



European Union
European Regional
Development Fund

Smart Chemistry Specialisation Strategy

**“Report on recommendations for the Involvement of Stakeholders
and Governance of Regional Innovation Strategies in
Asturias”**

February 2017

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1. Description of RIS governance

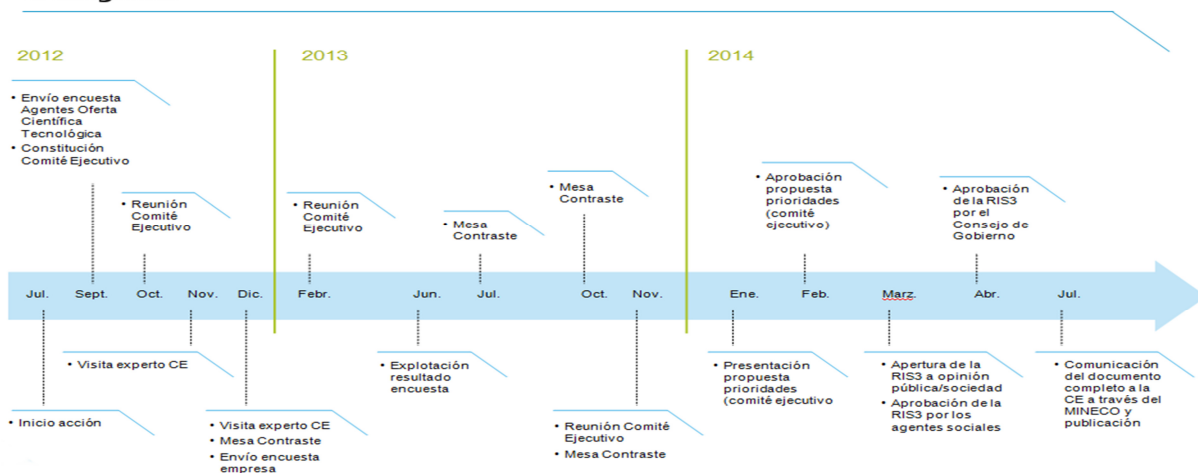
1.1 General Description

The RIS3 elaboration process in Asturias has been coordinated by an Executive Committee chaired by the General Director of Economy and Innovation and composed of 13 representatives from different Departments, as well as representatives of the regional and national public scientific offer. The Executive Committee met 8 times, the first in September 2012 and the last in February 2014. The Institute of Economic Development of the Principality of Asturias (IDEPA) promoted the process over more than a year and a half, and was responsible for collecting information, analyzing and formulating proposals, and drafting the RIS3, which was approved by the Governing Council in April 2014. This document was subsequently completed with an action plan and communicated to the European Commission in July of that year.

A number of tools that have allowed the implementation of the governance system and have tried to ensure participation have also been put in place, allowing the different actors to take the initiative in specific phases of strategy design. In December 2012 a survey was sent to 327 innovative companies and a report was prepared with the 59 responses that were obtained. A questionnaire was also designed to evaluate the research potential in relation to the scientific-technological offer: 4 Research Centres, 5 Technological Centres and 96 Research Groups of the University of Oviedo. Four discussion groups were organised for each group of enabling technologies that brought together 65 participants: tractor companies, EBTs, clusters, and research groups from the University of Oviedo and the Research and Technological Centres of Asturias. There have also been 56 bilateral interviews with companies, public administration managers and representatives of regional scientific-technological offer.

The identification of the strengths and future areas was done by preparing 4 inventories that analyzed the scientific-technological knowledge and associated them to the regional economic activities around four themes: Information and Communication Technologies, Materials, Manufacturing and Biotechnology.

Cronograma



For the implementation of Asturias RIS3, which will be developed up to 2020, a governance system was defined and it would allow not only to allocate resources and coordinate

execution methods, but also, understanding RIS3 as a dynamic process, to reflect on whether they are achieving the results in order to be able to introduce the relevant improvements.

Advisory Council

It is the body of strategic guidance, participation and advice, which fosters the dialogue with the agents of the innovation system, meet at least once a year and has the following functions within Asturias RIS3:

- To know the execution of Asturias RIS3 and advise
- Promote evaluation systems and participate in the mid-term and final evaluation
- To make recommendations and promote actions

These functions are entrusted to the Asturian Science, Technology and Innovation Council, a collegiate body that is the adviser and promoter of the policies developed by the Autonomous Community in the field of research, development and scientific and technological innovation.

Within the Advisory Council, a Working Group on the Monitoring of Indicators of Asturias RIS3 and a Working Group on Communication has been created.

Executive committee

Among its functions are the following:

- Review the 2014-2020 Action Plan
- Agree on annual programming
- Implement the monitoring and evaluation system
- Promote coordination of interdepartmental actions

It is chaired by the Minister of Employment, Industry and Tourism or the person to whom he delegates and it is composed of:

- Managing Director for Innovation and Entrepreneurship
- Managing Director of Budget and Public Sector,
- Managing Director of IDEPA,
- Managing Director of Industry
- Managing Director of Universities and Research,
- Managing Director of Environmental Quality,
- Managing Director for Rural Development and AgroFood,

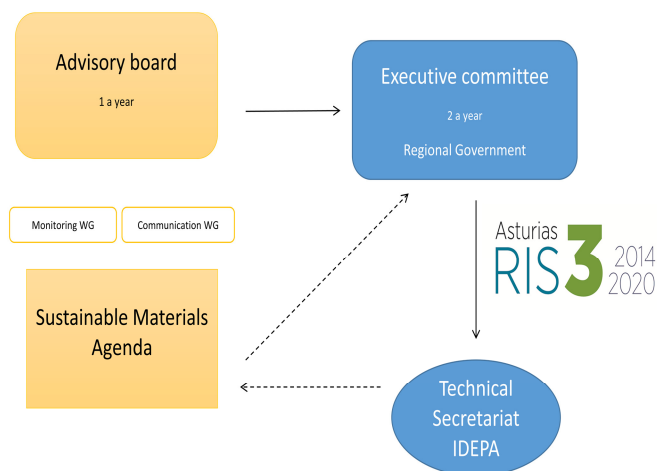
For certain priorities or themes can be constituted under another formation.

Monitoring includes all types of activities aimed at collecting and processing information on the degree of implementation of the policies and the achievement of results. At the same time, it also serves to reinforce stakeholder involvement by facilitating cooperation and engaging both stakeholders and public opinion as part of a communication and transparency strategy. This task belongs to the Executive Committee.

Technical secretariat

Body in charge of managing the implementation and follow-up process, as well as elaborating the proposals that are transferred to the Executive Committee. The Secretariat resides in IDEPA. Taking into account that the execution of the strategy needs, in particular for some of the themes, a greater development than the coordination of public and private

efforts, industry and scientific offer, the development of research and innovation Agendas will be promoted in order to define common goals.



1.2 Involvement of Regional Stakeholders

Research and Innovation Smart Specialization Strategy of Asturias RIS3 foresees the drafting of a Regional Agenda for Research and Innovation in Sustainable Materials which address the sustainability of the materials industry from the point of view of Circular Economy and explore the opportunities offered by the Bioeconomy, fostering intersectoral and public-private collaboration.

To achieve this it is necessary to agree on a roadmap that identifies the main focuses of technological attention of the powerful regional sector of materials, which facilitate the definition of value chains that favour the demand for secondary raw materials (Markets and applications) from their own waste or by-products or from biological waste.

The philosophy proposed in this plan is similar to the Spanish Platform of Sustainable Chemistry which in its Roadmap for the Future of Sustainable Chemistry identifies the use of alternative resources as one of the tractor axes.

In September 2016, IDEPA, supported by AIQPA, Asociación de Industrias Químicas y de Procesos de Asturias, promoted the creation of a working group for the elaboration of the Sustainable Materials Agenda of Asturias, conformed by big industrial companies of the basic materials sector, companies of the agro-food sector, medium-sized companies with experience in the use of secondary materials, EBTs, technology centers, researchers and representatives of the Ministry of the Environment, and

The Roadmap for Sustainable Materials in Asturias is defined by putting together the information collected from all groups, producers, managers, technologists and researches, and the selection of combinations of the analyzed information blocks: Waste + Market + Technology. For each value chain, which responds to the collective interests of the participants, objectives and commitments will be established.

Identificación de flujos de residuos industriales									
Residuo	Código LER	Cantidad	Perfil del participante	Motivo del interés	Interés	Tratamiento actual	Resultados del tratamiento	Satisfacción	Elementos de Valor del Residuos
ECONOMÍA CIRCULAR A PARTIR DE RESIDUOS DE LA INDUSTRIA MATERIALES									
10 Residuos de la prospección, extracción de minas y canteras y tratamientos físicos y químicos de minerales									
ESCORIAS DE PRIMERA FUSION DEL ALUMINIO	100304	2000-4000 T/año	Generador del residuo	Otros (indicar): encontrar otros procesadores alternativos para el residuo	3	entrega a gestor	Valorización: recuperación de metales	5	Aluminio y sales industriales
RECHAZO DE ALÚMINA	100305	150-200 T/año	Generador del residuo	Por oportunidad de valorización	6	Vertedero	Deposito en vertedero autorizado COGERSA	1	Alumina
POLVO TUBERÍA CAPTACION	100319	700-1400 T/año	Generador del residuo	Por oportunidad de valorización	5	Vertedero	Deposito en vertedero autorizado COGERSA	1	Alumina fina con contenido en fluor; contenido en carbono
CARBONILLA	100321	300-500 T/año	Generador del residuo	Por oportunidad de valorización	5	Vertedero	Deposito en vertedero autorizado COGERSA	1	Alto contenido en carbono, material carbonoso y baño electrolítico y alumina
BARREDURAS DE NAVES	100321	150-400 T/año	Generador del residuo	Por oportunidad de valorización	5	Vertedero	Deposito en vertedero autorizado COGERSA	1	Alumina
CENIZAS TERMICAS	100101	250000 TM	Generador del residuo	Por volumen	5	Vertedero	Abandono	1	

The identification of needs will serve to transfer them into the business innovation support programs that are put in place. In addition, the Ministry of the Environment will be ensured to maintain the alignment with the PERPA - Strategic Plan on Waste of Asturias 2014-2024 -, the work with the treatment chain, revaluation and reuse of waste lends itself to regional collaboration between large companies and a change of model of the company-administration relationship.

EVENT	DATE	ATTENDANCE / ANSWERS
Launching Meeting of the Working Group	22.SEPT.2016	13 companies; UNIOVI; CETEMAS; INCAR; ITMA; DG of Environmental Quality and DG of Environmental Prevention and Control; DG Innovation and Entrepreneurship, AIQPA; IDEPA
Meeting with producing companies to identify waste streams	22.FEB.2017	12 companies; 1 AIQPA; 4 IDEPA
Meeting with the Ministry of Infrastructure and the Environment.	28. FEB. 2017	2 DG, 3 heads of service, 2 IDEPA
Presentation of the work carried out before the partners of the European project S3chem	29. FEB. 2017	Economic promotion bodies of Catalonia, Warsaw (Poland), Limburg (Netherlands), Lombardy (Italy), Wallonia (Belgium) and Saxony-Anhalt (Germany) and Asturias.
Elaboration of the questionnaire, distribution, collection of information and analysis	FEB-APRIL.2017	Sent to: Companies waste-tractors + Research Groups + CT + OI + technological companies + valorisation companies
Meeting (plenary) of the Working Group to approve the Roadmap	29 JUNE. 2017	7 companies, UNIOVI, ITMA, CETEMAS, 2 Ministry of the Environment, 4 IDEPA, AIQPA, COGERSA
Meeting of the Executive Committee Asturias RIS3 to approve the Sustainable Materials Agenda	SEPT 2017	PENDING

Regarding instruments to support Research and Innovation, there are two particularly interesting for the field and that demands a strong stakeholder's involvement:

- Strategic projects

Since 2014, a competitive call for the granting of subsidies directed to the execution of differential or tractor R&D&I projects in the Principality of Asturias is published annually. The proposals, with a minimum amount of € 500,000, must be led by a tractor company, and jointly developed by at least three companies, one of them a PYME.

The projects approved respond to ambitious approaches and they have to be associated with a scientific priority or challenge of Asturias RIS3, among the challenges of our strategy is the "Sustainability in the industry of raw materials and materials for industrial use".

- Proof of Concept Premium Program

Through the Proof of Concept Premiums, the Government of the Principality is testing a new public-private financing instrument to support open innovation models in tractor companies in the region. This allows that basic research projects carried out by Asturian public scientific offer in the priority scientific areas of Asturias RIS3, thematic areas where strengths have been identified in terms of regional scientific-technological knowledge, are applied in the industrial environment.

Accepted applications must be defended by the proponent researcher (or person to whom it is delegated) in a public act before the jury. The premiums have an endowment of 30,000 Euros co-financed by IDEPA and the cooperating company at 50%. The research groups which will work together with the tractor company will have a year to carry out the proof of concept.

IDEPA and the University of Oviedo signed in March 2015 a collaboration agreement for the implementation of the Proof of Concept Program. ArcelorMittal joined in the year 2015. In the year 2016, IDEPA was associated with Asturian Dairy Industries (ILAS). Thyssenkrupp Elevator Innovation Center who joined to the agreement on April 2017 will be part of the third edition.

<https://www.idepa.es/innovacion/asturias-ris3/primas-proof-of-concept>

1.3 Participation Challenges

It is necessary that in the participatory process are present the companies that have a determining role, they are usually big companies that play a tractor role. However this is not enough, it is also need the right interlocutor within the company. In relation to our Sustainable Materials Agenda, the people involved in the Working Group are, or managers or responsible for environment and / or innovation, and thanks to this they have contributed with their knowledge to a high level debate.

Companies must lead the process, for this purpose we have the assistance of AIQPA that not only provides technical know-how but also promotes participation from the private sector. One challenge to be addressed is how to design a governance model that will keep the process alive after approving the roadmap, which seeks to combine a formal structure with a less formal type of network collaboration.

In the circular economy in which we move (using waste and by-products of an industrial process), stakeholder participation in specific R & D projects and activities requires a special collaboration between the producer of the waste and the user (another industry).

In the collaborative R & D activities that are promoted, the role of the producer of the waste will continue to be fundamental, not only as a supplier of the "raw material", but also for the work that might have to be carried out at source.

Also the producer could be interested in the lines that allowed diversifying his main activity. On the other hand, these research and development or demonstration activities must be approached from the outset contemplating their economic viability and analyzing the legal barriers that could arise, as a critical and differential fact of this theme. (See value chains in the appendix 2. Identification of thematic priorities).

A stakeholder whose involvement is also fundamental is the Ministry of Infrastructure and the Environment. Because of its definition of regional waste policies, because it is responsible for infrastructure (COGERSA) and because its collaboration is necessary when needed to know the legal framework regarding the strategy to be applied by the company of recovered waste (to date waste).

2. Networks and Clusters

Ten clusters have been created in our region, four of them were qualified as Excellent by the Ministry of Industry and four of them have obtained the bronze label of the European Cluster Excellent Initiative (Ainer, Asincar, Innovative Knowledge Business, Refractory). Since 2007, IDEPA (Economic Development Agency of the Principality of Asturias) has been carrying out work on developing and strengthening these Innovative Groups, turning them into an invaluable tool for achieving greater integration and structuring of the Regional System for Innovation.

More relevant clusters in relation to sustainable materials:

Cluster	Year	Members	Employment	Turnover	Export
 AINER ENERGY TECHNOLOGY CONSORTIUM OF ASTURIAS, EIG 	2009	47	n.d.	216 M €	42%
 ASINCAR MEAT INDUSTRY RESEARCH GROUP OF THE PRINCIPALITY OF ASTURIAS 	2009	97	1.588	237 M €	n.d.
 REFRACTORY MATERIALS CLUSTER OF ASTURIAS, EIG 	2010	14	n.d.	2.000 M €	100%
 CHEMICAL AND PROCESS INDUSTRIES CLUSTER OF ASTURIAS 	2010	11	n.d.	n.d.	n.d.
 STEEL INNOVATION CLUSTER 	2015	17	7143	4.452 M €	73%
 CLUSTER OF ADVANCED MANUFACTURING OF METAL INDUSTRY IN ASTURIAS 	2016	32	5160	1.314 M€	68%

- Chemical and Process Industries Cluster of Asturias**, Cluster IQPA was born on December 27, 2010, in response to the concerns and interests of companies in the sector and with the purpose of taking a step closer to the work carried out by The Chemical Industries Association (AIQPA) to provide companies with the appropriate framework for collaboration. The aim of the Cluster is to continue AIQPA's commitment to innovation, sustainability and cooperation. Its scope extends to all the territory of the Principality of Asturias, and includes companies dedicated to the activity of CHEMICAL INDUSTRIES AND PROCESSES, as well as, certain companies related to them. This includes: Fertiberia, Ence, Bayer Hispania, DuPont Asturias, Chemistry del Nalón, Praxair, ArcelorMittal, Asturquimia, Farmastur 2010, Association of Chemical and Process Industries of Asturias (AIQPA).
- The **Energy Technology Consortium of Asturias, EGI (AINER)** was founded in August 2009 by the Regional Energy Agency (FAEN). AINER works with the aim of

developing projects of interest of the Asturias energy sector, and involving 47 members, including 37 SMEs and 1 R&D Centre. FAEN is the Cluster Administrator. AINER provide facilities and resources to the members of the cluster is organised in thematic working groups in the main activity sectors of the membership: power generation and distribution, renewable energy sources (wind power, solar power, biomass & biofuels, and marine renewable sources of energy) and energy efficiency in buildings.

- **ASINCAR** is a Spanish cluster (Asturias, North-West Spain) formed by more than 80 companies (>95% SMEs) of the whole agro-food value chain, with a special focus in meat industry that was its origins. ASINCAR current scope covers multiple food markets: meat, fish, seafood, fruits and vegetables, ready meals, canned food, gourmet line,... ASINCAR also keeps active collaboration with regional University (University of Oviedo) and technology centers as well as regional public administration, acting as advisor in the Agrofood Working Group. Moreover, it maintains an active and growing partner network formed by Universities, research institutes, companies and NGOs from Spain and EU. Regarding participation in international platforms, Asincar is partner of the Bioeconomy pilot in the Vanguard Initiative promoted by the EU for Smart Specialisation. It also participates as full partner of several EU cluster strategical partnerships (ESCP-4i) as EU4FOOD and AdPack. Finally mention that is member of the technological platform Food for Life and participates in several working groups with national and regional public administrations.
- The **Cluster of Refractory Materials'** activities are: R&D&I collaborative (and cross-sectoral) projects promotion and development and Refractory Materials technology training. 14 members: 13 Companies and 1 Technology Centre. Relevant Thematic Innovation Priority / Research Field: Beneficiation of waste and byproducts as secondary raw materials. Some examples of projects carried out by the Cluster's members: Reactive sintering of mullites based on semi-calcined kaolinite sub-products (IDEPA Project). Valorisation of EDAR sludge in the manufacturing of light aggregate (Sludge4Aggregates LIFE Project) Reuse of waste generated in the Asturian industry in the manufacturing of insulating light aggregates (CDTI Project).

<http://www.clusterasturias.es/>

Other networks:

- The **University of Oviedo** was one of the first Spanish Universities awarded with the Campus of International Excellence. The project Ad Futurum. From the 17th to the 21st century: Looking back, looking ahead relies on 400 years tradition and promotes excellence in internationalization, teaching and research. In addition, this project is committed to encourage an effective knowledge transfer to the production sector and establish a new campus model that is integrated in the social environment. Ad Futurum is a project for the whole region, with a Strategic Alliance integrated by over

300 institutions and a transparent and participative governance system. The International Graduate Centre, the Cluster of Energy, Environment and Climate Change and the Cluster of Biomedicine and Health are three of the main elements that guarantee a future of excellence.

- The **Cluster of Biomedicine and Health** aims at bringing together the agents of an area with a great potential in our region. The cluster is intended to turn the Principality of Asturias into a leading region at a national and an international level. Besides renowned research groups, the cluster brings together companies, foundations, public administrations, research centres the hospital network of the region (including the new University Central Hospital of Asturias) and the Foundation for Biohealth Research and Innovation of the Principality of Asturias.

In its five research lines (Genomics and Proteomics related to cancer and the aging process, Brain Development and Degeneration, Biomedicine and Pharmaceutical Drugs Development, Regenerative Medicine, Transplants and Implants, Food Production and Technology) the cluster has become a meeting point for researchers, the production sector and the social agents in order to promote the development of joint projects, innovation and knowledge transfer.

- The **Cluster of Energy, Environment and Climate Change** promotes research focused on technology development and innovation in strategic sectors for the region, such as the production of capital goods and the industry related to clean energies and energy efficiency in the framework of a model of sustainable development. It relies on the support of many companies and brings together the research potential of the Principality of Asturias in this sector

<https://cei.uniovi.es/cei>

3. Identification of thematic priorities

The selection of the value chains took as a starting point the reflections gathered in the Research and Innovation Smart Specialization Strategy of Asturias RIS3. In this sense, the roadmap, and consequently the agenda, will consider as a priority the waste from processes of the basic materials industry of Asturias, due to the unique concentration of this activity in the region, and the particular characteristics of this sector in related to the consumer activity of raw materials and generator of waste.

On the other hand, the scientific and technological offer shows a considerable specialization in biological residues, which is considered especially important to solve some quasi-systemic problems of the region, due to the difficulties of finding alternatives to the filling of the current landfill.

Current European Circular Economy policies prolong the permanence of raw materials in the supply chain, and Bioeconomics and short cycle bioproducts of CO2 renewal provide the clues for the search for waste applications in other industrial processes, which already exist in the region, or in processes of regional diversification. Regional collaboration is a necessary requirement to address the challenges of AstuRIS3, and to determine the lines of work that will be incorporated into the Research and Innovation in Sustainable Materials Regional Agenda. It is therefore necessary to confirm the interest of the producers in combination, or with available regional technology, and / or with local companies that can use the waste (markets) by incorporating them into their production processes.

On the other hand, it analyzes the convergence between the public and private interest to find alternatives to the treatment of large volumes of waste, and its transformation into raw materials of other industrial processes to obtain products with high added value.

During the presentation of the identified value chains (nine), comments were made about the chance of the proposed chains from a regional cooperation perspective.

The extract of four preselected value chains is reproduced below (in addition there are 3 more for diversification) (provisional table as an example)

c1	<p>LER10. Thermal process residues: slag; Ashes; Sludge; Cinder; Rejects of minerals, sand, dust, sweeps.</p> <ul style="list-style-type: none"> • Markets: Interest in other industrial processes in Asturias (or for the same process that generates the waste) is detected: Clinker, cement and concrete; Construction materials; Refractory; Fertilizers • Diversification ...
c6	<p>LER03. Wastes from wood processing and the production of boards and furniture, paper pulp and paperboard: Calcium carbonate sludge; Green liqueur ash; Knots of wood; Sawdust, shavings and chips.</p> <ul style="list-style-type: none"> • Markets: Interest is detected in other industrial processes in Asturias (or for the same process that generates the waste): Clinker manufacture; Coal, Fertilizer, High value-added chemicals; Construction materials; Use in alkaline washes. Partial application in the pre-treatment of the wood

	<ul style="list-style-type: none"> • Diversification ...
c8	<p>LER19. Waste from waste treatment facilities, from external wastewater treatment plants and from the preparation of water for human consumption and water for industrial use: EDPS sludge; Organic amendments; RU and RI classification for CDR / CSR production; Non-hazardous landfill leachate.</p> <ul style="list-style-type: none"> • Markets: It is detected interest for other industrial processes existing in Asturias (or for the same process that generates the waste) Fuel; Coal, liquid fertilizer and chemical compounds with high added value; Struvite (liquid fertilizer); Agricultural uses (impulse treatment of irrigation in crops near production plants, amendments to improvements of soils with forest plantations) Fertilizer? • Diversification...
c9	<p>By-products (not classified as waste): Lactose-containing mother liquor; Industrial sewage sludge; Black liquor.</p> <ul style="list-style-type: none"> • Markets: It detects interest for other industrial processes existing in Asturias (or for the same process that generates the residue). Obtaining lignin, hexose, pentose for further processing Bio-polymers, adhesives, surfactants; Struvite (liquid fertilizer) from lactose • Diversification...

4. Conclusions and Recommendations

5. Annex: Regional Stakeholders

5.1 Public Authorities

Consejería de Infraestructuras, Ordenación del Territorio y Medio Ambiente

It is the responsibility of the General Directorate of Environmental Prevention and Control to apply the preventive instruments of environmental intervention: strategic environmental assessment, environmental impact assessment, integrated environmental authorization, as well as the granting of sectoral authorizations for emissions to the atmosphere, discharges to marine waters, and waste production and management, within the competence of the Principality of Asturias. It also has the control, inspection and surveillance of activities that affect the environment.

The General Direction of Environmental Quality is responsible for the planning and execution of environmental quality policies, through the elaboration and monitoring of strategies and plans on climate change, air, water, waste and noise; As well as the promotion of transparency and public participation in environmental issues. Likewise, it is responsible for the development of projects and works for the improvement of the quality of the environment, in particular the actions related to the integral treatment of the water cycle and the execution of environmental restoration works.

Consortio para la Gestión de los Residuos Sólidos de Asturias (COGERSA),



The collaboration in the early 1980s between the Government of the Principality and several municipalities in the central area of Asturias prompted the birth of COGERSA to provide a centralized solution to the problem of urban waste. Since then, COGERSA has tried to provide at all times the most adequate and agile solution to the needs of Asturias in the management of a wide diversity of waste.

The formula created in Asturias to carry out a joint and centralized waste management, pioneered in the 1980s, is still fully in force thanks to a consortium that unifies the resources and efforts of all the Asturian City Councils and the Autonomous Administration. COGERSA is currently composed of 78 Asturian municipalities and the Autonomous Administration (the Government of the Principality).

Construction works at the central landfill site in Asturias, the embryo of the current Waste Treatment Center of Asturias, in the valley of La Zoreda, were completed in October 1985. COGERSA was initially created to manage urban waste (domestic and commercial) It was soon apparent that its assets (centralized and complementary facilities, land availability, knowledge and experience, etc.) could be used to address the challenges posed by the proper management of other wastes. Thus, in 1989 the Government of the Principality, immersed in the plans for the rehabilitation of rivers, entrusted COGERSA with the management of hazardous industrial waste; In 1993 the first furnace for the incineration of infectious waste from hospitals was built; In 2002 all the residues arrived at the Asturian coasts after the sinking of Prestige; And construction and demolition waste treatment facilities were put into operation in 2003.

5.2 Networks and Clusters

<p>Name of the Organization: AINER (Energy Technology Consortium of Asturias EIG)</p>
<p>Type of Organization:</p> <p><input type="checkbox"/> Informal network without legal personality</p> <p><input type="checkbox"/> Project-funded network / cluster without legal personality</p> <p><input checked="" type="checkbox"/> Member-funded network / cluster with its own legal personality</p>
<p>Structure / Members:</p> <p>47 members: 45 companies and 2 entities (1 technological centre, 1 energy foundation)</p> <p>The Energy Technology Consortium of Asturias, EGI (AINER) was founded in August 2009 by the Regional Energy Agency (FAEN).</p> <p>AINER works with the aim of developing projects of interest of the Asturias energy sector, and involving 47 members, including 37 SMEs and 1 R&D Centre. FAEN is the Cluster Administrator.</p>
<p>Description of the Main Competencies / Fields of Activities (in headwords):</p> <p>Mission: To introduce a territorial structure supporting the business logic of the companies with higher activity in the value chain associated to the energy sector.</p> <p>Vision:</p> <ul style="list-style-type: none"> • As regional reference: Reference of innovation on the energy field in both energy cooperation and/or individually. • As national reference: Modernization of the energy sector and its adaption to global challenges related to climate change. <p>AINER provide facilities and resources to the members of the cluster is organised in thematic working groups in the main activity sectors of the membership: power generation and distribution, renewable energy sources (wind power, solar power, biomass & biofuels, and marine renewable sources of energy) and energy efficiency in buildings.</p> <p>2010-2017 Member of the Special Register for Innovative Enterprises Groupings of the Ministry of Science and Technology.</p> <p>2012-2014 'Cluster Management Excellence Bronze Label'</p> <p>2013-2017 Member of the National Federation of Innovative Enterprises Groupings & Clusters (FENAEIC) top leadership.</p> <ul style="list-style-type: none"> ▪ Strategic Area I: Development of management, communications, competitive monitoring, etc. ▪ Strategic Area II: Energy generation, distribution and consumption ▪ Strategic Area III: Renewable Energies ▪ Strategic Area IV: Energy Efficiency for Construction
<p>Relevant Thematic Innovation Priority / Research Field:</p> <p>Activities of AINER membership:</p> <ul style="list-style-type: none"> • BIOGAS FUEL CELL: Enterprise dedicated to biogas exploitation, with an important resources dedication to research, development and technological innovation. Its activity is based on four business areas: Development of R&D projects, Consultancy, Engineering and Biogas Exploitation. • DOBRA CONSEYEROS DE DESENDOLCU INTERNACIONAL DE NEGOCIOS: Development and marketing of biogas production and forest biomass gasification technologies. Engineering, energy efficiency and water purification consultancy services. • PELLETS ASTURIAS: Recycling, transformation, transport, manufacturing, elaboration, distribution and sales of products from forestry wastes and wood transformation industries

for energetic use, like pellets, briquettes, chips or others.

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Name of the Organization: REFRACTORY MATERIALS CLUSTER

Type of Organization:

- Informal network without legal personality
 Project-funded network / cluster without legal personality
 Member-funded network / cluster with its own legal personality

Structure / Members:

14 members: 13 Companies and 1 Technology Centre

Description of the Main Competencies / Fields of Activities (in headwords):

The Cluster of Refractories activities are:

- R&D&I collaborative (and cross-sectoral) projects promotion and development
- Refractory Materials technology training.

Relevant Thematic Innovation Priority / Research Field:

Beneficiation of waste and byproducts as secondary raw materials:

1.- Some examples of projects carried out by the Cluster's members:

- Reactive sintering of mullites based on semi-calcined kaolinite sub-products (IDEPA Project).
- Valorization of EDAR sludge in the manufacturing of light aggregate (Sludge4Aggregates LIFE Project)
- Reuse of waste generated in the Asturian industry in the manufacturing of insulating light aggregates (Proyecto CDTI).

2.- Some member companies already use as much as 100 ton per year of byproducts (rejects) and waste from other industries, incorporating them as secondary raw materials in their products.

Others internally recycle in their own production (as secondary raw material in define proportions) 100% of their byproducts (or production rejects)

One company main activity is transforming waste (LER 161104) into secondary raw materials, useful for the refractory industry. It recycles and valorizes refractory materials coming from the demolition of furnaces, converters etc. Therefore, its activity helps their clients to comply with EU's objectives in relation to industrial waste recycling.

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Name of the Organization: ASINCAR (Agrofood Cluster)

Type of Organization:

- Informal network without legal personality
 Project-funded network / cluster without legal personality
 Member-funded network / cluster with its own legal personality

Structure / Members:

Who are the participants / members (companies, science, public authorities, etc.) of the network?
 How is the relationship?

ASINCAR is a Spanish cluster (Asturias, North-West Spain) formed by more than 80 companies (>95% SMEs) of the whole agro-food value chain, with a special focus in meat industry that was its origins. ASINCAR current scope covers multiple food markets: meat, fish, seafood, fruits and vegetables, ready meals, canned food, gourmet line, etc.

ASINCAR also keeps active collaboration with regional University (University of Oviedo) and technology centres as well as regional public administration, acting as advisor in the Agrofood Working Group. Moreover, it maintains an active and growing partner network formed by Universities, research institutes, companies and NGOs from Spain and EU.

Regarding participation in international platforms, AsincAR is partner of the Bioeconomy pilot in the Vanguard Initiative promoted by the EU for Smart Specialisation. It also participates as full partner of several EU cluster strategic partnerships (ESCP-4i) as EU4FOOD and AdPack. Finally mention that is member of the **technological platform Food for Life** and participates in several working groups with national and regional public administrations.

Description of the Main Competencies / Fields of Activities (in headwords):

Main mission of ASINCAR is to contribute to the competitiveness and sustainability of agro-food companies and their adaptation to future market scenarios through innovation, cooperation, knowledge and technology transfer as well as support for accessing to new markets. Apart from cluster, ASINCAR has two additional roles: it is also a food industrial association (origins), protecting and defending the companies' rights, as well as a technology centre, promoting research and innovation initiatives. Main cluster activity axes are:

- Keeping a continuous vigilance of agrofood technology and market trends, transferring them to its members
- Fostering research and innovation activities in the agro-food sector. Dinamization of cooperation activities between members and external bodies
- Supporting for internationalisation of agro-food SMEs
- Cross-pollination with interrelated areas/clusters and generation of new value chains: ICT (Industry 4.0), advance manufacturing (Factories of the Future), sustainability (Energy Efficiency), health (healthy and functional foods and ingredients), sustainable consumption and consumer lifestyle/trends

Relevant Thematic Innovation Priority / Research Field:

Regarding Research & Innovation actions, our main innovation lines cover the following topics:

- **Valorisation of agro-food byproducts**
 - Conversion of waste (vegetal/fish/meat) into food and feed ingredients

- Extraction of high added value and functional compounds for food or other markets (cosmetics)
- Generation of biogas from residues
- Development of fertilizers from waste
- **Microbiology and Biotechnology for Food Safety**
 - Development and validation of new and improved food microbiology tests
 - Shelf-life enhancement and control
 - Optimization of productive and fermentation processes
 - Development of challenge tests
 - Biocontrol
 - Isolation, characterization and monitoring of wild-type strain
 - Analysis and exploitation of technological capacity of microbial strains
 - Preservation capacity of beneficial microorganisms
 - Development of biosensors for specific microorganisms as *Listeria monocytogenes* and *Salmonella* spp
- **Development of improved / new food products**
 - Healthy and functional food products (incorporation of functional ingredients over different food matrices; improvement of nutritional profile of processed products)
 - Development of new formulations, including the preparation of gourmet products
 - Adaptation of food to user specific requirements, for example for seniors
- **Food preservation technologies**
 - Optimization of parameters in traditional thermal treatments
 - Implementation of cutting edge conservation technologies, as high pressure processing, biopasteurization, flash pasteurization, vacuum cooking, ...
 - Mixing of preservation methodologies, e.g combination of thermal and packaging systems
- **Packaging systems**
 - Optimization of packaging systems, e.g MAP
 - Active and intelligent packaging systems, as e.g for detection of meat freshness and shelf life forecasting or oxygen scavenger packaging
 - New materials for packaging
- **On-line and advanced IT systems for food value chain**
 - Food Traceability Systems
 - NIR-based systems for real-time monitoring of microbiology and macronutrients of food preparations and final product // NIR: Near Infrared Spectroscopy
 - Predictive models for food microbiology
 - NIR-based systems for fraud detection
 - NIR-based tools for the assessment of surface hygiene
 - Analytical devices for the on-line monitoring of Food Contact Materias
 - Combination of NIR with other analytical and characterization techniques for further applications

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5.3 Science

Name of the Research Institution: Universidad de Oviedo	
Number of Researchers: 2808	
Type of Institution	Research Category
<input checked="" type="checkbox"/> University <input type="checkbox"/> Research Institute <input type="checkbox"/> Research and Centers for development, that are operated by industrial enterprises	<input checked="" type="checkbox"/> Basic Research <input checked="" type="checkbox"/> Industrial Research <input checked="" type="checkbox"/> Experimental Research
Description of Main Competencies / Research Areas (in headwords): <ul style="list-style-type: none"> • Chemical processes and engineering, environmental technologies, valorisation of waste • Green Chemistry, Synthetic Organic Chemistry and Biocatalysis • Industrial Biotechnology, high value products production • Biogas (landfilled gas, sludge gas, organic fraction gas) • Ecosystems management • Wastes to energy; biomass boilers 	
Relevant Thematic Innovation Priority / Research Field: <u>Research fields:</u> <p>The research in the University of Oviedo is organized in research groups and research centres and institutes. Related to bioeconomy and sustainable chemistry, the University of Oviedo, have the following institutes:</p> <p>-The University Institute of Organometallic Chemistry "Enrique Moles" (IUQOEM) was created in 1992 by several research groups of the Faculties of Chemistry and Geology of the University of Oviedo, with the aim of promoting excellent research in the field of Chemistry Organometallic and its projection to society. The lines of research they develop are at the forefront of modern organometallic chemistry and focus both on the development of new methods of synthesis and reactivity with derivatives of transition metals and in catalytic processes using organometallic compounds. Special attention is given to the applications in organic synthesis, in particular the methodologies for the generation of new carbon-carbon and carbon-heteroatom couplings in both organic and aqueous media.</p> <p>-The University Institute of Biotechnology of Asturias (IUBA) began its activities in 1992, bringing together several research groups from the Departments of Functional Biology, Biology of Organisms and Systems and Chemical Engineering that developed works in the field of plant biotechnology, microorganisms and bioprocesses.</p> <p>The IUBA aims to consolidate and enhance the multidisciplinary of its researchers in order to achieve excellence in post-graduate teaching in the field of biotechnology as well as applied research in human and animal health, agriculture, livestock and fisheries, food or industrial bioprocesses.</p> <u>Other research lines:</u> <ul style="list-style-type: none"> -Benefit of waste food and lignocellulosic; Biological sludge transformation and use; Separation of components of food fractions; Fermentation of food and food waste components -Preparation and characterization of heterogenic catalysers; Chemical Reactors for biofuel production and valorisation of residual biomass -Building blocks in organic synthesis or liquid fuels using bio-renewable solvents (deep eutectic solvents); Conversions of biomass into building blocks -Biocatalysis and Chemoenzymatic synthesis; Selective enzymatic strategies to novel organic compounds; Strategies for the degradation of lignin; Utilization of laccases for bioplastic production -Streptomyces biology, differentiation, and biotechnological applications; Antibiotic production 	

(fermentations); New bioactive compounds from natural actinomycetes

-Microbial factories; Combinatorial biosynthesis, genetic and metabolic engineering in Microalgae and bacteria; High value products: nutraceutical and pharmaceuticals production

-Molecular tools to quality assurance, traceability and sustainability of feedstock and complex product in food industry; Prospective analysis of biological activity and valorisation of subproducts; Fisheries and aquaculture's sustainability

-Sustainable management; Use of natural resources and the environment; Ecosystem services for human wellbeing

Research Projects:

In the area of Bioeconomy, UNIOVI is participating in the following European projects, which accounts for about 1,2M€: NOMORFILM (Novel marine biomolecules against biofilms. Application to medical devices, H2020-SC2), BIOCASCADES (Sustainable and Scalable Biocatalytic Cascade Reactions Training Network, H2020, ITN), OXYPOL (Optimized laccase systems for high-value bioplastics production from Biomass, ERA-IB2), ECOFRUIT (Managing ecosystem services for fruit production in different European climates, BIODIVERSA), AQUAINVADED (AQUATIC INVADERS, Early Detection, Control and Management). At national level, Uniovi leads more than 20 projects in the field of bioeconomy in the last two years with a total financing of 3,1M€.

Networking:

The University takes part of ERRIN (Brussels-based platform of Research and Innovation Organisations and Stakeholders in Regions) and actively participates in its Bioeconomy and Blue Growth working groups. Our region, Asturias, is also committed to the Vanguard Initiative, being UNIOVI the regional lead institution and member of the Steering Group at the Bioeconomy Pilot. The objective of the Vanguard Initiative is the implementation of synergies in new value chains across regions based on the smart specialisations of the regions. In addition, experts of the University of Oviedo are participating in the definition of the Spanish Bioeconomy Strategy. At the regional level, the University of Oviedo was actively involved with the regional government in the process of defining the Regional Smart Specialization Strategy.

Masters:

Master's Degree in Chemical Engineering

Master's Degree in Chemistry & Sustainable Development

Master's Degree in Theoretical Chemistry and Computational Modelling

Master's Degree in Science in Marine Biodiversity and Conservation

Master's Degree in Biotechnology Applied to Conservation & Sustainable Management of Plant Resources

Master's Degree in Biotechnology of Environment and Health

Master's Degree in Materials Science and Technology

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Name of the Research Institution: Agri-Food Research and Development Regional Service (SERIDA)	
Number of Researchers: 45	
Type of Institution	Research Category
<input type="checkbox"/> University <input checked="" type="checkbox"/> Research Institute <input type="checkbox"/> Research and Centers for Development, that are operated by industrial enterprises	<input type="checkbox"/> Basic Research <input type="checkbox"/> Industrial Research <input checked="" type="checkbox"/> Experimental Research
<p>Description of Main Competencies / Research Areas (in headwords):</p> <p>The Institute is organized in Areas developing research in different fields. The specific functions carried out by SERIDA are the following:</p> <ol style="list-style-type: none"> 1. To develop and carry out applied research (experimental research) leading to the improvement of the competitiveness of the regional agri-food sector, the adaptation of production methods to the environment and the improvement of the product quality and commercialization structures. 2. To bring educators and professionals up to date regarding scientific, technical and environmental knowledge. 3. To establish an agri-food technology development programme within the Regional Plan for Research which will be able to contribute to the improvement of productivity in the Asturian primary sector. 4. To foster relations between research and technology development centres and as many public or private institutions as necessary in order to enable scientific development and specific lines of research. 5. To provide administrative services for the agri-food sector within its objectives. <p>The main research areas are focused on:</p> <ul style="list-style-type: none"> • <u>Animal</u> Production Systems • Animal nutrition, forages and grasslands • Animal health • Genetics and Animal Reproduction • Plants Genetics and Health • Forestry • Food technologies 	
<p>Relevant Thematic Innovation Priority / Research Field:</p> <p>Developing sustainable, quality-differentiating animal production systems which will contribute not only to diversification, but also to an increase in income and employment in the rural setting and to conservation or an increase in the biodiversity of the natural environment. Projects:</p> <ul style="list-style-type: none"> ✓ Diversification of extensive livestock production to improve the management efficiency of Cantabrian uplands with silvopastoral systems. ✓ Productive responses, parasitic diseases and sustainability of different types of flocks with ruminants grazing in partially improved heathlands of less favoured areas. 	

✓ **Holistic Production to Reduce the Ecological Footprint of Meat.**

Study of the influence of the feed on milk production and composition and the technology of grassland and forage production from ensiled grasses and forage crops, as well as the evaluation of feeds *in vivo* (nutrition balances), *in situ* (ruminal degradability) and by laboratory methods. The goals are to obtain forages which are balanced in energy and protein in a conventional, ecological way by associating cereal and winter and summer leguminous plants, to improve the nutritional, fermentative and aerobic stability quality of silages and to predict feed characteristics and animal response by traditional methods and by near infrared reflectance (NIRS). Projects:

- ✓ Management of dairy farm manures in northern Spain. From farm to land: nutrient use efficiency, mitigation of greenhouse gases and reduction of carbon footprint.
- ✓ Performance and production costs of fodder produced on farms in the Principality of Asturias, under the conditions of crop diversification imposed by the CAP 2015-2020, as the first link in the precision feeding of dairy herds.
- ✓ Forage legumes rotating with maize as an alternative to optimize the feeding costs of milk cows and improve the profitability and environmental sustainability of farms.

Studies of natural pasture systems and development of the silviculture programme using leafy trees (chestnut) and conifers (maritime pine). Forestry genetic resources. Projects:

- ✓ Research of sewage sludge from Asturias for use with a range of soil products (RecySoil) and for energy use (Sludge4Power).

Process design and characterization of products derived from apples and other fruits for improving traditional production methods and for developing new cider products by incorporating innovative technologies. The strategies followed in the typification of products are based on the application of modern molecular biology, instrumental and sensory techniques. Projects:

- ✓ Reuse of wastes from the cider industry for the design of enriched foods and bioproducts.
- ✓ Sustainable management and revalorisation of agrofood by-products for feeding, energy and agronomic use.

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Name of the Research Institution: CETEMAS (Forest and Wood Technology Research Centre)	
Number of Researchers: 6	
Type of Institution	Research Category
<input type="checkbox"/> University <input checked="" type="checkbox"/> Research Institute <input type="checkbox"/> Research and Centers for Development, that are operated by industrial enterprises	<input type="checkbox"/> Basic Research <input checked="" type="checkbox"/> Industrial Research <input checked="" type="checkbox"/> Experimental Research
Description of Main Competencies / Research Areas (in headwords): <ul style="list-style-type: none"> ▪ Breeding and forest production associated with clearwood product quality ▪ Planning and logistics with remote sensors ▪ Wood products ▪ Bioproducts and wood chemistry ▪ Product life cycle, carbon footprint and climatic change 	
Relevant Thematic Innovation Priority / Research Field: Bioproducts and wood chemistry: <ul style="list-style-type: none"> ▪ Selection and classification of woods based on physical-chemical properties (i.e. extractives, density, phenols...) analysed by non-destructive techniques (NIR sensors). ▪ Exploitation of forest resources (solid wood, biomass, residues, ...) for high-value products recovery (i.e. phenols, carbohydrates). Extraction, isolation, fractionation, purification & concentration. ▪ Membrane technology use for wood industry byproduct treatment focused on fractionation and concentration of family products. Micro, ultra and nanofiltration membranes studies. 	
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Research category¹ Definitions according to EU aid measures

"basic research" means experimental or theoretical work, which primarily serves the acquisition of new basic knowledge without a direct practical possibility for an application.

"Industrial research" means scheduled research or critical research to acquire new knowledge and skills with the aim of developing new products, processes or services or to bring about substantial improvements in existing products, processes or services. This also includes the development of parts of complex systems and, possibly, the construction of prototypes in a laboratory environment or in an environment with simulated interfaces to the systems as well as pilot lines, if this is necessary for industrial research and in particular for the validation of technological bases.

"Experimental development" means the acquisition, combination, design and use of existing scientific, technical, economic and other relevant knowledge and skills with the aim of developing new or improved products, processes or services. This includes activities for the conception, planning and documentation of new products, processes and services. Experimental development may include the development of prototypes, demonstration activities, pilot projects and the testing and validation of new or improved products, processes and services in a realistic environment where the main objective of these measures is to identify essentially unsettled products, procedures or services. The experimental development may include the development of commercially viable prototypes and pilot projects where the commercial end product is inevitably involved and its production would be too expensive for demonstration and validation purposes alone. The experimental development does not include routine or regular changes to existing products, production lines, production processes, services or other ongoing operations, even if these changes should be improvements.

Source: <http://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52014XC0627%2801%29&from=EN>