7: Policy Instruments

Source: IDEPA

In order to implement Asturias RIS3, the priority topics have been deployed in greater detail in successive calls for grants, and have been classified into three types: scientific priorities, technological priorities and challenges.

Additional
information

1. Scientific Priorities: Fields in which strengths have been observed in regional R&D competencies, especially in the University and in science and technology centres.
2. Technological Priorities: Fields in which there is a concentration of interest from the regional industry with competitiveness improvement targets.
3. Challenges (and Markets): Topics that arise from analysis, that are specific or characteristic of the region and that meet collective interests.

6.2 Focus on chemistry/bio-economy, etc. – Highlight Priority Topics

In terms of Priority Topics, three are particularly linked to the chemical and processes sector.

1.TOPIC	SUSTAINABLE MATERIALS
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The specialisation of Asturias in the manufacturing of basic materials makes it a significant focus in terms of the generation of industrial waste, some of which has unique characteristics. A change is taking place in the industry-government relationship in this field, with an emergence of the need to apply circular economy concepts, this new approach will be aligned with the Asturian Strategic Plan for Waste (PERPA 2014-2024). Moreover, scientific and technological knowledge has been developed in this field at the University of Oviedo, INCAR, CETEMAS and ITMA

There has also been a proposal to include the industrial circuit of secondary raw materials and bio-products. Asturian tractor companies from the chemical and process industry may have a notable influence on the development of efficient alternative bio-process for incorporation into its processes or for the use of its products (end-users). In terms of biomass availability (supplier) in the region, on the one hand there is the biomass from raw forestry materials, whilst the other major regional focus of bio-waste is the agrifood sector. In terms of knowledge, this is grouped around the Cluster of Biomedicine and Health of the University of OVIEDO and two scientific bodies established in the region: The Dairy Research Institute of Asturias and the Regional Agrifood Research and Development Service.

2. TOPIC	ENERGY: PRODUCTION, SUPPLY AND CONSUMPTION
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Energy is a location and competitive factor that justifies the need to face CHALLENGES for the generation, consumption and distribution of energy. Regional activity in this field has favoured the specialisation of numerous research groups. The Asturian Energy Foundation and the Energy Technology Consortium of Asturias carry out important work in the exploration and dissemination of technology. The University of Oviedo, INCAR and ITMA have addressed the issue from various perspectives.

3. TOPIC	WATER MANAGEMENT
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The availability of water is an industrial location factor that has contributed to the concentration of activity in the region of heavy industry. Asturias has an attractive offer in specialised hydraulic engineering works and environmental services. The treatment of industrial and urban waste waters is a widely discussed topic in the research projects of some university specialities, particularly among chemical engineering research groups.

The focus should be orientated towards minimising the consumption and use of this resource and conserving the region’s water-biodiversity combination.

6.3 Further activities to specify innovation topics (e.g. Roadmaps)

The drawing up of a research and innovation Agenda related to sustainable materials has been envisaged within the Asturias RIS3 Action Plan. This Agenda, as a roadmap, will describe the main research and innovation challenges in the treatment of waste flows in the region to improve the sustainability of the materials industry and to promote new value chains based on biomass, pinpointing research, development and demonstration activities to be carried out, and specifying the allocation of resources by the agents involved.

7. Description of ERD operational programme

The programming process of the European Structural and Investment Funds (ESIF) for the 2014-2020 period in Spain was completed with the approval of the Partnership Agreement with Spain 2014-2020 on 30th October 2014, and in the case of ERDF of Asturias, with the approval from the European Commission of the Operative Programme (OP) 2014-2020 on 14th July 2015.

7.1 Priority axes and available funding

The ERDF programme in Asturias has a total budget of 317 million Euros and a Community contribution of 253 million from the ERDF.

The financial allocation of the Programme comfortably meets the priority field concentration objectives required by Community regulations. In this respect, 67% of the ERDF Community aid is destined to R&D&i, to improve the use and quality of Information and Communication Technologies (ICT), to improve the competitiveness of SMEs and to encourage the shift towards a lower carbon consuming economy.

INVESTMENT PRIORITIES	Investment (Euros)
Priority 1. Research and Innovation	64,043,242.00

Priority 2. Information and Communication technologies	13,807,584.00
Priority 3. Competitiveness of SMEs	78,356,134.00
Priority 4. Low-carbon economy	15,120,255.00
Priority 6. Environment and resource efficiency	51,358,707.00
Priority 9. Social inclusion	17,000,287.00
Priority 10. Better education, training	12,358,048.00
Priority 13. Better public administration	1,500,000.00
TOTAL	253,544,257.00

Table 29: Investment Priorities

Source: ERDF OP Asturias 2014-2020

8. Description of funding programmes

The main instruments for implementing Asturias RIS3, if not the only ones, are aids to enable companies to develop R&D activities. Over these two years of Strategy implementation, existing aids have been adapted to focus them on priority topics, even developing specific programmes, whilst launching new initiatives (such as the public private initiative Proof of Concept Premiums).

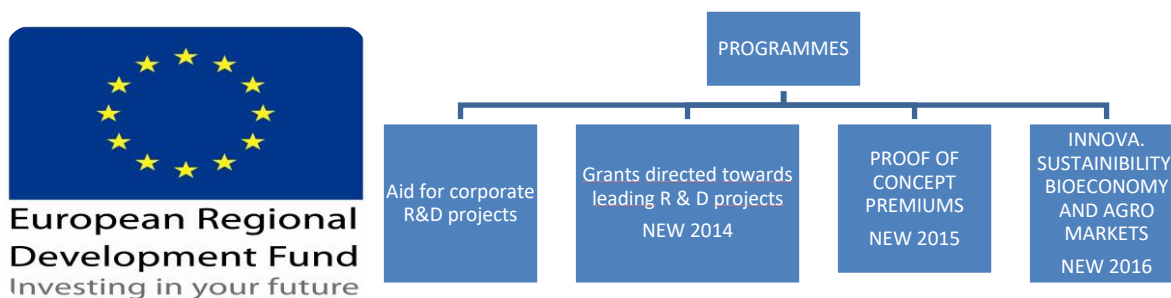


Figure 8: Overview Investment programs

Source: Created by IDEPA

Furthermore, the following tables displays how they were designed to be complementary. Among them is the particularly noteworthy sub-programme Innova, aimed at encouraging the identification of new technological niches and sustainable economic growth. It aims to improve the relationship of the region's industrial sector with its surroundings, focusing on the concepts of circular economy, developing bio-economy and strengthening positioning within agrifood sector markets.

PROGRAMME	ASTURIAS PRIORITY	RIS3	TYPE OF PROJECT	ASTURIAS RIS3 OBJECTIVE
R&D&i projects	All		<ul style="list-style-type: none"> Industrial research and experimental development Feasibility studies 	Objective 1: Industrial leadership through technology
Differential or tractor projects	Scientific priorities and Challenges		<ul style="list-style-type: none"> Industrial research and experimental development Process innovation 	Objective 1: Industrial leadership through technology Objective 3: New territorial management model
INNOVA	Sustainability Industry 4.0 Steel Hub		<ul style="list-style-type: none"> Experimental development projects Process innovation 	Objective 2: Orientation towards markets and diversification

REGIONAL SUBSIDIES TO R&D PROJECTS IMPLEMENTED BY COMPANIES LOCATED IN ASTURIAS

TYPE PROJECT	OF	TRL	FUNDING RATE				SIZE
R & D & i projects							
Indv. or Collaborative		<=6		S	M	B	Max contribution requested: Inv 750.000 € Des. 200.000 € Inn. 50.000 €
			Research	70	60	50	
			Dev.	45	35	25	
			Estudios	60	60	50	
+ 15 % collab							
INNOVA							
Indv. or Collaborative		>=5		S	M	B	Max contribution requested 150.00 €
			Dev	45	35	25	
			Inno.	45	35	25	
+ 15 % collab							
Differential or tractor projects							
Collaborative				S	M	B	Project size: > 500.00 € y < 2.000.000 €
			Research	80	75	50	
			Dev.	60	50	25	
			Inno	50	40	15	
ERANETS (MANUNET, MERANET)							
Collaborative - International				S	M	B	Project size >150 .000 € Max contribution requested 200.000 €
			Research	80	75	65	
			Dev.	60	50	40	
			Human Resources	50	50		

Table 30: Regional Subsidies to R&D projects 2016

Source: Created by IDEPA

Proof of Concept Prizes it is a new instrument, a public-private collaboration, based on open innovation models, each researcher who wins the prize is awarded with 30.000 € and has a year to proof the viability of their ideas and 30.000 €. The instrument is financed half by IDEPA and half by a leader company, the first pilot took place on 2015, the company that signed the agreement was ArcelorMittal.

Finally, beyond direct aids, IDEPA has other financial instruments that manages throughout its instrumental bodies. The Regional Promotion Society of the Principality of Asturias, S.A. (SRP) is a company whose majority of shares are held by the Principality of Asturias, which has acted as a body for economic promotion since 1984, and operates in the venture capital market.

The Sociedad Regional de Promoción (SRP) promotes the creation of new companies and the improvement of those already existing, by means of participation in their share capital, by granting share loans and by contributing its experience and market knowledge to the company's management.

9. Governance

The Advisory Board is the strategic guidance body for participation and consultancy, which will drive forward dialogue with the innovation system agents. It is set to meet at least once a year and it has been attributed the following functions within the framework of Asturias RIS3:

1. Give management strategic support
2. Participate in the follow-up and intermediate and final assessments
3. Give recommendations and propose actions

These functions have been consigned to the Asturian Science, Technology and Innovation Board⁴, a collegiate body that offers consultancy and guidance and that promotes the policies developed by the Autonomous Community within the field of scientific and technological research, development and innovation.

The Executive Committee implements the different actions encompassed within the RIS3, and shall meet at least three times a year. Among its functions are the following:

1. Approve the Action Plan 2014-2020
2. Approve the Communication Plan
3. Annual programming
4. Implement the follow-up and assessment system
5. Arrange the coordination of inter-departmental actions

It is chaired by the Regional Employment, Industry and Tourism Minister, or the delegated person and it is formed by the Director-General of Innovation and Entrepreneurship, the Director-General of Budgets and the Public Sector, the CEO of IDEPA, the Director-General of Industry, the Director-General of Universities and Research, the Director-General of Environmental Quality, the Director-General of Rural Development and Agrifood, and the Director-General of Sanitary Planning. For certain priorities or topics, it can be constituted differently, incorporating the corresponding people in charge.

The Technical Secretariat is the body commissioned to manage the implementation and follow-up process as well as to create the proposals that will be passed on to the Executive Committee. The Secretariat resides in the IDEPA.

In order to promote coordination between governing departments and the participation of other interested parties, Work Groups shall be promoted. Furthermore, considering the execution of the strategy needs - in particular for some of the topics, and likewise a greater development than the coordination of public and private efforts of industry and the scientific

⁴ Decree 18/2009, for the creation of the Asturian Science, Technology and Innovation Board, modified by Decree 25/2012.

offer - the creation of research and development, Agendas will be promoted with the aim of establishing common targets.

10. Current challenges for implementation of RIS and expectations for inter-regional learning

The roadmap of material sustainability will act as a trial that can be applied to other topics. Our efforts will be aimed at strengthening participative mechanisms, deepening and sharing targets in the field of sustainability, and reinforcing public-private collaborations. On the part of the government, it will also require coordination from the different departments. Furthermore, this roadmap will also begin by identifying data and indications that can be used in decision making, a difficult task in this field.

Regarding inter-regional cooperation, we find it particularly interesting to be able to confirm our focuses with regards to the chemical and process sector and to identify new approaches, as well as getting to know the maturity of technological challenges and the possibilities of addressing them with R&D projects in international collaboration, which will enable a more ambitious approach and the establishment of long-lasting relations. Finally, we hope to learn from other promotional instruments that are used in other regions, including the most innovative, and in particular aids and financial instruments for companies.