REPORT OF THE ACTIVITIES 2012/2014

Three years of commitment in research and technology transfer activities on energy and environment issues in Liguria Region.

Tecnologie Innovative per il Controllo Ambientale e lo Sviluppo Sostenibile
Managing body of the "Energy and Environment" regional Innovation Hub

The establishment of the "Energy and Environment" regional Innovation Hub and most of the projects described were carried out with the support of the European Regional Development Fund (ERDF).

45 partners

over **1.5 billion euros** of turnover for the associated companies

more than **3 thousand employees**

more than 20 projects realized from 2012 to 2014

more than15 million euros spent for the projects in the years 2012/2014

over 8 million euros of european funding obtained from 2012 to 2014

Three years of commitment in research and technology transfer activities on energy and environment issues in Liguria region

Almost after five years since the establishment of TICASS Consortium, and after three years of activity as managing body of the Regional Innovation Hub in the "Energy-Environment" field, I take this opportunity to **think about the path of development, matured together with our partners**.

The main strength of the Consortium leans on its members and partners: thanks to them TICASS had the chance to grow-up in these years, and here I will try to highlight the main aspects of its growth.

The steady increase in the number of its associates, as well as the positive trend of its main economic and financial data, can give an idea of TICASS' growth. This is even more impressive if you consider the negative economic period in which we are living in.

TICASS has also grown-up in other important aspects of its activity, such as the size of the target market, which has been gradually expanding, **moving from regional to national scale at first, then aiming to European target**.
Another aspect worth mentioning is the average size of the projects in which the Consortium has been and is still involved; indeed alongside regional and private projects, there are also multi-year European projects.

Among the results, I wish to point out the great compactness of this structure, that is the result of **a constant interaction between TICASS and its members** (and vice versa).
Thanks to this feature and to the relationship of trust between the associated partners, which consolidated in the past few years, **TICASS represents one of the few examples of successful aggregation between research structures and industries**.
In particular, the role played by the University of Genoa and its departments, and by some national research structures (CNR and INFN) has been and is still an important driving force for the development of the Consortium's skills.

The active participation of researchers with different backgrounds gave a major boost to the growth of TICASS, contributing to **create and develop new project ideas, with important implications for the local economic reality**.
The interaction between researchers from the University and from other research centers, with technicians of private companies, led to the construction of a supportive environment, which activated technology transfer mechanisms and real collaborations to deal with real needs.

I am glad to finally emphasize that, despite of its growth, the first goal of the Consortium is still firmly anchored to the needs of its members, with particular attention to Ligurian SMEs. Indeed it is primarily toward them that all the activities of TICASS are directed.

Gustavo Capannelli
President of TICASS

TICASS: research and innovation for a sustainable development

TICASS - acronym for "Innovative Technologies for Environmental Control and Sustainable Development" - is a non-profit Consortium born in March 2010, including public research bodies (Departments of the University of Genoa), SMEs and large Companies. It is the managing body of the "Energy and Environment" regional Innovation Hub, supported by ERDF in the Liguria Region in Italy.

Being the managing body of the "Energy and Environment" regional Innovation Hub, TICASS promotes, disseminates, and enhances the activity of research and technological innovation with reference to these two areas, acting as a meeting point between institutions and local economic and productive realities.

The main goal of the Consortium is **to find effective solutions to support the sustainable development of our territory**, knowing that only through innovation the economy of Liguria and Italian territory will be able to be competitive at European and international level.

The strength of TICASS is the heterogeneity of its members: manufacturing and service companies, public and private research institutions, small medium and large companies. This characteristic allows the creation of synergies that enable TICASS to develop innovative projects related to the needs of the members and the community.

In particular, **TICASS works to promote and to facilitate the participation of companies (with particular attention to SMEs) to the funded projects**, with the aim of maximize the exploitation of economic public resources allocated for research by the different policy levels.

The activity of TICASS - **environmental monitoring, development of sustainable products and processes, development of territory and resources** (natural and mineral), **new materials and blue energy** - is in line with the recommendations of the European Union. Sustainable growth, based on a greener economy and more efficient management of resources is, in fact, one of the priorities of the **"Europe 2020"** strategy, through which Europe wants to overcome the economic crisis and to create the conditions for the development of a more competitive economy, characterized by a higher employment rate.

The projects realized in the last period, those on which TICASS is currently working, including the project Med SMART-PORT, the project Life+ inREACH and those related to the waste recovery, are in compliance with this direction.

TICASS adheres to:

CLUSTER CL.A.N - aims to increase the competitiveness of the agri-food chain in its main components - agricultural production, processing, related industries (packaging, logistics etc.), distribution and consumption - through the innovation stimulation, access to and exploitation of results of research activities, collaboration between research institutions, companies and public administration.

SPRING – nonprofit association which brings together different realities working in the field of bio-economy, and which represents the entire Italian green chemistry industry, from agriculture to research in the renewable sources field, industrial biotechnology etc.

4 RESEARCH ORGANIZATIONS

CeRSAA - Centro di Sperimentazione e Assistenza Agricola
CNR - Consiglio Nazionale delle Ricerche
INFN - Istituto Nazionale di Fisica Nucleare
Università degli Studi di Genova

7 MEDIUM COMPANIES

A&A F.lli Parodi S.p.A.
Circle CAP S.r.l.
C.P.G. Lab S.r.l.
Giuseppe Santoro S.r.l.
Ireos S.p.A.
Istituto Italiano della Saldatura - Ente morale
Spiga Nord S.p.A.

9 LARGE COMPANIES

Amiu S.p.A.
Boero Bartolomeo S.p.A.
Faci S.p.A.
Fondazione AMGA
Fondazione CIMA
Iplom S.p.A.
Iren Acqua Gas S.p.A.
Italiana Coke S.r.l.
Servizi Ecologici Porto di Genova S.r.l.

25 SMALL COMPANIES

ABIRK Italia S.r.l.
Active Cells S.r.l.
Analisi e Controlli S.p.A.
Antea S.r.l.
Archimede Ricerche S.r.l.
Biotec Sistemi
Circle S.r.l.
Erde S.r.l.
Eurochem S.r.l.
Fondazione MUVITA
Lab. Chimico Merceologico SV
Gis & Web S.r.l.
Gisig
I.A. Industria Ambiente S.r.l.
Ingenia S.r.l.
Ireos Laboratori S.r.l.
Ismar Chimica S.p.A.
Itec Engineering S.r.l.
Mesa S.r.l.
Medservice.com S.r.l.
Micamo S.r.l.
PM_ten S.r.l.
Port and Territory S.r.l.
SIGE S.r.l.
SIIT PMI


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Monitoring of nanoparticles in the atmosphere

The project, ended in June 2014, aimed **to develop a system for the evaluation and the monitoring of nanoparticles in the atmosphere**, with highly innovative approaches involving the use of integrated high resolution tools and techniques, such as electron microscopy, able to evaluate continuously the quantity and the distribution of nanoparticles (particles counter).

The nanoparticles are considered as **a new category of potential pollutants** (never evaluated until now) that, within the project, have been characterized in terms of their quantity and sources (natural, maritime etc.)

The research allowed to correlate, by the counting of the ultrafine particles, their distribution with chemical composition and morphology, performed through electron microscopy techniques. It also allowed to define the chemical composition and therefore the level of pollution and the contribution of the various polluting sources.
The integrated system enables the planning and the implementation of **innovative environmental survey campaigns** (controls on industrial gaseous emissions, verification of environmental contribution of specific gaseous emissions, evaluation of the amount of particulate matter in urban areas) and feasibility studies for the development of smart detection stations.

For this research a patent application was filed.

Title: Study and development of an innovative system for monitoring ultrafine particles and nanoparticles in the atmosphere, correlating concentration and speciation.

Partnership: C.P.G. S.r.l., Port and Territory S.r.l.
Subcontract: University of Genoa - Department of Chemistry and Industrial Chemistry, TICASS S.c.r.l.
Acknowledgments: Environment Division, ex-Provincia di Genova.

Funding instrument: POR Liguria (2007-2013) - Asse 1 Innovazione e Competitività - Azione 1.2.2 Ricerca industriale e sviluppo sperimentale.

Budget: € 714.479,68

Granted funds: € 389.983,81

Project duration: January 2012/June 2014

Production of syngas by thermal processes. Case study: coke oven gas

The project involved the development of **an innovative process based on the molecular thermal decomposition of volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs), in the presence of other gases, such as CO, H_2 and water vapor, produced by pyrolysis, gasification and coal coking processes**.

Results provided by the experimental study, carried out feeding the reactor with both gaseous model mixtures and real coke oven gas, showed that **the process is able to convert coke oven gas in gaseous mixtures consisting of high purity syngas (H_2 and CO) with the ability to decompose organic pollutants** (BTEX, PAH), with removal efficiencies greater than 99.99% for BTEX and 99.999% for PAHs. These efficiencies are significantly higher than those of the conventional purification treatments.

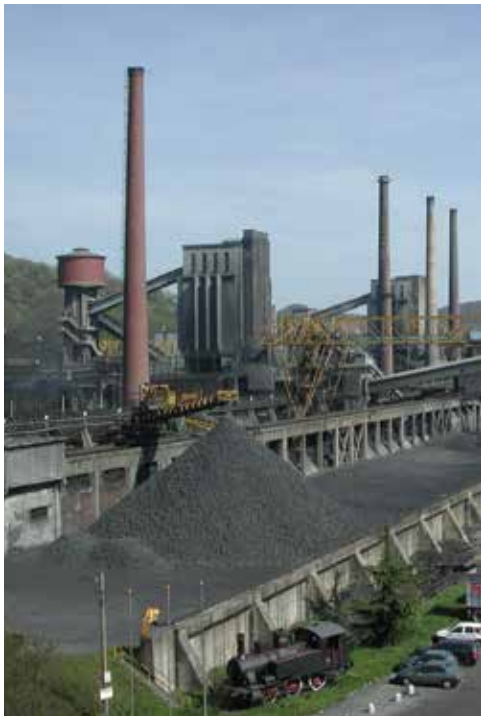
Thanks to their composition and to a very low content of organic pollutants, **the produced mixtures are potentially usable as fuels with high energy content in cogeneration processes, as hydrogen sources and, in particular, as syngas for the production of many intermediates in the chemical industry** (methanol, ethylene glycol, etc.).

Furthermore the high easiness of the process (single-stage) makes it advantageous, both in environmental and economic terms.

Among the main obtained results, there is the construction of two pilot plants, built-up to study and optimize the process; the first one was installed in the laboratories of the Department of Chemistry and Industrial Chemistry of the University of Genoa, while the second one inside the plant of the leader company.

The project also aimed to develop both a kinetic model, necessary to identify the best operating conditions for the engineering of the industrial process, and **a technical and economic feasibility study for the construction of a plant on industrial scale, aimed to produce syngas from coke oven gas or from gases generated by the pyrolysis of organic matters**.

For this research a patent application was filed.



Title: Study and development of innovative systems for purification of coke oven gas with high energy / environmental efficiency.

Partnership: Italiana Coke S.r.l., IREOS Laboratori S.r.l., E.A.T. European Advanced Technologies S.r.l.. Subcontract: University of Genoa (DCCI e DICCA), TICASS S.c.r.l.

Funding instrument: POR Liguria (2007-2013) - Asse 1 Innovazione e Competitività - Azione 1.2.2 Ricerca industriale e sviluppo sperimentale.

Budget: € 1.386.306,54

Granted funds: € 663.655,75

Project duration: March 2012/September 2014

"Membrane contactors" for CO_2 absorption from industrial gaseous streams

FSC Fondo per lo Sviluppo e la Coesione

The process developed in the context of the project (still in progress) is able to **remove CO_2 from any gaseous stream, and is then suitable for the purification of different types of industrial gaseous streams, such as biogas and flue gas from combustion processes and chemical processes**. Using membrane contactors, the process allows to absorb CO_2 from any gas stream, avoiding direct contact with the liquid absorbent solution. It has also been evaluated the possibility of recovering CO_2 with high purity and reuse it in food, chemical and photosynthetic processes.

The use of "membrane contactors" entails considerable advantages over conventional absorption systems: higher contact surface, higher separation efficiencies, easier scale-up of the absorption module, greater compactness and possibility of modulation.

The study involved the construction of **two pilot plants, fed with gas streams from industrial processes**, specifically from steam reforming of methane for production of ultra-pure hydrogen (IPLOM S.p.A.) and from flue gas of a cogeneration system of a coking plant (Italiana Coke S.r.l.).

For this research a patent application was filed.

Title: Recovery and enhancement/ valorization of carbon dioxide from industrial gaseous streams by applying an innovative membrane technology.

Partnership: IPLOM S.p.A., Italiana Coke S.r.l., Servizi Industriali Genova, SIGE S.r.l., IREOS Laboratori S.r.l., University of Genoa(DCCI e DICCA). Project idea: TICASS S.c.r.l.

Funding instrument: Bando attuativo del programma attuativo regionale ex Fas 2007-2013 Progetto 4 "Programma triennale per la ricerca e l'innovazione: progetti integrati ad alta tecnologia".

Budget: € 2.184.136,85

Assistance granted: € 1.139.005,61

Project duration: January 2014/ December 2015

Innovative technologies for dredging and remediation of seabeds

FSC Fondo per lo Sviluppo e la Coesione

The main goal of the project was **the development of an environmentally and economically sustainable technology for dredging, aimed both to remove marine sediments and remediate the seabed. The new process produces concrete aggregates, making the material on the seabed totally inert**.

This technology is based on **the development of new materials, consisting of environmental friendly concretes,** that means: low concentrations of heavy metals, ultra quick-setting, high encapsulation and hardening capability, even in the presence of large volumes of water.

The technology involves the sediment from its handling on the seabed up to their remediation with the realization of concrete aggregates, which can be reused or disposed of as inert material.

Moreover the project foresees, in addition to the formulation of a suitable material, **the realization of a plant for the treatment of sediments**, able to mix them with the concrete systems selected for the production of agglomerates.
The next step will be the realization of an industrial prototype, able to represent a real business opportunity in the field of dredging and remediation of the seabed both for freshwater and seawater.

For this research a patent application was filed.

Title: Definition and development of innovative technologies with low environmental impact for the development of new systems for the dredging of the seabed.

Partnership: Giuseppe Santoro S.r.l., C.P.G. LAB S.r.l., Itec Engineering S.r.l., MESA S.r.l., University of Genoa (DCCI).
Project created by TICASS S.c.r.l. and realized in collaboration with Italcementi Bergamo.

Funding instrument: Bando attuativo del programma attuativo regionale ex Fas 2007-2013 Progetto 4 "Programma triennale per la ricerca e l'innovazione: progetti integrati ad alta tecnologia".

Budget: € 797.495,55

Assistance granted: € 538.246,08

Project duration: 24 months (2013/2015)

Innovative anti-wear and anti-friction powders

At first, the aim of this project was **to analyze and test new powders to be used in the construction of anti-friction and anti-wear coatings on rolling cylinders**, characterized by a content in nickel greatly reduced compared to those normally used, and with more relevant technological properties, thanks to the powder spray technique PTA.

The powders tested during this project **allowed to obtain an improvement in the environmental impact, a higher productivity as well as a reduced energy consumption associated to the rolling process**.

In addition the emissions of the reporting process were monitored, highlighting the nature of the emitted particulate and identifying the environmental monitoring methods for the capture of the particulate generated during the process.

Title: Study and development of innovative anti-wear and anti-friction powders on rolling cylinders by using an innovative technology: powder spray technique PTA.

Partnership: IIS Progress S.r.l., Antea S.r.l.
Subcontract: University of Genoa - Department of Chemistry and Industrial Chemistry, TICASS S.c.r.l.

Funding instrument: POR Liguria (2007-2013) - Asse 1 Innovazione e Competitività - Azione 1.2.2 Ricerca industriale e sviluppo sperimentale.

Budget: € 751.617,88

Granted fund: € 281.073,68

Project duration: April 2012/ September 2014

Paints for energy efficiency and living comfort

The research project has been focused on **the development of innovative colored paints, with peculiar reflection properties in the infrared range**. The use of these paints on buildings' external walls can reduce their heating in the summer period, thus reducing energy consumption for air cooling.

The results of the research activity show that, even with the use of IR-reflective black pigments, it is possible to obtain paints, black or dark (realized with small percentages of black dye), characterized by values of solar reflectance greater than 30% compared to the corresponding standard paints. At the same time it was verified the possibility to increase the solar reflectance of colored paints (such as yellow oxide) by using this unique IR reflection property.
Indeed, **it was possible to obtain differences of temperature up to 10°C between the buildings varnished with these special paints and those varnished with the standard ones**.

Title: New paints formulation aimed at improving the reflection properties for the energy efficiency and living comfort of buildings.

Soggetti coinvolti: Boero Bartolomeo S.p.A. (leader), Omega S.r.l. (co-applicant). Cristoforo Tixe d'Arenzano S.r.l. (co-applicant), University of Genoa - Department of Chemistry and Industrial Chemistry (consultant).
Project idea was developed in collaboration with TICASS S.c.r.l.

Funding instrument: POR Liguria (2007-2013) - Asse 1 Innovazione e Competitività - Azione 1.2.2 Ricerca industriale e sviluppo sperimentale.

Budget: € 499.606,68

Granted fund: 50%

Project duration: approximately 2 years

Artificial intelligence and nanometric scale sensors for environmental monitoring

The aim of the project was **to study, to define and to design an integrated environmental monitoring platform as a "data repository"** where the environmental data used by companies of the IREN group, by the partners of the project (Abirk Italia and Leonet) and by third parties, become available. By using this platform the companies will be able to manage their own activities in the environmental monitoring field, and also to manage forecasting systems to foresee storms along the coastlines.

The platform is a technological demonstrator that integrates the results and that represents the basis for a further development. Some data are currently available on rain's height connected to the network of the drainage system managed by IREN group, made of underground streams that cross the city centre. Data on thematic maps are also available, related to the current ranges in the stretch of sea off Genoa for specific weather conditions (wind strength and direction) and to the waves' height, and their prediction in 10 hours.

The platform is characterized by **a centralized database, fed by streams of data coming from multiple sources located throughout the territory**, which consists of environmental monitoring systems (acquired by chemical, physical and weather sensors) related to mathematical models that are used to simulate different scenarios.

Title: Data acquisition and environmental monitoring platform, integrated with innovative elements of artificial intelligence and nanometric scale sensors.

Partners: Iren Acqua Gas, Abirk Italia (ex Medservice.com) e Leonet (ex CAP.TEL.).
Project idea was developed in collaboration with TICASS S.c.r.l.

Funding instrument: POR Liguria (2007-2013) - Asse 1 Innovazione e Competitività - Azione 1.2.2 Ricerca industriale e sviluppo sperimentale.

Budget: € 769.168,81

Granted fund: € 354.359,22

Project duration: 23 months

Extraction of polyphenols for cosmetic and pharmaceutical industry from olive oil production

This research project, ended in 2014, aimed to obtain useful products for cosmetic and pharmaceutical industries (polyphenolic compounds, pure or dissolved in oil), derived from by-products of oil industry.

In particular **the attention was focused on vegetable oils and environmentally friendly solvents for the extraction of polyphenols**, obtaining a double result in this way: from one side the ecological disposal of wastewater, while from the other side the obtaining of valuable products (polyphenols), and in particular of hydroxyl-tyrosol, which has considerable antioxidant properties and it is largely used in the pharmaceutical and cosmetic industry.

Title: Study and development of innovative technologies for the extraction of polyphenols from olive vegetation water coming from olive oil production, also through the use of environmental friendly solvents.

Participants: ALSO S.r.l. Consulente: TICASS S.c.r.l.

Funding instrument: POR Liguria (2007-2013) - Asse 1 Innovazione e Competitività - Azione 1.2.2 Ricerca industriale e sviluppo sperimentale.

Budget: € 1.056.557

Fund granted: € 434.140

Project duration:: January 2012/June 2014

Innovative processes and technologies for the treatment (purification) of oily bilge water

The goal of this research project was **the made-up and the optimization of a process for de-oiling the bilge water**, and the subsequent purification of the aqueous phase through membrane-based processes.

The process ensures almost the complete recovery of the oil and even the purification of the water, thus allowing the discharge of the bilge water into the sea. In this way both an environmental and an economic advantage is obtained.

Title: Study aiming at the full recovery of oils and at the purification of bilge water through innovative processes and technologies.

Soggetti coinvolti: A.O.C. Antipollution Operative Center S.r.l., Ismar Chimica S.p.A., M.E.S. S.r.l. Molecular Energy Systems. Consultants: University of Genoa - Department of Chemistry and Industrial Chemistry, TICASS S.c.r.l.

Funding instrument: POR Liguria (2007-2013) - Asse 1 Innovazione e Competitività - Azione 1.2.2 Ricerca industriale e sviluppo sperimentale.

Budget: € 432.365,40

Fund granted: € 259.419,24

Project duration: March 2011/August 2013

An action plan for the European "smart ports"

The project SMART-PORT is part of the plan "Europe 2020", through which Europe wants to support a smart, inclusive and sustainable growth.
It focuses in particular on the situation of the container ports of the Mediterranean basin, with the aim of **fostering the adoption of sustainable management models for promoting innovation in the energy-environment field**, with the goal of minimizing the impact and improve its competitiveness.

The project is divided into three phases; the first one has involved **the definition of the concept of "Smart Port"**, through the collection, analysis and measurement of a set of criteria and indicators related to: operational efficiency, energy efficiency and environmental performance of a large sample of ports, selected within the first 100 container ports in the world.
The second phase of the project is aimed at **identifying the main factors of competitiveness** (advantages and disadvantages) of five ports, selected from the sample previously identified. The methodology chosen for this purpose includes the development and administration of a blind questionnaire sent to the stakeholders of the project, followed by the subsequent analysis of the results.
The last one involves the definition, based on the results of the previous phase, of an action plan that aims at **the affirmation of the concept of Smart Port**, and that can support its actual adoption.
It is also foreseen the creation of a network at European level for the sharing of best practices and exchange and comparison of experiences.

Title: SMART-PORT - Action plan towards the Smart Port concept in the Mediterranean Area.

Participants: Andalusian Institute of Technology (capofila), TICASS S.c.r.l., Institute of Communication System - ICCS, University of Cádiz, Institute of Traffic and Transport Ljiblijana.

Funding instruments: MED Program.

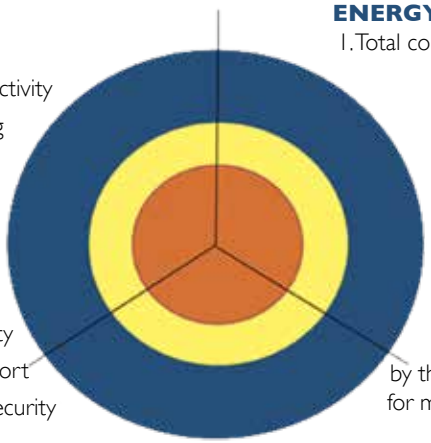
Budget: € 660.000

Fund granted: 75%/100%

Project duration: 12 months (2014/2015)

Website: www.medmaritimeprojects.eu/section/smartport

SMART PORT CRITERIA



OPERATION
1. Berth productivity
2. Infrastructure productivity
3. Capacity of receiving large vessels
4. Size and use of the maximum capacity
5. Technologic level
6. Level of automation
7. Level of intermodality
8. Lines calling at the port
9. Quality, safety and security

ENERGY CONSUMPTION
1. Total consumpiotions of energy
2. Energy consumption by containers
3. Energy consumption by internal fleet
4. Energy consumption by offices
5. Energy consumption by lighting
6. Energy consumption by the terminals' equipment for movement of containers
7. Use of renewables
8. Energy management

ENVIRONMENT
1. Environmental management system
2. Waste management plan
3. Water management
4. Emissions to air
5. Noise pollution

"Road map" to make the import stage of chemicals safer in the EU territory

The objective of the inREACH project is the protection of the environment and human health, by **supporting and facilitating the exchange of information on products, substances, mixtures and articles classified in terms of their chemical composition, imported from countries outside the EU. The aim is also to define the arrangements for monitoring and verifying their compliance with the REACH and CLP Regulations,** through innovative solutions.

The application of these regulations is now particularly complex, because of the non-compliance of the information transferred by exporters outside Europe, and also because of the problems of general management expressed by European producers and importers.

The project, which started a few months ago, has the intention to solve the current problems through a series of actions, including:

- the creation of a national platform of stakeholders and their engagement both at EU and non-EU;
- the definition of the main 25 issues that have a negative impact on the implementation of the REACH and CLP Regulations for SMEs and individuals, Enforcement etc;
- the definition of a Road Map with 25 possible solutions to overcome these problems;
- the release of a Framework (procedures and ICT tools) and the implementation of demonstration activities.

So, the final goal of this project is **to obtain an overall reduction of 5/10 % of the substances and products imported within the EU area, which do not contain sufficient information as requested by the REACH Regulation**. All of this will be reached through the rationalization of compliance controls, the simplification of the information, by improving data sharing between the entities involved and the supervisory authorities.

Project funded by Life+ 2007-2013 financial instrument

Title: INREACH - protecting health and environment by streamlining REACH compliance check at European Economic Area import stage.

Soggetti coinvolti: TICASS S.c.r.l. (leader), Istituto di Ricerche Farmacologiche Mario Negri, Centro Reach S.r.l., Federchimica.

Funding instrument: LIFE+ 2007-2013.

Budget: € 801.034,00

Co-financing: € 400.517,00 (50%)

Project duration: 36 months (September 2014/August 2017)

Website: www.inreachproject.eu

A master on energy efficiency for 24 young Russian teachers

The project, still in progress, is funded by the Tempus Program (Trans European Mobility Scheme for University Studies) which aims **to promote the process of modernization of higher education in the partner countries of the former USSR's area and of the Mediterranean basin**.

It foresees **an intense activity of technological transfer through the mobility of the teaching staff** of the partner universities from Russia and vice versa, in order **to develop a two-year master** which will be included into the training project of the six Russian universities involved in the project.

In order to achieve this goal TICASS, which is involved into this project as a partner, has been involved in **the realization of the pilot course: "Energy savings and environmental protection and control"**, which has already had 24 students from 11 different Russian Universities.

Title: GREENMA - LLL Training And Master In Innovative Technologies For Energy Saving And Environmental Control For Russian Universities, involving Stakeholders.

Participants: University of Genoa – Servizi Relazioni Internazionali dell'Ateneo (project coordinator), TICASS S.c.r.l. and other 19 partners, including 11 Russian universities.

Funding instrument: Tempus Program.

Budget: € 986.574,20

Durata del progetto: 36 months (2012/2015)

Website: greenma.tstu.ru

"Open" geo-data for innovative services and user applications towards smart city

Title: GEOSMARTCITY - Open geo-data for innovative services and user applications towards Smart Cities.

Participants: GISIG (capofila), TICASS S.c.r.l. and 12 other partners.

Funding instrument: CIP-ICT-PSP-2013-7 Pilot Action.

Budget: € 3.476.005

Co-finanziamento: € 1.738.000

Project duration: 36 months (2014/2017)

Website: www.geosmartcity.eu

The European project ICT-PSP GeoSmartCity aims **to develop a platform that can publish geographic information and provide specialized services, based on operational protocols and open standards.**

The potential of GeoSmartCity will be demonstrated at European level, through **the implementation of 11 operational pilot cases,** repeatable in other territories, **which refer to two scenarios: Green Energy** - which support the Covenant of Mayors promoting energy efficiency - **and Underground**, that supports the integrated management of the subsoil through the sharing of the work environment and of basic geographic information, produced and/or owned by the government..

Membrane integrated processes for wastewater treatment

This experimental activity, carried out on behalf of eni, is an important example of collaboration with companies that are not members of TICASS Consortium.
In collaboration with the Department of Chemistry and Industrial Chemistry of the University of Genoa, the Consortium worked with the aim of **acquiring a deeper technical know-how in the management of wastewater treatment through membrane-based processes**. This kind of processes are able to retain specific pollutants and simultaneously allow the recovery of water in polluted industrial sites (for example in the recovery of washing water, industrial wastewater, groundwater etc.).

TICASS' activity has therefore focused on **the study of the membrane processes**, in order to acquire data and knowledge about the actual separation capability in the different case studies examined (micro-filtration, ultra-filtration, nano-filtration and reverse osmosis).

A significant part of this experimental study has been devoted to the overcoming of the main industrial criticalities, such as the removal of borate ions from groundwater or industrial wastewater. The attention has also been focused on the identification of appropriate types of membrane and appropriate operational conditions (pH, maintenance of high separation factors), both for the production of potable water and industrial wastewater treatment.

Actions carried out by TICASS and other research groups which cooperated in this experimental research, allowed to obtain the following results:

- Verification of performance in terms of effectiveness and efficiency of membranes suitable for separating suspended solids through processes of Microfiltration (MF). These membranes can be used in clarification processes or as a pre-treatment of other processes, such as nano-filtration (NF) and reverse osmosis (RO).
- Identification and characterization of:
  NF membranes for selective separation of macro-ions;
  RO membranes, capable of separating ions in solutions with low osmotic value, characterized by high retention and considerable flow at low operating pressures;
  RO membranes, capable of withhold any high-concentration ionic species, which require high operating pressures to overcome the osmotic contributions.
- Optimization of operating conditions for the achievement and maintenance of stable performances over time.

Participants: Direzione Research & Technological Innovation - Renewable Energy & Environmental R&D - Renewable Energy & Environmental Laboratories, eni S.p.A., in collaboration with TICASS S.c.r.l. and the Department of Chemistry and Industrial Chemistry (DCCI) of the University of Genoa.

Funding instrument: private funding by eni S.p.A.

Budget: € 270.000

Project duration: 24 months (October 2012/September 2014)

A center of excellence for the production of microalgae for aquaculture, food supplements and cosmetics' market

Archimede Ricerche S.r.l., part of the A & A Fratelli Parodi S.p.A., is engaged since 2010 in the development of **a center of excellence for the production of microalgae that will be placed on the markets of aquaculture, food supplements, novel foods and cosmetics**.

In Camporosso, a little town nearby Imperia, the company has realized **the first and largest facility of photo-bioreactors in Italy**. This facility is also the only one where the CO_2, utilized in the photosynthesis process, is obtained from a renewable source. Indeed it is a 1000 kW co-generation plant for the simultaneous production of steam and hot water and an original system for purification of flue gases, utilized for biological use. The development of this center of excellence foreseen **an investment of 5 million euros, and a future investment of 8 million euros to equip the production site with a R&D private center**, open to the new sustainable agriculture reality, and to collaborations with research centers like the University of Genoa, TICASS, IRF Sanremo, CRA FSO Sanremo, Associazione Piscicoltori Italiani.

According to the company's goal, **this center will also host a school of algae farming** which, thanks to the possibility of doing a training session offered by the plant, will be able **to establish collaborative programs with research structures as the University of Genoa, hotel management schools** interested in the applications of microalgae as novel food and novel ingredients, and with realities of the local agriculture for the reuse of abandoned greenhouses. Therefore **this research center will be able to propose itself at European level** alongside centers of excellence like those in Florence, Lisbon and Wageningen: it will arise above the others for its strong, entrepreneurial and brave productive character.

Archimede Ricerche S.r.l. has benefited for its industrial research of a funding of over 470000 euros (out of a total budget of around 1 million euros) under the POR Liguria 2007-2013, for **the development of a project - entitled "Study and development of production and innovative applications of microalgae and natural active derivatives" - dedicated to the reduction of the cost of biomass production** through the development of a technology based on the re-use of the culture medium and the use of CO_2 from flue gas in photosynthesis. The project has also been focused on **studying and testing a technology for the separation and the purification of active ingredients as fucoxanthin**, to increase the yield of carotenoids and polyunsaturated fatty acids. Thanks to this project, cosmetic applications of extracts from microalgae have been developed, as well as preparation techniques for new food products.

Archimede Ricerche S.r.l. also collaborates with nine European partners, to the European project FP7 "BIOFAT" (Biofuel from Algae Technologies), **which includes the installation of a pilot plant for biofuels production from microalgae.** The project is part of Algae Cluster (the set of European projects for applications of microalgae in energy area) will receive funds for approximately 10 million euros in five years and aims to contribute significantly to **the development of the sector, thanks to the design of the first microalgae plant on demonstration scale** (10ha).

FESR

European Union

Archimede Ricerche Srl

Future plans: sustainability of port activities, waste valorization and new materials

Starting from what has been achieved in the first three years of activity (2012-2014) and looking at the future, TICASS will continue its activity of support and consultancy services addressed to the companies involved in the Consortium.
Furthermore it will also help and collaborate with external subjects about the thematic areas on which it has built its identity: application of innovative elements in the production cycles, design and implementation of research projects, promotion and realization of training activities for technical and professional growth, environmental issues and development of sustainable processes and products.

Concerning in particular the environmental sector, TICASS intends **to develop and deepen aspects related to sustainability issues, associated with port activities**, which represent one of the main economic driving forces for the Ligurian territory, where you can find three of the most important ports in the Mediterranean basin. In this way it is possible to give continuity to the work started in recent times and to strengthen its support towards the members operating in this area.

The skills and interests of the members of the Consortium will be further enhanced in two national Clusters: Agrifood and CLAN-Green Chemistry, joined by TICASS, whose skills will also be enhanced in funding programs for research projects at European level, like Horizon 2020, Med, Interreg and Life.

The main ideas on which we're going to work are focused on the enhancement of waste. About the waste issue, **TICASS has just joined a European project - Horizon 2020 - "Bluecities", in which it will bring its know-how and an important experience made in 2013 in the development of the Regional Plan for Waste Management in Liguria**.
In this context, the new proposal of development will focus on **the recovery of waste as a second raw material, as well as on the production and transformation of organic matter through the use of biotechnology and biochemical transformations**. We will apply an integrated approach, that will allow us to use the technology on different types of renewable material such as: waste vegetable oils, products derived from agricultural activity, urban waste and industrial waste.
This activity is in line with the main goals and strategies of "Europe 2020", i.e. the transition from a "linear economy" to a model of "circular economy", based on a society aiming to improve the consumption of resources, to recycle the products, in order to reduce waste and use them as new secondary raw materials.
In particular the goal of TICASS is to actively **contribute to the production of alternative molecules of industrial interest from renewable resources**, which can be used in the place of products derived from fossil fuels.

A certain attention will also be paid to the Green Energy and Blue Energy issues, with the aim to adjust the system of recovery and use of thermal energy and electric energy; in this area we will focus on **innovative technologies for energy production** (based on gradients of temperature, concentration, pressure etc.). Another goal is the enhancement of clean methane production from biogas.

Furthermore, considering the number of experts in synthesis processes, formulation and characterization of materials, that are working in the companies of the Consortium, **TICASS will be keen on research on new materials, as a priority theme**.

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Credits:
Genoa Port Center and Francesco Tomasinelli, picture of the harbor of Genoa at page 8.
Antonio Amato, picture of IPLOM plant at page 8 and 11.

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