



# EARTO INNOVATION AWARDS 2020



European Association  
of Research and Technology Organisations

Technology for a better world - [www.ear.to.eu](http://www.ear.to.eu)



## **EARTO - European Association of Research and Technology Organisations**

Founded in 1999, EARTO promotes Research and Technology Organisations and represents their interest in Europe. EARTO network counts over 350 RTOs in more than 20 countries. EARTO members represent 150,000 highly-skilled researchers and engineers managing a wide range of innovation infrastructures.

**CONTRIBUTE**  
EU RD&I PROGRAMMES  
**GLOBAL CHALLENGES**  
**EUROPE'S**  
**INDUSTRIAL COMPETITIVENESS**  
EUROPEAN RESEARCH AREA

# TABLE OF CONTENTS

EARTO INNOVATION AWARDS 2020

06-07

## IMPACT DELIVERED

### FIRST PRIZE

Helmholtz – Slowing down osteoporosis

10-11

### SECOND PRIZE

CSEM – Non-obtrusive technique needed

12-13

### THIRD PRIZE

Fraunhofer – Safe and non-toxic fire-protection gel

14-15

### MORE INNOVATIONS

16-22

## IMPACT EXPECTED

### FIRST PRIZE

VTT – Eggs without chickens

26-27

### SECOND PRIZE

TECNALIA – Paralysed patients are not alone

28-29

### THIRD PRIZE

RISE – Superheroes' filaments come to life

30-31

### MORE INNOVATIONS

32-37

## RTOs INTERNATIONAL NETWORK (RIN)

### DISCOVER INNOVATIONS FROM EARTO RIN MEMBERS

40-49

# Sine Qua Non For Productivity, Prosperity And Growth: Investments In Research, Development And Innovation

Governments around the globe are currently working on reinforcing their public health sectors fighting COVID-19 and taking actions to alleviate the socio-economic impact of the pandemic. As key RD&I actors, RTOs are supporting those efforts.

Thanks to their technological competences, digital tools and data analysis capabilities, EARTO members are actively supporting the health sector with upgrading the manufacturing capabilities, quality testing and distribution of key medical supplies and equipment, while supporting the pharmaceutical development of testing and diagnosis, as well as of new treatments and vaccines. RTOs worldwide are working alongside their governments in today's crisis management. EARTO members support their governments in developing specific policy measures to alleviate the pandemic's socio-economic consequences, helping the society to recover from the crisis. Understandably, many are focused on the immediate survival. But even deeper crises are ahead of us unless we respond in time: climate change and the collapse of natural ecosystems must be stopped.

It would be a great pity if we were unable to imagine a better world than the one we had before this crisis. We must look far ahead into future and seize opportunities that can offer well-being also decades from now. Science, technology and innovation open up numerous paths for us, as long as we dare to take them. Deployment of new technologies requires investment: laboratories, research and experimental facilities for trial and error and learning - professional research environments, where European companies can develop and scale-up new solutions.

Tackling the crisis and ensuring Europe's economic recovery and industrial competitiveness cannot be successful without Research, Development and Innovation (RD&I) investments. Given that RD&I investments are the key drivers of productivity, prosperity and growth, the European leaders need to put forward an ambitious EU RD&I policy and related investments that reduce the level of uncertainty of private RD&I investments, enhance Europe's technology sovereignty and make the green and digital transition a reality. As stated in the [EARTO policy recommendations](#), fostering cross-border RD&I collaboration and supporting a European RD&I ecosystem approach along strategic value chains is the only solution to face the global societal and industrial challenges of today. The Pillar II of Horizon Europe is crucial and, more than ever before, now is the time to act as strong and competitive Europeans and aim at targeting 3% of GDP spending on R&D. The future of the European Research Area (ERA) will be at stake without increased investments in research and technology.

The research community and RD&I stakeholders (RTOs, Industries, Universities), including EARTO, joined forces to bring research at the heart of the institutional negotiations and discussions. To answer future pandemics and challenges, and to have a hope for a brighter future, R&D should be THE priority in Europe.

This year, the EARTO Innovation Awards 2020 achieved the impossible. EARTO members showcased 32 impressive and real-life innovations, which are set in the next pages. Not only do they demonstrate meaningful examples on how RTOs create significant socio-economic impact, they also focus on today's challenges.

Sky has no limits, so does RTOs' impact!



**Antti Vasara**  
President & CEO, VTT Technical Research Centre of Finland

# EARTO INNOVATION AWARDS 2020

From the lab to your everyday life. RTOs innovate to improve your health and well-being, your safety and security, your mobility and connectivity. Their technologies cover all scientific fields. RTOs are non-profit organisations with public missions to support society. To do so, they closely cooperate with industries, large and small, as well as a wide array of public actors. The innovations presented in this brochure give a flavour of their work. They include real life examples which illustrate RTOs' focus on solving real-world problems and addressing today's challenges! The EARTO Innovation Awards celebrate this year its twelfth edition.

# 12 YEARS

# EARTO INNOVATION AWARDS

## NUMBER OF APPLICATIONS SO FAR

**262**  
APPLICATIONS

**51**  
RTOs

**22**  
COUNTRIES

## NUMBER OF WINNERS SO FAR

**51**  
WINNERS

**16**  
RTOs

**12**  
COUNTRIES

## Impact Delivered

For this category, the rewarded innovations (product or services) have social and/or economic relevance, innovative originality, are today on the market and have proven their impact.

## Impact Expected

For this category, the rewarded innovations (product or services) have social and/or economic relevance, innovative originality, are not yet on the market as a final product/service but promise to have a great impact.

### The award competition is adjudicated by an independent jury



**Peter Dröll**  
Director,  
DG Research & Innovation,  
European Commission



**Simon Edmonds**  
Deputy Executive Chair  
& Chief Business Officer,  
Innovate UK



**Christian Ehler**  
Member of the  
European Parliament



**Jana Kolar**  
Member of the Governing Board,  
EIT



**Ernst Kristiansen**  
Vice-President Research,  
SINTEF



**Juan Antonio Tébar**  
Director,  
CDTI

# IMPACT DELIVERED

Discover  
more innovations  
from RTOs





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# FIRST PRIZE

## HELMHOLTZ ASSOCIATION

### Slowing down osteoporosis



ABOUT **1,000** KITS HAVE BEEN SOLD TO CUSTOMERS AND APPROXIMATELY RECEIVED **€240,000** IN THE FIRST SIX MONTHS



**94-100%** SENSITIVITY CAN BE REACHED COMPARED TO PREVIOUS DXA METHOD



THERE ARE CURRENTLY **15** HOME - AND MED-KIT ORDERS PER WEEK



**120** INTERNET-BASED SALES PER MONTH ARE EXPECTED IN THE THIRD QUARTER OF **2020**

Helmholtz Association is Germany's largest scientific organisation. It represents more than 40,000 employees in 19 research centres across Germany. The Helmholtz Association conducts top-level research to identify and explore the major challenges facing society, science and the economy. Its work is divided into six research fields. Helmholtz transfers scientific knowledge into innovation and on into the market and so contributes to creating the technological basis for a competitive society.

GEOMAR Helmholtz Centre for Ocean Research Kiel is a world-wide leading institute of marine research. It investigates chemical, physical, biological and geological processes of the seafloor, oceans and ocean margins and their interactions with the atmosphere.

**HELMHOLTZ**  
RESEARCH FOR GRAND CHALLENGES

[www.helmholtz.de](http://www.helmholtz.de)

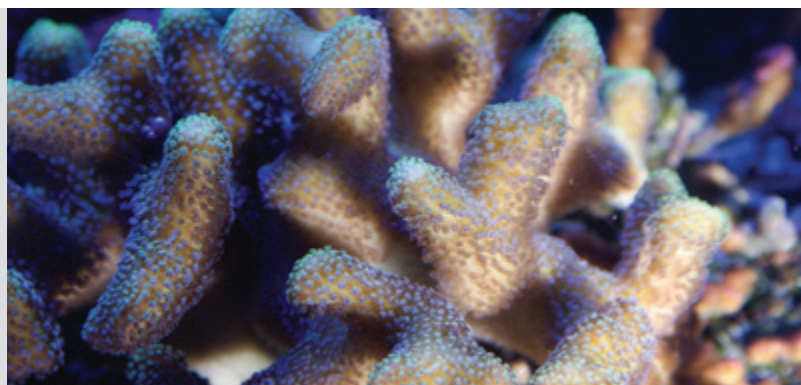
**GEOMAR**

[www.geomar.de](http://www.geomar.de)

# Love your bones and prevent future “break-ups”

In Europe, more than 20M people suffer from osteoporosis. Estimations project that this number will further increase due to the expanding population on the continent. That means, 33.9M people will be diagnosed with osteoporosis in 2025, corresponding to an increase of 23%. Osteoporosis mostly affects the elderly, and among those primarily women, who suffer from chronic skeletal pain and reduced mobility after a bone has fractured, which also often results in psychological distress such as depression, loss of mobility and isolation resulting thereof. It is true that the individual quality of live increases when osteoporosis is diagnosed and treated earlier than it is currently possible. The estimated economic costs, spent for the treatment of osteoporotic fractures,

reach many billion euros. The Helmholtz Centre for Ocean Research Kiel (GEOMAR), member of the Helmholtz Association of German Research Centres, has developed a technology that diagnoses osteoporosis years earlier compared to current standards and long before the disease becomes serious. The innovation has been officially commercialised by a spin-off company from GEOMAR, which is working with a strategic medical laboratory to collect additional individual basic medical data, providing an optimal individual diagnosis and medical result for each patient.



The osteolabs technology makes it possible to diagnose calcium loss and osteoporosis in humans earlier and more accurately than ever before.

## Leveraging the current diagnostic gap

The current standard DXA method of diagnosing osteoporosis uses low intensity but invasive radiation to measure bone density. Therefore, this method is mostly applied only after a bone has broken to verify its cause. The used X-rays can also allow different interpretations, which depend on the experience of the medical staff. The radiation based on this DXA method is relatively insensitive and osteoporosis can only be diagnosed if more than 30% of the original bone mass is already lost. As a result, many osteoporosis cases are overseen due to the limitations of the DXA method.

## Lighting up new opportunities

The Helmholtz Association of German Research Centres, a member of EARTO since 2015, has enabled this change with its osteolabs CIM (Calcium Isotope based Marker) technology which detects the disease days to weeks after bone loss starts. This CIM method introduces a new, powerful, and practical set of completely new diagnostic tools, which is much more sensitive and harmless for the patient. Due to its non-invasive nature, doctors can take preventive measures and monitor its success almost in real time, adapt them individually or change them if necessary. The therapy monitoring can be performed only with a small amount of blood and urine, without any X-ray laboratory needed. This process significantly saves resources, money as well as specialist personnel.

## Creating high-added value kits

GEOMAR's spin off "osteolabs" received funding from the European Fund for regional development (EFRE). To date it has launched two test-kits, the "med-kit" for the doctors' office and the "home-kit" for home private use. It has now a European client base covering Austria, Switzerland, Belgium as well as Turkey. The initial user of this CIM method are institutional customers, which ordered more than 1,000 test-kits. Outcomes of online-based sales are also expected to increase. The test comes at a fraction of the price compared to the medical costs for the treatment of osteoporotic fractures, thereby reducing treatment costs significantly and offering good chances of preventing or slowing down the disease's progress.

IMPACT  
DELIVERED

# SECOND PRIZE

# CSEM

## Non-obtrusive technique needed



CSEM'S TECHNOLOGY IS EXPECTED TO PENETRATE **2%** OF THE TOTAL MEDICAL MARKET, LEADING TO ANNUAL REVENUES OF APPROXIMATIVELY **\$40M** IN 5 YEARS



CSEM'S TECHNOLOGY CAN POTENTIALLY HELP AROUND **1.4B** HYPERTENSIVE PEOPLE GLOBALLY



CSEM CURRENTLY HOLDS A LARGE PATENT PORTFOLIO (**7 PATENTS**) IN THE DOMAIN OF BLOOD PRESSURE MONITORING



CSEM'S TECHNOLOGY ALLOWS HYPERTENSIVE PATIENTS TO HAVE A FULL **24-HOUR VIEW** OF THEIR BLOOD PRESSURE PROFILE

CSEM is a Swiss private, non-profit research and technology organisation with 35 years of Deep Tech development and transfer to industry. A bridge and catalyst for the transfer of technology and know-how between science and the economy, CSEM continually adapts its research focus to meet industry's needs. Today, CSEM supplies a broad range of markets - including automotive, medical, machine tools, and space exploration - with an even broader range of technological solutions.



[www.csem.ch](http://www.csem.ch)

# Worry less with cuff-less blood pressure monitoring

Hypertension is one of the greatest global health epidemics. Around 1.4B people are hypertensive worldwide, from whom 50M Europeans. According to statistics, less than 50% of treated individuals have their blood pressure under control. This “silent killer” has a significant associated cost which could be reduced once regular monitoring is made possible. The greatest barriers to managing hypertension are difficulty in providing monitors at a global scale, and tracking patient/population

blood pressure consistently and effectively over time. Responding to this challenge, CSEM has developed a patented sensing technology which is capable of estimating blood pressure values from optical signals. Through collaborations with Ava, Biospectal and CSEM’s start-up AKTIIA, this highly accurate technology has overcome all limitations of traditional inflatable cuffs for blood pressure monitoring in various form factors.



CSEM’s patented technology offers a wearable multi-sensor solution for a cuff-less blood pressure monitoring.

## No more blood pressure cuff

The only existing non-invasive and medically certified method to measure blood pressure and thus to help manage hypertension is through the inflatable blood pressure cuff, either automated or using a stethoscope. However, this traditional way of measuring blood pressure has certain limitations when it comes to availability to the general population, measurement comfort and cost. Several companies have addressed this medical necessity by proposing cuff-less alternatives with wearable devices. Nevertheless, no clinical acceptance and medical-grade accuracy has been achieved so far.

## Tracking blood pressure through optical means

EARTO member CSEM, in collaboration with its start-up AKTIIA and two other Swiss entities, Biospectal and Ava, have created an easy-to-use sensing technology which provides continuous blood pressure estimations capable of tracking short- to long-term blood pressure variations. This optical monitoring technology can easily be integrated in various form factors such as smartphones, bracelets or textiles. For instance, when embedded in a wearable device, it measures blood pressure in an inconspicuous manner, providing the user with a full 24-hour view of their blood pressure profile.

## Offering accurate blood pressure solutions

CSEM’s patented technology is considered one of the most breakthrough solutions in the field of vital sign monitoring. In the recent years, CSEM has validated its medical accuracy in 8 published clinical studies and is bringing this innovation to the market by supporting its commercialisation in various form factors through its partnership with AKTIIA, Ava and Biospectal. CSEM’s technology provides a promising tool for fighting the increasing incidence of hypertension. Not only does it offer an affordable and medically certified wearable monitoring solution, but also represents an interesting business opportunity, with a chance to grasp a significant share of the market of blood pressure monitoring devices in the years to come.

IMPACT  
DELIVERED

THIRD PRIZE

FRAUNHOFER

## Safe and non-toxic fire-protection gel



FRAUNHOFER'S HYDROGEL DEVELOPMENT WAS DESIGNED IN A PERIOD FOR ONLY **4 YEARS** (2015 TO 2018)



THE INNOVATION WON THE TENDER FOR A CONSTRUCTION OF A **110M** TOWER IN FRANKFURT



THE NEW GLAZING PRODUCTION METHOD CAN REDUCE FIRE PROTECTION GEL THICKNESS BY **3MM** AND WEIGHT BY **12%**



FRAUNHOFER AND COLLABORATOR HÖRMANN VERIFIED THE FUNCTION OF FIRE-RESISTANT COMPONENTS IN GAS BURNERS OF UP TO **1,000°C**

The Fraunhofer-Gesellschaft is a leading research and technology organisation with 74 institutes and research institutions throughout Europe. It employs a staff of around 28,000 who work with an annual research budget totalling €2.8B, 70% of which is generated through collaborative research with industry and publicly-funded projects.

The Fraunhofer Institute of Environmental, Safety, and Energy Technology (UMSICHT) specialises in sustainable energy and raw materials management.

 **Fraunhofer**

[www.fraunhofer.de](http://www.fraunhofer.de)

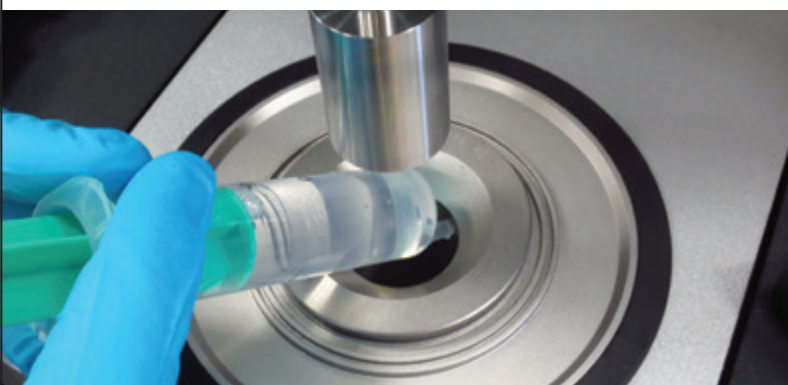
 **Fraunhofer**  
UMSICHT

[www.umsicht.fraunhofer.de](http://www.umsicht.fraunhofer.de)

# Fire-protection glazing goes now hand in hand with a digitalised glass production

The use of glazed elements as fire-protection closure is a challenge. The fire-protection glazing using hydrogels has been developed since 1970. However, the establishment of such systems is characterised by the use of carcinogenic elements. As a result, the operational staff, who handles these chemicals by hand, could face occupational difficulties and process management, reproducibility, and

quality-controlled production is challenging. The Fraunhofer Institute of Environmental, Safety, and Energy Technology (UMSICHT) in collaboration with industrial partner Hörmann has developed a new type of non-toxic fire-protection gel which contributes to less use of resources and leads to a safe automated production process.



Fraunhofer UMSICHT's innovative fire-protection-gel and resulting fire-protection glazings based on gels, enables operational staff for the most suitable and safe tool in their hands.

## Industrialising non-toxic gel components

The performance of the fire-protection gel as well as its dangerous using methods urged the need to establish a new gel production process. According to the present state of knowledge, there is no information regarding the interaction between the synthesis parameters of hydrogels and the fire-protection properties. The scientists systematically studied these interactions, scientists transformed the idea into a plant technology process, which builds up a new state of art. This process allows a continuous mixing and processing of its reactive components.

## Continuous, automated, and digitalised production process

EARTO member Fraunhofer-Gesellschaft, on behalf of the Fraunhofer UMSICHT and industrial partner Hörmann KG Glastechnik, developed for the first time a brand-new production process for the manufacture of continuous, automated, and digitalised fire-resistant glazings based on a non-toxic gel component, rich of water and electrolytes, which is filled in the interspace of two glasses. This novel methodological approach depends on the gel formulation and the parameters selected during the gel production, using a new type of mixing element in an innovative polymerisation synthesis process. This enables the industrial production of fire-protection gels, and leads to a high performance fire-resistant glazings, which meet the desired criteria in terms of toxicology, occupational safety, transparency, UV resistance, and fire-protection behaviour.

## Opening up new market opportunities

Fraunhofer UMSICHT's innovation has paved the way for reducing the thickness of the fire-protection gel, by 3mm and saving 12% weight in a large area of a three millimetres' glazing. This process can, thus limit resources and CO<sub>2</sub> output by saving raw materials and reducing transport weight. Fraunhofer UMSICHT along with its industrial collaborator, Hörmann, have verified the function of fire-resistant components in standardised tests and established a new, digitalised, quality controlled, and automated fire-protection glazing production facility, under the VITRAFIRE® brand of Hörmann, in accordance with the existing international standards and norms. The system also offers excellent opportunities for further developments, as it is scalable and not limited in terms of extended quantities, while extending the process chain and implementing the production of blank panes.



## VULKANO: the new solution for energy efficiency

Currently, the most intensive industries, such as industrial furnaces are exploring ways to improve their competitiveness and energy, environmental and cost performance. To this end, the development of improved designs based on new materials, alternative equipment and integration of permanent monitoring and control systems into new and existing furnaces seem to be the essential instrument to meet those demands.

**Innovation:** EARTO member CIRCE – Research Center for Energy Resources and Consumption developed the VULKANO solution, a holistic system to increase the energy and environmental efficiency in existing preheating and melting industrial furnaces currently fed with natural gas. It has a life cycle perspective based on 4 leading-edge working methodologies and 1 software development that overcomes limitations of durability, reuses waste heat at high temperatures and improves monitoring and control systems.

**Impact Delivered:** This innovation is a collaboration of 12 partners and has been developed under the H2020 project VULKANO. It aims at increasing Europe's energy efficiency by 20% and reducing fossil fuel consumption by 40% and furnaces' costs of the companies by 15%. VULKANO has been implemented in three different industrial sectors and is extending its technologies to other sectors that share common phases in the production process.



CIRCE is a technological centre founded in 1993 and seeks to provide innovative solutions for sustainable development.

[www.fcirce.es](http://www.fcirce.es)



## Deep learning keeps rail networks safe

Nowadays the public transport infrastructure has an important role to play and the massive investment in railway networks across Europe has created enormous challenges in sustaining both quality and passenger safety. The current “diagnostic trains”, which are used in the inspection processes, provide many false findings and cannot satisfy the rapidly growing requirements in keeping infrastructure quality at its necessary level with the available track methods.

**Innovation:** EARTO member CSEM developed an easy-to-use AI software solution which fully processes the large amount of vision data created by the high speed diagnostic trains. CSEM's disruptive innovation consists of deep learning algorithms, deployed in a full processing pipeline which includes pre-processing, analysis, fingerprinting (unique identification of each defect), support for maintenance planning and life-long learning in a complete system.

**Impact Delivered:** CSEM's innovative rail software reduces the effort to find, classify and track defects. It minimises time spent on often dangerous visual inspections, optimizes repair planning, and contributes on improving punctuality. The algorithms of CSEM will be further deployed by the lead customer Swiss Federal Railways (SBB) in 2020. This business opportunity could save 1M Swiss Franc (CHF) in the first five years and, potentially, 100M CHF at global scale.



CSEM is a Swiss private, non-profit research and technology organisation with 35 years of Deep Tech development and transfer to industry. CSEM supplies a broad range of markets with an even broader range of technological solutions.

[www.csem.ch](http://www.csem.ch)





## Fibre injection in manufacturing technology

The urgent need for fuel costs' reduction and a greener environment has been escalated as a top priority worldwide in the last years. As a result, light-weighting technologies become more and more important in many sectors, including the transport industry. These technologies can be applied to a wide range of high-added value products, offering innovative solutions for the environment as well as the society.

**Innovation:** EARTO member Eurecat developed a Continuous Fibre Injection Process (CFIP) technology, a 3D printing post-process which enables the manufacturing of highly optimised structures with high-performance materials. This brand-new solution has two main values: it allows the efficient manufacturing of large and strong structures, but also uses the most efficient material and manufacturing technology in each zone of the structure, according to mechanical requirements.

**Impact Delivered:** The CFIP technology contributes to reducing CO<sub>2</sub> emissions, fuel and electricity costs in transport industry by 20%. It also increases the European competitiveness and productivity, while reducing the manufacturing costs. This disruptive innovation has been outperformed in several projects and different sectors, in collaboration with top companies, such as Airbus and Asics. The revenue from competitive projects was estimated to €500K.



Eurecat is the largest cross-sectoral and trans-national RTO in Catalonia, Spain, with 700 professionals covering all technological specialities to deliver added value to our society.

[www.eurecat.org](http://www.eurecat.org)



## Perfect mattress for the perfect comfort

The demand for eco-friendly mattresses is one of the key emerging trends in the mattresses' market in Europe. The mattresses recycling sector is based mainly on manual processes. Only 4 installations have been identified using automatic or semi-automatic processes with limited results. So far, there is no sustainable mattress on the market made from recycled products.

**Innovation:** AIMPLAS, EARTO member through Fedit, developed the ECOPURE process which offers clean and wasteless mattresses. This newly developed process allows to recycle current mattresses and/or produce other high added-value products, such as sofa, chairs, seats and isolation panels, for many industrial sectors. The use of recycled materials allows ECOPURE to have a better performance in terms of fatigue and comfort aspects.

**Impact Delivered:** This innovation can offer a cost reduction of 35%, compared to petrol-based applications, higher mechanical and sustainable performance with a competitive price. It has already reached three markets by introducing two state-of-the-art products: high and medium quality sustainable mattress and recycled foam core for mattress application. It is expected to double its production capacity with an additional turnover of €3.2M per year in the five coming years.



Fedit is a Spanish association of research and technology organisations whose main mission is to boost and encourage innovation, technological development and private research.

[www.fedit.com](http://www.fedit.com) - [www.aimplas.net](http://www.aimplas.net)



## Fresh coffee smell when you get your shoes on

Several companies are conducting studies on the integration of coffee waste into different products and in multiple sectors. Given its properties, coffee and its coffee waste are able to reduce or, even, totally eliminate bad smell, due to its pleasant aroma. However, no research advancements have been found in the footwear sector which is now focusing on having both antimicrobial and aromatic character in the new eco-friendly products.

**Innovation:** The Footwear Technology Center of La Rioja (CTCR), EARTO member through Fedit, developed aromatic and antimicrobial shoe soles and midsoles out of coffee waste which comes from the hotel industry. These coffee soles inhibit the growth of bacteria by using a microencapsulation process of coffee oils. CTCR conducted a whole life cycle analysis to evaluate its production capacity in a normal shoe production process, moulding and cooling each shoe.

**Impact Delivered:** This novel footwear incorporates 15% coffee grounds in its sole formulation, reducing its carbon footprint by 11.3% compared to the normal shoe model. CTCR's methodology reduces the use of fossil resources, toxic processes and inorganic compounds. In 2020, during its first year of commercialisation, it is assumed to sale approximately 6K pairs and gradually increase its production by 5% in the following year.



Fedit is a Spanish association of research and technology organisations whose main mission is to boost and encourage innovation, technological development and private research.

[www.fedit.com](http://www.fedit.com) - [www.ctcr.es](http://www.ctcr.es)



## Using technology to save lives

In March, the World Health Organisation declared the COVID-19 virus as a pandemic. With more than 13M confirmed infections in more than 184 countries, this virus has currently caused more than 1M deaths. Assuming that a high percentage of confirmed cases require the use of ventilators, it is high time to face this increasing global demand for ventilators and reduce their prices as well as the time to reach the market.

**Innovation:** EARTO member Leitatz developed "Leitatz 1", a 3D-printed field ventilator for COVID-19 patients at ICUs requiring mechanical ventilation. This device, which was designed in less than 48 hours, can control the respiration's cycle, volume and pressure. It is composed of a mechanical system mainly formed of a resuscitating balloon (AMBU) and two actionable blades, and an electric system, which will allow setting the parameters and actioning the mechanical part. Leitatz 1 also includes several sensors and alarms to ensure safety. Thanks to 3D technology, manufacturing time is shorter and cheaper compared to regular manufacturing processes.

**Impact Delivered:** Leitatz 1 has a high production capacity (50 to 100 units per day), as well as a lower production cost, €5K per unit. The total spending would be 90% cheaper than the traditional ventilators, given that the price of a commercial ventilator is around €50K.



Leitatz is a leading Catalan RTO that offers disruptive solutions to the technological needs of companies, with a clear orientation towards generating competitive value.

[www.leitatz.org](http://www.leitatz.org)



## Boosting the 3D talent of the future

Nowadays, 3D printing technologies are at the forefront of the new industrial revolution, offering many advantages compared to traditional manufacturing methods: they use less material and allow new geometries, so products can be up to fifty per cent lighter. They also have a significant added-value to the environment by reducing transportation costs and distribution emissions, among others.

**Innovation:** EARTO member Leitat has driven the first European 3D incubator that aims to boost the most promising initiatives based on 3D printing. It provides a wide range of services including production of 3D printed parts, innovation and business consultancy, testing, internationalisation and market entry support. It features a complete high-tech 3D printing lab with 6 different technologies. It has 4 state-of-the-art industrial 3D printers and mini printers; as well as post-processing, metrology and quality control equipment.

**Impact Delivered:** The 3D Factory Incubator was promoted by Leitat and Consorci de la Zona Franca de Barcelona (CZFB), with the support of the European Regional Development Funds (ERDF) through Incyde Foundation. It is the home of 37 companies and has provided more than 500 services to the incubated companies during its first year, which have generated more than 40 highly qualified jobs.



Leitat is a leading Catalan RTO that offers disruptive solutions to the technological needs of companies, with a clear orientation towards generating competitive value.

[www.leitat.org](http://www.leitat.org)



## Meeting e-needs thanks to the eLF platform

Online services' platforms have been created to manage digital services and eliminate the costs of providing and updating information. In some countries, such as Poland, the growing number of digital services sometimes makes existing platforms inefficient, given the necessity of their constant management. Implementing and updating services is usually very time and money - consuming as it requires to involve IT developers. To answer those needs it was necessary to find an alternative solution with new architecture and technology.

**Innovation:** The Institute of Logistics and Warehousing, EARTO member through Łukasiewicz Research Network, developed the eLF platform, a software, available in multiple languages, which enables to implement and maintain digital services in real-time without engaging extensive programming work. The eLF innovation introduced a tool called "e-service configurator", with a graphical interface and great capabilities which meets all legal requirements.

**Impact Delivered:** The eLF platform, launched in early 2020, is currently used by the Polish Ministry of Economic Development and has a huge potential when it comes to commercial use, with more than 250K registered users and 120K submitted applications. It delivers high economic and social performance, including cost reduction of provision and updating e-services.



The Łukasiewicz Research Network is the third largest research network in Europe. It occupies 7,500 staff and has 33 research institutes located in 11 cities across Poland.

[www.lukasiewicz.gov.pl](http://www.lukasiewicz.gov.pl)



## Super-efficient monitoring system for pregnancy and labour

By 2030 all countries aim at reducing the global maternal, foetal and newborn mortality. Responding to this target, there is a vital need to further develop perinatal surveillance systems to increase the effectiveness of mortality detection in early stages.

**Innovation:** The Institute of Medical Technology and Equipment, EARTO member through Łukasiewicz Research Network, developed the MONAKO System – an innovation for pregnancy and labour monitoring to ensure comprehensive care for the foetus and mother. It is a computer-aided system, with automated vital signal analysis software and perinatal database, enabling the monitoring of many patients simultaneously to support the medical staff and to increase the surveillance efficiency.

**Impact Delivered:** This innovation is currently offered only in the Polish market. However, it has shown a significant potential, reaching sales of €100K in 2019. More than 130 systems have been installed in hospitals and clinics, in various configurations tailored to the client's needs. The MONAKO System can thus increase the effectiveness of detection of early signs of foetal distress and therefore reduce the perinatal mortality.



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[www.lukasiewicz.gov.pl](http://www.lukasiewicz.gov.pl)



## Natural products out of supercritical CO<sub>2</sub> technology

Natural ingredients and clean labels are on the top of food and cosmetics sectors' trends. Consumers awareness about diet and beauty products safety and quality boost new product release. Low fat products, plant-based proteins and fine oils are being increasingly demanded, even more those coming from natural resources. However, a clean technology that could contribute to a circular economy is necessary, that does not use organic solvent nor generate waste.

**Innovation:** AINIA, EARTO member through REDIT Innovation Network, developed a supercritical CO<sub>2</sub> extraction plant named ALTEX. It is an innovative cost-effective way of producing natural high quality products by using CO<sub>2</sub> at supercritical stage. This is a green industrial process with two mainly applications: to extract and separate a high variety of added value substances, and to remove non-desired substances such as pesticides, traces and chemicals.

**Impact Delivered:** Due to the high quality and purity of getting products, its alignment with market trends and because of being a technology that supports circular economy, ALTEX supercritical CO<sub>2</sub> extraction technology is demanded worldwide. ALTEX adapts its solutions to customers specific requirements. ALTEX contributes to increasing employment indirectly, by creating new job positions.



The Network of Technological Centres of the Valencian Community (REDIT) is a private non-profit association that integrates and represents the 11 technological centres of the region.

[www.redit.es](http://www.redit.es) - [www.ainia.es](http://www.ainia.es)



## One Smart-SHOP for hydropower

Hydropower can serve as a complete enabler for a fully renewable energy system and its storability, flexibility and controllability is of critical importance. However, the complex spatial-temporal coupling of water releases makes it difficult for human operators to keep complete overview of all relevant factors when participating in fast-paced power markets. To maximise the utilisation of hydropower in both energy and capacity markets, there is a need for a precise calculations and decision support models.

**Innovation:** EARTO member SINTEF developed SHOP, a Short-term Hydropower Optimisation Program. It is a totally innovative and efficient tool – fit to all types of rivers – which enables the hydropower operators to maximise their potentials. This software, composed of advanced modelling techniques and solution methodologies, provides critical decision support to hydropower producers by determining an optimal and reliable operating policy for either a single hydropower plant or an integrated system.

**Impact Delivered:** The SHOP solution contributes to an energy system that is reliable and secure, as well as economically and environmentally sustainable. SHOP is used daily to optimise more than 60K MW of hydropower, corresponding to 28% of the installed European hydropower capacity. The SHOP model is an integrated component of more than 25 major hydropower producers so far, and has been brought to market by Powel AS.



SINTEF is a broad, multidisciplinary research institute with international top-level expertise in technology, medicine and the social sciences.

[www.sintef.no](http://www.sintef.no)



## MotorBox: the new toolbox for the electric motor industry

The electrification is at the core of many European challenges in societal and technical development. Electric motors consume 50% of Europe's electricity. As a result, the demand on electric machines' designs require better understanding and more complex methods. This involves using highly specialised software for each individual step of the engineering process, which is difficult to be fulfilled.

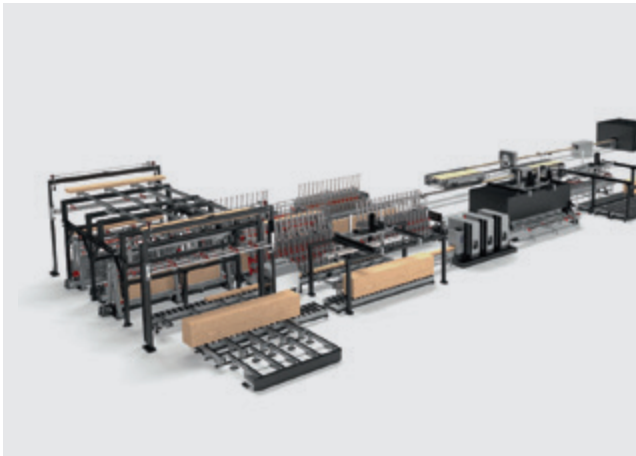
**Innovation:** Linz Center of Mechatronics GmbH (LCM), EARTO member through UAR, developed the SyMSpace MotorBox, a high-end tool for electric motor design for fast set-up and reduced complexity. Once created, the motor design workflows can be stored, executed, and optimised. The multi-objective optimiser uses high-end algorithms and Artificial Intelligence methods, while offering an interactive viewing for result analysis, third-party tools, better simulations, increased computing performance or user-specific models.

**Impact Delivered:** SyMSpace has been developed by LCM for more than 10 years and used by 8 long term partner companies, mostly from the electric machine manufacturing business. Over the past two years, 42 customers have directly been serviced using SyMSpace MotorBox in a total of 89 individual projects. Thanks to its efficient and competitive solutions, the economic performance of SMEs and other industrial players could be increased.



UAR (Upper Austrian Research GmbH), together with its associated RTO companies, is promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

[www.uar.at](http://www.uar.at) - [www.lcm.at](http://www.lcm.at)



## Innovative algorithm designs a more sustainable wooden future

In the wood processing industry, simple rule-based algorithms are used to control machines at the execution level. These rules are often extremely specific to the given product configuration and raw materials. This can therefore lead to complex operational results and inefficient use of raw materials. Today's powerful computing resources can be used to solve this situation by using new approaches for machine control.

**Innovation:** RISC Software GmbH, EARTO member through UAR, developed a sophisticated optimisation algorithm which processes a wide variety of raw materials and allows an optimal control of machine execution during the machines' cycle time. This "branch and bound" software enables a sustainable wood processing and ensures high-performance for both plants and machines' computing hardware in almost real time.

**Impact Delivered:** This innovation can be seen as a pioneer project which sets new production standards. It also offers an eco-friendly and "cost and benefit" solution for a greener pattern of consumption and production. The solution of RISC Software is operational since 2019 and can be used in several future projects.



UAR (Upper Austrian Research GmbH), together with its associated RTO companies, is promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

[www.uar.at](http://www.uar.at) - [www.risc-software.at](http://www.risc-software.at)



## Ice prevention that allows maximum energy production

Wind energy is one of the most eco-friendly and sustainable energy sources, contributing to delivering on the Paris Climate Agreement. Especially, in Europe wind energy has a significant annual turnover, creating thousands of job opportunities. Many wind turbines have been installed in cold climates due to their favourable wind conditions and low population density. However, the electricity generated is negatively affected by the icing, which lowers the energy production of the wind turbine and reduces its lifetime.

**Innovation:** EARTO member VTT developed an innovative heating technology, WIPS (Wicetec Ice Prevention System), which is currently commercialised by VTT's spin-off Wicetec. It has a unique worldwide-patented heating and ice detection technology, enabling wind turbines running in icing conditions and maximising its renewable energy production only when needed. The heaters, made of a thin layer of carbon fabric heating elements, protect from icing the area critical to energy production.

**Impact Delivered:** VTT sold the IPR to Wicetec in 2014, who productised and standardised the technology, and made further developments. WIPS innovation has already been commercialized to Wicetec's customers located in different countries around the world. WIPS can recover 90% of icing losses and reduces the cost of energy by 6–8 %. During the first five operational years, Wicetec's sales have increased, reaching a total of €2M in 2019.



VTT is a visionary research, development and innovation partner. VTT is one of Europe's leading research institutions. Its goal is to turn large global challenges into sustainable growth for businesses and society, through science and technology.

[www.vttresearch.com](http://www.vttresearch.com)



# IMPACT EXPECTED

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# FIRST PRIZE

# VTT

## Eggs without chickens



VTT'S TECHNOLOGY WILL ENABLE FOOD PRODUCERS TO DECREASE GREENHOUSE GAS EMISSIONS BY UP TO **74%** AND LAND USE BY **90%\*\***



THE COST TO PRODUCE EGG WHITE PROTEIN BY CELLULAR AGRICULTURE IS **COMPETITIVE**, WHEN COMPARED TO THE PRODUCTION COSTS OF EGG PROTEINS FROM CHICKENS



THE PRODUCTION COST OF THE EGG WHITE PROTEIN IS ESTIMATED TO BE LESS THAN **€10 PER KG** AND IS SUITABLE FOR LARGE SCALE INDUSTRIAL PRODUCTION (>**300.000 LITRES**),



VTT'S CURRENT AND UNDER NEGOTIATION PROJECTS IN THE CELLULAR AGRICULTURE DOMAIN ARE WORTH NEARLY **€9M**

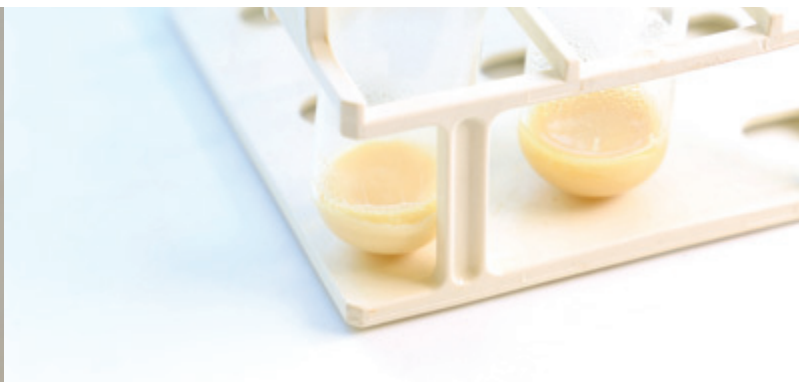
VTT is a visionary research, development and innovation partner. VTT is one of Europe's leading research institutions. Its goal is to turn large global challenges into sustainable growth for businesses and society, through science and technology. Its research concentrates in 5 main themes: climate action, resource sufficiency, good life, safety and security and industrial renewal.

[www.vttresearch.com](http://www.vttresearch.com)

# Taking the egg white protein production to the next level

Food production currently requires a large amount of natural resources, such as water, and extensive use of land area. Due to the expected global increase in population, along with the high demand for reducing the environmental impact caused by conventional agriculture, innovative solutions in food production are necessary. Indeed, the need to find alternative ways to produce animal-based ingredients has challenged the food industry, for example, the need to find alternative solutions for making high performance ingredients of chicken eggs. Therefore, VTT developed a way of producing

food ingredients, such as egg white protein, using new biotechnology-based protein production technologies, also known as cellular agriculture. This technology provides a vital alternative to various animal and plant-based ingredients and makes the food value chain more sustainable, while introducing completely new food products. VTT has turned the complex chemistry of selected organisms into so-called “Cell Factories” and developed its own patent IPR. VTT has also exclusive license rights for different patents on critical improvements to the microbial production technologies.



VTT's cellular agriculture-based technology enables sustainable production of high value animal and plant-based food ingredients, such as egg white protein.

## Rebuilding the food production chain

Almost all food industries use eggs, and thus, egg proteins dominate the protein ingredient market. Millions of tons of eggs are needed every year, from which a significant percentage goes to protein ingredient production. A profound change in the global food and agricultural systems is needed. A new approach to produce food ingredients with high nutritional value is vital to enable more sustainable and ethical food production and to find new business opportunities with better price predictability. The key solution for future food industry is to transform food production in a way that it will not be dependent on growing seasons or land availability. The disruptive change that cellular agriculture brings about can be compared to the agricultural revolution from the 1700s to the 1900s.

## Producing egg protein in the lab

EARTO member VTT developed a unique technology, which enables mass production of many important food ingredients, such as high value proteins (e.g. egg proteins), without using animals and with low environmental impact. Bringing its long history and top-class expertise on industrial biotechnology, VTT's egg protein production technology takes the manufacturing of food components a leap forward and decouples the food production from traditional agriculture. By developing a new cellular agriculture-based food business, VTT enables bringing various high value food ingredients to the market.

## Huge business opportunities

VTT's innovative cell factory technology represents a low-cost solution for egg white protein production and supports a sustainable food system, with new food ingredients of high nutritional value and low environmental footprint. VTT, being a key partner in the cellular agriculture domain, is currently developing the microbial production technology along with several leading start-up companies, and with its long-term research and licensing agreements. So far, the expected financial and commercial demand for cellular agriculture globally is extremely high. In this regard, VTT has negotiated new projects and licensing deals with two international companies worth at least €3.5M. Thus, this is not only about chickens or about eggs; it is about creating completely new businesses to disrupt the food industry.

\*\* The figures are obtained from preliminary calculations, and were done in collaboration with sustainability assessment experts from University of Helsinki.

IMPACT  
EXPECTED

SECOND PRIZE

TECNALIA

Paralysed patients are not alone



TECNALIA'S ISMORE WILL DIRECTLY  
SAVE MORE THAN **€13M** FOR  
EUROPEAN HOSPITALS AND HEALTH  
CARE SYSTEMS ANNUALLY



**60%** OF STROKE SURVIVORS  
COULD BENEFIT FROM  
TECNALIA'S ISMORE



REDUCTION OF STROKE SEVERITY  
CAN DECREASE AT LEAST **30%** OF  
POST-STROKE REHABILITATION COST  
AND **1-2** HOSPITALISATION DAYS  
PER PATIENT



ISMORE IS EXPECTED  
TO ACHIEVE SALES OF **€11M**  
OVER THE FIRST FIVE YEARS

TECNALIA is a Spanish RTO aiming to transform technology into GDP, helping companies to be more competitive and generate wealth and employment. Its key scopes of action are: Digital Transformation, Advanced Manufacturing, Energy Transition, Sustainable Mobility, Urban Ecosystem and Health. Experts from 29 different nationalities in 23 offices all over the world, visualise, identify and develop comprehensive technological solutions with creativity and imagination for more than 4K clients.

tecnalia  Inspiring  
Business

[www.tecnalia.com](http://www.tecnalia.com)

# Groundbreaking brain-muscle control breaks the “stroke” ceiling

Incidence as well as prevalence of stroke constitute an unsolved problem and a leading cause of serious and long-term disabilities. In Europe, there are almost 8M severely impaired and chronic patients and, in parallel, stroke costs are estimated at around \$34B globally per year. Current rehabilitation therapies are not efficient enough, and a more intense treatment is needed. Indeed, the problem has been also shifted to clinics, healthcare systems and insurances that have to bear the costs of stroke rehabilitation, accounting for thousands of euros per patient. TECNALIA, collaborating with the

Universities of Tübingen, University of California Berkeley and supported by the Basque Country Health System, the University of Basque country and Université Libre de Bruxelles, accomplished something impossible. Not only has TECNALIA's ISMORE achieved to develop a system which bridges the gap between brain and muscles, but also to boost the existing therapies. ISMORE provides the patients with an efficacious therapy, allowing them to execute functional movements interacting with objects, activating functional neuroplasticity and achieving a faster personalised treatment.



ISMORE is an innovative system that reconnects brain, muscles and movements of paralysed patients.

## Improving existing robotic therapies

Conventional electrical stimulation therapies as well as recent robotic therapy clinical trials have proven to be incapable of solving patients' needs. It is true that the robotic clinical trials have given important results, reducing 25% total health care expenses with a high-intense therapist intervention. However, these new non-invasive neural approaches do not yet fully meet the high expectations, as they deliver on limited or even poor results. They exclude 20% patients and yet, they are the most successful existing cost/efficacy therapies. In this regard, American and European guidelines for post-stroke care and rehabilitation continue to recommend robot assisted therapy for rehabilitation.

## Decoding brain algorithm

EARTO member TECNALIA developed a system which directly hacks the nervous system and decodes the movement intention to restore joints' control. Unlike current methods, TECNALIA's ISMORE novel solution links brain and muscles again, via instrumental learning, to induce functional neuroplasticity even in the unsolved worst-case scenario. Thanks to TECNALIA and to its partners a brain-muscle shared control algorithm ensures a real-time brain control of arm and hand movements combining robotic exoskeleton and physiotherapy. ISMORE's neural interface allows a ten-times' accurate, single-trial, real time decoding and a three-times' technological improvement compared to the best existing stroke rehabilitation method.

## Achieving great preliminary interest

ISMORE's novelty has already been protected by two international patents. The commercialisation roadmap plans to complete the clinical validation during 2020-2022, while, in parallel, the first industrial prototype (non-invasive therapy) will be available in two years. A new start-up company will bring the solution to the market in 2022 with the support of TECNALIA Ventures, with public and private hospitals to be the first targets. ISMORE business opportunity has also been presented to potential investors, achieving preliminary interest from several venture capital firms. In its first three years, ISMORE aims to have a turnover of €5.3M by selling over almost 70 entire services.

IMPACT  
EXPECTED

# THIRD PRIZE

# RISE

## Superheroes' filaments come to life



RISE'S PRODUCTION PROCESS RESULTS IN FILAMENTS THAT ARE **2 TIMES** STIFFER AND STRONGER COMPARED TO THE BEST COMMERCIALY PERFORMING CELLULOSE-BASED FILAMENT



CO<sub>2</sub> EMISSIONS CAN BE REDUCED BY **40-50%** WITH RISE'S SUPER FILAMENTS



SUPER FILAMENTS CAN LOWER THE MATERIAL USAGE, REDUCING THE WEIGHT BY **50%**



WITH THEIR INTENSE AND CONTINUOUS WORK, SUPER FILAMENTS CAN BE PRODUCED AT **1KM** PER DAY (0.1 G/DAY)

RISE is an independent, state-owned research institute. As an innovation partner for every part of society, RISE helps developing technologies, products, services and processes that contribute to a sustainable world and a competitive business community. RISE does this in collaboration with and on behalf of companies, academia and the public sector. RISE also has a special focus on supporting small and medium-sized enterprises in their innovation processes.

**RI  
SE**

[www.ri.se](http://www.ri.se)

# A circular bioeconomy is worth the fight with super bio-based materials

Filaments can be found in many existing products, from clothing to composites. Today, it can be noted that most of the commercially available filaments are fossil-based. In parallel, the bio-based alternatives are scarce and have disappointing properties. The idea of replacing for example glass fiber would not only make the material use more efficient but it would also result in avoiding landfill, as being the only end of life option. A collaboration between RISE and KTH Royal Institute of Technology,

with funding from Knut and Alice Wallenberg Foundation, FORMAS and RISE responded to this challenge, by developing a bio-based and non-toxic production process for stronger filaments. This innovation utilises the renewable material, cellulose from paper pulp, to achieve filaments with high performing and unique properties, suitable in a rich variety of products. This innovation is a superhero within bio-based materials.



The innovation “Super filaments” is a 100% bio-based and renewable production process for the stiffest and strongest filaments.

## The greatest power comes from the most natural products

Strengthening the transformation to a more circular bioeconomy is not any easy process. The transformation from fossil-based materials to renewable materials has been in high demand for many years and has the potential to create a positive impact on the society. By using cellulose, which is a natural resource and the backbone of trees and plants, it can be ensured that the raw material is not going to run out, which is the case for fossil-based materials. Switching to sustainable forestry is well in line with preserving trees, producing less waste, and using innovative, efficient, and eco-friendly cellulose-based filaments.

## Learning to pick renewable materials back up

RISE's solution was a critical one: to replace the existing filaments' production process and to pave the way for a new natural-based development that would fulfil all environmental and economic requirements. The innovation is aiming to achieve all these targets by outperforming other commercial systems which uses renewable cellulose from wood. RISE, with a strong background in developing energy efficient production processes, developed a water-based filament spinning process in collaboration with KTH Royal University of Technology, producing filaments with the highest mechanical properties of any biobased material. All project collaborators were crucial during both the initial development and the transition of the development to reach high TRL levels. The “Super filaments” have strong mechanical properties and are easy to functionalise, making them unbeatable for both high-value and high-volume segments.

## Filaments with high potentials

RISE's superheroes' filaments are 2 times stiffer and stronger compared to the best performing products and, at the same time, 8 times stiffer than spider silk. However, there is still process optimisation needed to move to a pilot scale continuous production. At the moment, licenses have been sold to 2 material producing companies. These could supply the raw material, upscale the spinning process towards a commercial production or incorporate the filaments in their products within coming years. The filaments have already proven to be cost-competitive in high value markets, serving as textile for biomedical applications and as fiber reinforcement in high value composites. Interest has been raised from raw material manufacturers, end application producers and private investors.



## A Blindnet to secure Internet

Reaping Internet's benefits largely depends on its privacy and security rules. Internet-enabled innovators and entrepreneurs often tend to use the same technologies to ensure both privacy and security measures. However, they consider these two properties as antagonistic because of the permanent duality between freedom and control. Therefore, a new model for seeking a mutual reinforcement of both privacy and security is very much needed.

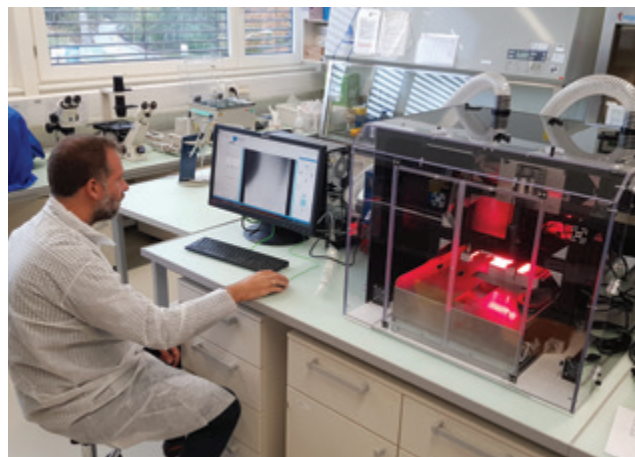
**Innovation:** EARTO member CEA has developed Blindnet, an online privacy and security platform that thwarts the possibility for mass surveillance on the Internet. Restricted to businesses for ethical reasons, Blindnet offers unchallenged level of security and privacy for network communications. Blindnet aims at replacing the current end-to-end cryptographic security model such as the Virtual Private Network (VPN) technology. With its beyond-trust paradigm, Blindnet gets rid of the trusted third party and prevents anyone from identifying and snooping a communication.

**Impact Expected:** CEA's disruptive innovation is planned to be commercially available in 2021. The cybersecurity markets have a growing potential, reaching more than \$100B in 2019. Blindnet targets especially the VPN market, expecting to become the new key technology brick. It estimates that its security layer can be included in the \$35B VPN market, among which to the nearly 300 VPN service companies.



The Alternative Energies and Atomic Energy Commission (CEA) is a French government-funded RTO and a prominent player in the European Research Area.

[www.cea.fr](http://www.cea.fr)



## New treatments for Musculoskeletal Diseases under way

Musculoskeletal Diseases (MSD) affect people's everyday life in different ways and can result in many disability issues. MSD are the major contributor to mild discomfort, muscle loss or death in some extreme cases. As a result, there is an immense medical need for new treatments, therapies, and drugs. So far, the development of therapies has been limited due to the the lack of functional in-vitro models of skeletal muscle tissue.

**Innovation:** Together with its partners, EARTO member CSEM developed the most reliable and simple screening platform for engineered muscle tissues. Based on a 3D bioprinting method, the skeletal muscle models mimic the contraction of muscle fibres when stimulated with an electrical field. In a nutshell, this innovative platform tests the new drugs for MSD by measuring the relative changes of contractility of the tissues when exposed to different compounds.

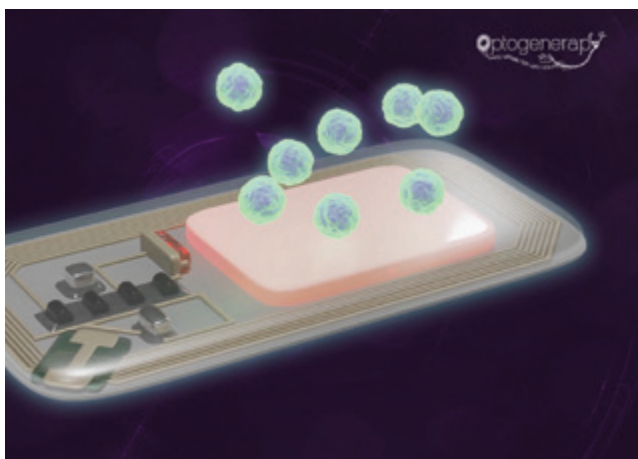
**Impact Expected:** CSEM's breakthrough innovation could reduce the animal experiments' use by at least 50% and plastic waste by 40%. The industrialisation of this tool is expected by 2021. The sales of all platform's products could reach approximately €10M within the first five years. A future platform for cardiac muscle models is also planned to enter the market by 2023.



CSEM is a Swiss private, non-profit research and technology organisation with 35 years of Deep Tech development and transfer to industry. CSEM supplies a broad range of markets with an even broader range of technological solutions.

[www.csem.ch](http://www.csem.ch)





## Optogenetic therapy for Multiple Sclerosis

Multiple Sclerosis (MS) is a chronic disease that attacks the central nervous system of the human brain and is the leading cause of non-traumatic disability, especially in young adults. In the European Union, more than 700K people have been diagnosed so far, from whom 2/3 are women. Existing therapies are either very costly or require the patient to keep obtaining several doses of medication through regular injections that have significant side effects.

**Innovation:** EARTO member Eurecat applied optogenetics, a new technique used to control immortalised mesenchymal cells via a combination of light and genetic engineering, for developing a novel approach for treating MS disease. The Optogenerapy solution consists of an implantable device, producing recombinant interferon beta (IFN- $\beta$ ) protein. The cells within the device are activated and produce the drug, which is infused into the patient blood circulation through a membrane. It offers a “switch on-off” sustainable medicine approach that improves the immune response.

**Impact Expected:** A human version of the device and the start of clinical trials has already been proposed. The deployment of the Optogenerapy device can increase patient satisfaction, reduce the most frequent secondary effects caused by current MS treatments and increase patients’ quality of life, as well as reduce the total MS expenditure at EU level. It can also be applicable to other cell therapies, such as Alzheimer and Parkinson.



Eurecat is the main Technology Centre in Catalonia, Spain. Its multidisciplinary and multinational team of 650 professionals work in more than 170 projects of applied R&D.

[www.eurecat.org](http://www.eurecat.org)



## E-planning for clean water and sanitation

The demand for clean water and sanitation is one of the most challenging issues globally. Sustainable water management gathered the interest of the research community in the last years, aiming at adapting sufficient sanitation systems in a transparent way. Nevertheless, there has been relatively limited results on Cyber-Physical Systems (CPS) oriented to the distribution of drinking water and the quality of water resources.

**Innovation:** ITG, EARTO member through Fedit, developed and implemented the SANePLAN, a web-based Decision Support System to improve Water Governance and to facilitate the integrated management of water cycle (drinking water and sanitation) and urban planning. It provides a holistic approach, embedding Artificial Intelligence and Internet of Things technology, to detect efficiently leakages, optimise waste and reduce weaknesses across all water networks.

**Impact Expected:** This innovative governance system can have an overall environmental impact, contributing to water cycle performance and fostering the coherence between sanitation and urban policies. It raised the interest of 10 entities and has already planned 7 commercial activities at national and international level. Its first version is ready, while in parallel there are 3 new pilots currently ongoing. By 2025, ITG’s SANePLAN is expected to have sales of almost €10M.



Fedit is a Spanish association of research and technology organisations whose main mission is to boost and encourage innovation, technological development and private research.

[www.fedit.com](http://www.fedit.com) - [www.itg.es](http://www.itg.es)



## Eco need for #PlasticFree packaging

The high demand for Europe to be climate-neutral by 2030, as part of the European Green Deal, has forced the Circular Economy Action Plan to focus on the production of sustainable products, especially in the plastics' sector. To achieve this target, it is important to adopt new technologies that contribute to solving the global crisis with sustainable packaging solutions, using bio-based materials.

**Innovation:** EARTO member Fraunhofer-Gesellschaft, on behalf of its Institute of Silicate Research (ISC), has developed the bioORMOCER® innovation which aims at replacing the current multilayer plastics packaging into a mono-material or paperbased, compostable and/or recyclable packaging, with a bio-based coating material. Thanks to its low thickness and high functionality, this novel concept offers a comparable barrier protection on plastics and paper substrates, while reusing vegetable waste or fruit residues to avoid food crops and price increase of food.

**Impact Expected:** The bioORMOCER® packaging solution shows a way to solve existing challenges regarding pollution, sustainability and social responsibility. This technology can be part of the growing bioplastic market, expecting to reach a 20% growth by 2024, and can help to decrease plastics' packaging waste by 5%. The bioORMOCER® solution can reduce CO<sub>2</sub> emissions, energy and material consumption and, at the same time, it can maximise the independence from fossil resources.



The Fraunhofer-Gesellschaft is a German RTO, which has a clearly defined mission of application-oriented research, with a focus on key technologies of relevance to the future.

[www.fraunhofer.de](http://www.fraunhofer.de) - [www.isc.fraunhofer.de](http://www.isc.fraunhofer.de)



## Real-time water monitoring from space (WaMoS)

Given the increasing global demand for fresh drinking water, the real time forecast of emerging flood, irrigation, and droughts observation systems remain a challenge. Private companies and public organisations keep a track based on hydro meteorological models, which cannot measure changes in groundwater storage. As a result, the management of critical water resources is uncertain offering lower accuracy.

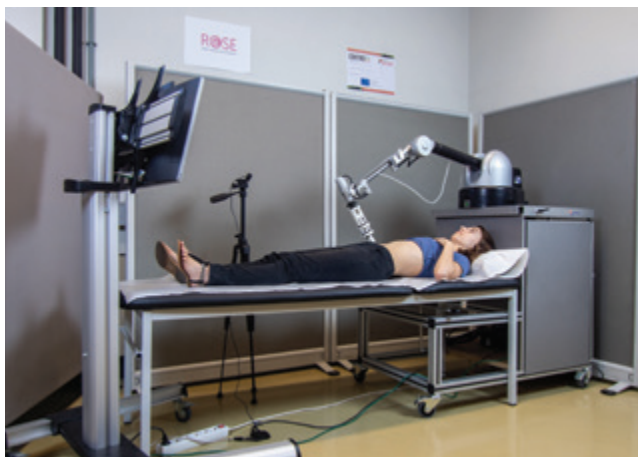
**Innovation:** The Helmholtz Centre Potsdam, German Research Centre for Geosciences (GFZ), EARTO member through Helmholtz Association developed the WaMoS process, a highly complementary set of water-related information which provides the customer with daily quantitative data based on gravity satellite missions' observations, in the form of an automated software with reports and dashboards. WaMoS offers special consulting services to improve the accuracy of existing water balance models and increases spatial resolution of measurements.

**Impact Expected:** This innovation offers an independent water resources' sustainability audit and makes sophisticated data available for public users. It enables a more accurate risk mitigation process, a sustainable use of water for agriculture and optimises the pricing strategy for hydropower. A steady revenue stream of €150K is expected per year and substantial investments into product design programming are foreseen to be significantly increased within 1-2 years.



Helmholtz Association is Germany's largest scientific organisation. It represents more than 39,000 employees working in 18 research centres across Germany.

[www.helmholtz.de](http://www.helmholtz.de) - [www.gfz-potsdam.de](http://www.gfz-potsdam.de)



## The new medicine for telemedicine

Diagnose imaging, like ultrasound, is required for accurately treating at least 25% of patients worldwide. However, not all healthcare providers have the adequate resources available. Robot-assisted diagnosis used as a telemedicine tool still lacks development and product-oriented solutions at a wider scale. The current medical robot systems for tele-ultrasound use methods that depend on physicians' skills and require a certain level of expertise to obtain a correct medical interpretation.

**Innovation:** EARTO member Instituto Pedro Nunes (IPN) developed the ROSE solution (Robotic Sensing for Tele-Ecography), based on controlled lightweight robots and compliant telecontrol architectures. It combines state-of-the-art technological advances on both ultrasound and robotic systems which enable new user interfaces to operate efficiently for clinicians and patients. This dual system provides accurate diagnosis and helps detecting the development of chronic conditions in early stages.

**Impact Expected:** IPN's innovation is currently deployed in Portugal and aims to reach the market within 2 years. The demand for medical robot systems is growing and is expected to increase by 20% between 2019–2025. IPN's operation can generate revenues for hospitals, in a similar way that classical ultrasounds do, and can create new technological opportunities, entering new markets.



Instituto Pedro Nunes (IPN) is a private non-profit organisation that promotes innovation and technology transfer, while connecting scientific and technological environment.

[www.ipn.pt](http://www.ipn.pt)



## New era for non-invasive glucose sensors

The number of people suffering from diabetes has risen and is predicted to affect 9.7% of the general population by 2030. Its early detection and treatment are important steps towards its reduction. For this purpose, development in glucose sensing technology aims at eliminating the risks of diabetes' side effects. However, current commercial "sugar level monitoring equipment" is insufficient.

**Innovation:** Łukasiewicz Centre, EARTO member through Łukasiewicz Research Network, developed a non-invasive glucose biosensor which offers high sensitivity and detects physiological values for glucose in blood as well as sweat, saliva and tears. It is based on an original concept of immobilising the glucose enzyme into another gate. This biosensor integrates new units of microprocessor and wireless transmission as well as innovative sensing modules.

**Impact Expected:** This high-tech biosensor is planned to feature as a complete set, including a device for determining the level of glucose in body fluids and an annual subscription, under which the user has a mobile application enabling to perform certain tests per year. It is expected to reach the market within the next 2 years. It could be used in 50% of private hospitals, 25% of public hospitals, 20% of medical entities in Poland, producing approximately 16K units.



The Łukasiewicz Research Network is the third largest research network in Europe. It occupies 7,500 staff and has 33 research institutes located in 11 cities across Poland.

[www.lukasiewicz.gov.pl](http://www.lukasiewicz.gov.pl)



## Heterogeneous process for bio-based AA production

The chemical industry has tremendous effects on global economy and supports millions of job opportunities. However, it contributes significantly to greenhouse gas emissions and production of harmful by-products. The production of bio-based adipic acid (AA) has been shifted towards an eco-friendly process that reduces the process' costs, the dependence on fossil-based sources, as well as NOx emissions.

**Innovation:** EARTO member National Institute of Chemistry (NIC) developed an alternative sustainable process for the production of AA and its dimethyl ester (DMA) from bio-based aldaric acids. Bio-based AA and DMA come in the form of a white powder or colourless liquid which has the same properties as petro-based acids and esters. The innovative chemical process is based on the so-called “dehydroxylation” method via solid re-catalyst requiring operation of more than 95% at high conversion and selectivity towards AA or DMA.

**Impact Expected:** NIC's innovation has already received the support of domestic and foreign industrial partners and participated in various European projects. This process, planned to be commercially available within 2-3 years, directly targets the AA market which is expected to have a growth of 4.6% by 2023. It can be synthesised in both existing and new market formulations, aiming at replacing fossil-fuel acid by at least 50%.



The National Institute of Chemistry (NIC) offers high-level research equipment, allowing researchers to engage in the most cutting edge research challenges. It has 9 departments and 2 infrastructure centers.

[www.ki.si](http://www.ki.si)



## Developing new microorganism-based products

Products based on microorganisms, such as probiotics or bio-fertilizers, are used to help people's good health and well-being. These products are already available on the market but most of them can be found only in liquid form. This form increases the logistics and production cost and reduces the shelf life of the products. Several spray-drying technologies offer products in powder form, but their high-temperature can lead to microorganisms' cell damage.

**Innovation:** AINIA, EARTO member through REDIT Innovation Network, developed the CAPSULAC, a technology to get stable microorganism-based products which combines biotechnology and spray-drying technology. CAPSULAC has the form of powder without losing the viability and properties of the microorganisms. It uses a microencapsulation process with a previous bioprocess to enhance thermal resistance, increasing the microorganisms' survival and protecting them against damaging factors.

**Impact Expected:** AINIA's innovation therefore increases the quality of the microorganism-based products and their functionality. They can be implemented in an industrial environment within one year and can reach the market within the next 2-3 years. So far 5 companies have expressed their interest and 15 orders have been submitted, including 4 different sectors (agriculture, food, cosmetic and pharmaceutical).



The Network of Technological Centres of the Valencian Community (REDIT) is a private non-profit association that integrates and represents the 11 technological centres of the region.

[www.redit.es](http://www.redit.es) - [www.ainia.es](http://www.ainia.es)



## Innovative gun for breast cancer diagnosis

Breast cancer is one of the most common cancers in women. It is estimated that one in eight women will develop breast cancer during their lifetime. However, current clinical methods including mammography, ultrasound and breast biopsy, have not yet significantly reduced diagnosis time and cost, resulting in unnecessary pain for patients and significant economic cost to the healthcare system.

**Innovation:** EARTO member Tyndall developed the SMARTProbe device, embedded with an advanced sensor system and software analytics engine to improve the existing breast cancer diagnostic pathway. This breakthrough innovation consists of an innovative, re-usable, hand-held biopsy gun and wireless display used with disposable biopsy needles. SMARTProbe identifies benign/cancerous tissue types at moment of biopsy, integrating into current clinical practice and digital patient records.

**Impact Expected:** Tyndall, together with the RPO and Cork University Hospital, developed this innovation to improve patients' psychological welfare and deliver a step-change reduction in healthcare costs in the pathology pathway from €500 to €60 per patient. With a clinical deployment partner in place, the initial target is 10% of the total market of €120M by 2030. SMARTProbe can be applied to cancer diagnostic methods for other organs, enabling expansion into additional significant diagnostic markets.



Tyndall National Institute is a leading European research centre in integrated ICT (Information and Communications Technology) materials, devices and systems. Specialising in both electronics and photonics, Tyndall works with industry and academia to transform research into products in its core market areas.

[www.tyndall.ie](http://www.tyndall.ie)



## A photothermal imaging is worth more than a thousand words

In the past, looking under the surface of samples was only possible for transparent materials. Nowadays, the discovery of X-rays, ultrasound technology as well as thermography have been used for subsurface imaging of materials or for biomedical imaging. However, all these methods do not fully offer the high-resolution needed for deeper structures.

**Innovation:** The Research Center for Non-Destructive Testing GmbH (RECENDT), EARTO member through UAR, developed an innovative super "hybrid" imaging technique, the so-called "thermo-tomography" that combines the advantages of thermography and ultrasound. With the use of a mathematical transformation, the measured thermography signal for each pixel can be converted into a "virtual" sound wave. These converted signals can then be used to generate an image from the interior of the material by using tested ultrasound algorithms.

**Impact Expected:** RECENDT's method is able to deliver on higher raw material, energy efficiency and can be applied before, but also directly in the production line. Thanks to this innovation, significant revenue from its software sale can be achieved, opening-up new business and job opportunities. Two relevant systems are available on the market, but only for surface imaging. The full project, using in-depth imaging, will reach the market within 3 years.



UAR (Upper Austrian Research GmbH), together with its associated RTO companies, is promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

[www.uar.at](http://www.uar.at) - [www.recendt.at](http://www.recendt.at)

# RTOs INTERNATIONAL NETWORK **RIN**



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# RTOs INTERNATIONAL NETWORK RIN

## AIST

### Challenges for zero emission



WORKING TO CREATE  
**ENVIRONMENTAL  
INNOVATIONS** TO ACHIEVE A  
ZERO EMISSION SOCIETY



INTERNATIONAL COLLABORATIONS WITH  
**50+** WORLD-LEADING RESEARCH  
INSTITUTES AND OTHER ORGANISATIONS



A RESEARCH PLATFORM TO CONNECT  
**120,000** RESEARCHERS IN  
G20+ COUNTRIES



TACKLING **16** TECHNOLOGICAL  
CHALLENGES STIPULATED IN THE  
“ENVIRONMENT INNOVATION STRATEGY”

The National Institute of Advanced Industrial Science and Technology (AIST), one of Japan’s largest public research organisations, focuses on the creation and practical realisation of technologies useful to industry and society, and on “bridging” the gap between innovative technological seeds and commercialisation. AIST is organised into 7 research departments, and has around 2,300 researchers at 11 research bases nationwide.



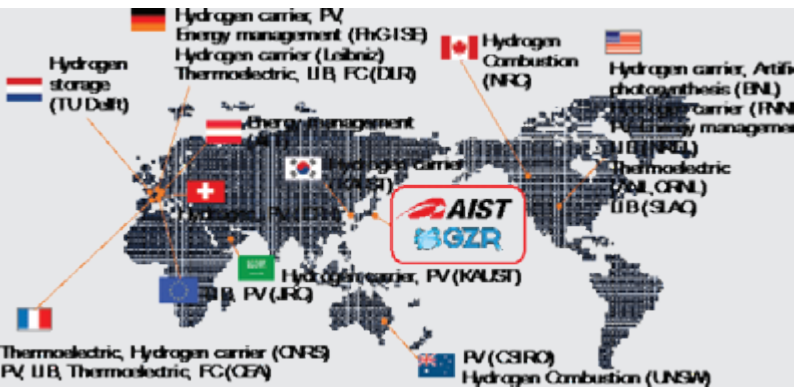
[www.aist.go.jp](http://www.aist.go.jp)



# Developing basic sciences and industrial technologies, and making the “ET Revolution” a reality

Global environmental issues are among the most urgently difficult confronted by human beings to date. Solutions to these issues require the creation of discontinuous innovations for environmental and energy technologies (ETs). Solving these issues with a single technology would likely be impossible. Various technologies should be integrated to pave ways towards making possible what has thus far been deemed impossible. Meanwhile, an innovation which should be called the fourth industrial revolution is arising, with new

technologies such as AI, IoT, and 5G. Such novel technologies should be linked with global environmental issues, and serve as powerful arms for the aforementioned solutions. When these technologies are well combined, the revolution in environmental and energy technologies, or ET revolution, will occur.



At its facilities in AIST, GZR will conduct researches for innovative ETs by collaborating with leading national research institutes and other organisations.

## Hub of knowledge

At the Green Innovation Summit held in Tokyo in October 2019, the Japanese government outlined plans to inaugurate an international joint research base in Japan for zero emission technologies as a hub of knowledge from all over the world. In response, AIST established the Global Zero Emission Research Center (GZR) in January 2020. Under the leadership of its Director, Dr. Akira Yoshino, a 2019 Nobel Laureate in Chemistry, GZR will conduct fundamental research for innovative ETs to jointly achieve a zero emission society with more than 120K researchers from leading national research institutes and other organisations of G20 and other countries that are prominent in research and innovation.

## GZR research teams

GZR integrates all AIST's advanced ETs research to create environmental innovations. GZR is comprised of the following 10 research teams with 200 researchers and staff: Organic-Inorganic Hybrid PV team, Multijunction PV Team, Thermoelectric and Thermal Management Team, Fundamentals of Ionic Devices Research Team, Artificial Photosynthesis Research Team, Hydrogen Production and Storage Team, Carbon-Based Energy Carrier Research Team, Smart CO<sub>2</sub> Utilization Research Team, Resource Circulation Technology Research Team, and Environmental and Social Impact Assessment Team. To expand our research globally, GZR will collaborate with more than 50 world-leading research institutes and other organisations.

## Sharing outcomes

Both domestic and international collaborations are critical for a decarbonized future. To tackle the 16 technological challenges stipulated in the “Environment Innovation Strategy” endorsed by the Japanese government, GZR aims to create innovative technologies required for strengthening greenhouse gas emissions reduction measures through the implementation of basic science and industrial technologies for ETs. To accelerate both the domestic and global collaborations, GZR as a hub would like to invite the best human intelligence and share the outcomes with the rest of the world, and confront together the global environmental issues common to all human beings.

# RTOs INTERNATIONAL NETWORK RIN

## CSIRO

### FutureFeed



APPROXIMATELY **1.3B** PEOPLE AROUND THE WORLD RELY ON LIVESTOCK FOR THEIR LIVELIHOODS



THE METABOLIC CONVERSION OF METHANE REPRESENTS UP TO **15%** OF FEED ENERGY AND FEED EXPENSES



METHANE FROM BURPS AND FARTS FROM LIVESTOCK IS A GREENHOUSE GAS **28 TIMES** MORE POWERFUL THAN CARBON DIOXIDE



IF JUST **10%** OF GLOBAL RUMINANT PRODUCERS ADOPTED FUTUREFEED AS AN ADDITIVE TO FEED THEIR LIVESTOCK, IT WOULD HAVE THE SAME IMPACT FOR OUR CLIMATE AS REMOVING 50M CARS FROM ROADS

As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology. CSIRO is Australia's most trusted research institution and most connected innovator, working with every Australian university, government department and major Australian industry. Its collaborative research turns science into solutions for food security and quality; clean energy and resources; health and wellbeing; resilient and valuable environments; innovative industries; and a secure Australia and region.

# CSIRO

[www.csiro.au](http://www.csiro.au)

# Helping to secure global food security and fight climate change by reducing powerful greenhouse gas

More than 800M people are currently experiencing food insecurity. This number will grow and put an even greater strain on the food chain given the increase in the world's population. Furthermore, approximately 1.3B people rely on livestock such as cattle and sheep for their livelihoods. Consequently, there is a significant need for increasing productivity in livestock production to help lift people out of economic and food poverty. If livestock could be helped to grow larger, faster, and at little expense, then a significant part of the

problem could be alleviated. Livestock also bring with them a gassy problem. Methane from burps and farts is a greenhouse gas 28 times more powerful than carbon dioxide. More than 20% of the world's entire total of greenhouse gas emissions come from livestock production. This double threat of a growing population and rising greenhouse gas emissions risks destabilising communities and requires an urgent response that can be implemented rapidly and inexpensively.



FutureFeed is a cost-effective seaweed feed additive that aims at increasing livestock productivity and reducing methane emissions.

## Our response: A sea-based land solution

Our scientists have developed a cost-effective seaweed feed additive called FutureFeed, which uses a variety of Australian seaweed that significantly reduces their methane emissions and has potential to increase livestock productivity. The *Asparagopsis* species of seaweed produces a bioactive compound, which prevents the formation of methane by inhibiting a specific enzyme in the gut during the digestion of feed. It has been found to reduce the production of enteric methane by more than 80%.

## Cheaper, greener, better results

The metabolic conversion of methane represents up to 15% of feed energy and feed expenses, and is a loss of economic potential. The reduction of methane emissions has a potential economic benefit for producers as well as a metabolic benefit for the animal, via an improved conversion of energy otherwise lost as methane emissions.

## Feeding livestock with FutureFeed

If just 10% of global ruminant producers adopted FutureFeed as an additive to feed their livestock, it would have the same impact for our climate as removing 50M cars from roads. FutureFeed can also lead to a potential increase in livestock productivity, creating enough food to feed an additional 23M people on the continent.

For more information on FutureFeed, reach out to the team at [futurefeed@csiro.au](mailto:futurefeed@csiro.au).

# RTOs INTERNATIONAL NETWORK RIN

# ITRI

## LCD waste recycling system



THE PILOT PLANT HANDLES **3T** OF WASTE LCD PANELS DAILY, WITH A LIQUID CRYSTAL RECYCLING RATE OF **100%**, INDIUM RECOVERY RATE OF MORE THAN **90%** AND GLASS RECYCLING RATE OF **100%**



THE GLOBAL ANNUAL OUTPUT VALUE OF LCD WASTE PANEL MATERIAL RECYCLING IS ESTIMATED AT **\$3B**



AROUND **1M TONS** OF LCD PANEL ARE DISCARDED IN THE WORLD EVERY YEAR AND **1,000** SETS OF LCD WASTE RECYCLING SYSTEM ARE REQUIRED FOR RECYCLING



ITRI HAS ASSISTED TAIWAN LCD MAKERS IN RECOVERING AND REUSING **100T** OF LIQUID CRYSTALS, ACHIEVING A COST REDUCTION BENEFIT OF ABOUT **\$700M**

ITRI is a leading research and technology institute with more than 6,000 researchers. Its mission is to drive industrial development, create economic value, and enhance societal well-being through technology R&D. Founded in 1973, it pioneered in IC development and continues to nurture emerging tech ventures and deliver its R&D results to industries.



**ITRI**  
Industrial Technology  
Research Institute

[www.itri.org.tw](http://www.itri.org.tw)

# A zero-waste, eco-friendly and cost-effective total solution for LCD waste treatment

Liquid Crystal Displays (LCDs) have replaced Cathode Ray Tubes (CRTs) as the main display devices in recent years. To satisfy the increasing demands, billions of LCDs are manufactured annually. As more LCDs are produced and used, the amount of LCD waste is increasing at an alarming rate. Current treatment technologies can disassemble LCD into multiple components and recycle them according to their materials. However, there is no suitable model for treating LCD panels. Research has repeatedly shown the harmfulness of liquid crystal, indium and

other heavy metals which LCD panels contain. As a result an increasing number of countries have classified LCD panels as hazardous waste. Because of this, future processing of LCD panel waste will require on-site burial, burning, or physical disposal, not only increasing processing costs, but also causing environmental damage. This is a huge problem. That is why this recycling technology for waste LCD panels is a kind of revolutionary breakthrough.



LCD Waste Recycling System is a solution complying to the principles of circular economy. It recovers and regenerates LCD panel materials for reuse, rather than a linear-economy approach based on making, using and disposing.

## Recycling of liquid crystals

Liquid crystal is the main component of LCD. It is a chemical with a high unit cost, high stability and low biodegradability. While the harmfulness of liquid crystal is uncertain, its structure contains a large volume of benzene rings, fluorine, chlorine, and bromine, which, if buried, may seep into subterranean water systems and impact ecosystems. Physical processing entails breaking down LCD panels and adding them to cement or concrete, which does not remove liquid crystals and heavy metals from the panels, so they may still enter and harm the environment following rain or washing. Based on environmental and economic considerations, the liquid crystal in the LCD panel should be reused.

## Separation, purification and recycling

To prevent the pollution caused by waste LCD panel disposal, and to control processing costs, ITRI thoroughly analysed the characteristics and reusability of each material contained in LCD panels, and designed a logical separation procedure according to the associations between each material, first separating liquid crystal, indium, and glass, and then developing purification technology for each material which enables the reuse of these materials. Liquid crystal can be reused in new LCDs or liquid crystal smart windows. Indium can be refined as the raw material of sputtering targets. Glass can become a humidity-controlling green building material or heavy-metal adsorption material.

## Protecting the environment worldwide

ITRI's pilot plant can treat 3 tons of waste LCD panel per day of operation, producing 3 kilograms of liquid crystal, 750 grams of indium, and about 2,550 kilograms of glass, which can be reused as humidity-controlling green building material or heavy-metal adsorption material. ITRI's team uses the pilot plant for technical verification of on-line scrap LCD panels and end-of-life LCD panels. ITRI can build the LCD panel processing center for LCD manufacturers and e-waste recycling companies.

# RTOs INTERNATIONAL NETWORK RIN

## NRC

### National Research Council of Canada's clean energy agenda



CANADA HAS COMMITTED TO INCREASING THE VALUE OF CLEAN TECHNOLOGY

EXPORTS BY **2025** AND **100%** PENETRATION OF ZERO-EMISSIONS LIGHT-DUTY VEHICLES BY **2040**



THIS **\$57M** PROGRAMME WILL CREATE A CLEANER, MORE SUSTAINABLE CANADIAN ENERGY AND CHEMICAL INDUSTRY THROUGH MATERIALS INNOVATION



NRC'S PROGRAMME ON MATERIALS FOR CLEAN FUELS WILL TAKE CLEAN ELECTRICITY, WATER, AND CARBON DIOXIDE AND MAKE RENEWABLE FUELS WITHIN **7** YEARS



THE PROGRAMME FOCUSES ON **3** AREAS, INCLUDING CO<sub>2</sub> CONVERSION, CLEAN HYDROGEN PRODUCTION, AND SELF-DRIVING LABS FOR MATERIALS DISCOVERY

The National Research Council of Canada (NRC) is at the intersection of academia, industry and government. Commitment to research and innovation underpins everything we do. The NRC encourage economic prosperity by delivering technology development programmes and specialized national facilities and services, with an eye to boosting industrial R&D. The NRC is Canada's engine for industrial innovation, with a focus on translating research and technology into prosperity.

Canada

National Research  
Council Canada  
Conseil national de  
recherches Canada

[nrc.canada.ca](http://nrc.canada.ca)

# Creating a common path towards SDGs through environmental research and technology

The international drivers for environmental research and technology development are at an all-time high. The 2020 World Economic Forum's annual Risk Report is for the first time dominated by environmental factors. At the United Nations Climate Change Conference in 2015 (COP 21) in Paris, the International community committed to combatting climate change and accelerating the actions and investments needed for a sustainable low carbon future. Institutional investors around the globe are urging governments to do more. Each of the 17 Sustainable Development

Goals (SDGs) adopted in the 2030 Agenda for Sustainable Development is associated with between one and twelve environmental indicators. These cut across disciplines, sectors and institutional mandates, acknowledging the integrated nature of the many challenges facing humanity. To accelerate progress and create a common vision for Canada's path forward against the SDGs, the Government of Canada is leading the development of a 2030 Agenda National Strategy.



The Materials for Clean Fuels Challenge programme will create a cleaner, more sustainable Canadian energy and chemical industry through materials innovation - Credit: National Research Council of Canada

## Enabling a more sustainable economy

Canada has committed to achieving net-zero emissions by 2050, increasing the value of clean technology exports by 2025 and 100% penetration of zero-emissions light-duty vehicles by 2040. The National Research Council of Canada (NRC) has a critical role to play in advancing Canada's efforts in climate change, environmental sustainability, and clean technologies. NRC's R&D is focused on finding alternative low-carbon sources of energy while reducing greenhouse gas emissions, and new technologies and approaches for a more sustainable economy – from transportation and manufacturing, to natural resources and construction, and other end-use areas. One of its programmes is doing just that...

## Innovations in clean fuels

The economy needs fuel to function, and we need clean technology to meet climate change targets. NRC's programme on Materials for Clean Fuels will take clean electricity, water, and carbon dioxide and make renewable fuels. This seven-year \$57M programme will create a cleaner, more sustainable Canadian energy and chemical industry through materials innovation. The NRC is coordinating a Canadian and international effort to collaborate with leaders in academia and industry to catalyse the discovery and development of materials for early-stage exploratory technologies to decarbonise the oil and gas and petrochemical sectors.

## Impact expected

The Materials for Clean Fuels Challenge programme focuses on 3 areas: (1) using renewable energy to convert CO<sub>2</sub> captured from point sources into valuable fuels and chemical feedstocks; (2) reducing the cost to make, use, move, and store emissions-free hydrogen; and (3) AI accelerated materials discovery. Over the next 7 years, we will develop new materials for zero-emission transportation fuels and chemical feedstocks, from discovery to commercialisation. Through collaboration, we will bring disruptive solutions to the design, development and delivery of clean fuels and chemicals in Canada.

# RTOs INTERNATIONAL NETWORK RIN

## NST

### Honeybush



A **12-WEEK** RANDOMISED CLINICAL STUDY PROVED SIGNIFICANT EFFICACY OF FERMENTED HONEYBUSH ON THE SKIN WRINKLE



**NO ADVERSE EFFECTS** WERE SHOWN DURING THE CLINICAL PERIOD AND TOXICITY TEST (GLP)



TOXICITY TEST WAS PERFORMED, RESULTING IN THE LETHAL DOSE OF MORE THAN **5K MG/KG**



HONEYBUSH HAS BEEN COMMERCIALISED SINCE **2017** AND NOW ON SALE IN MARKET

The National Research Council of Science & Technology (NST) was established in 2014 to support policy-making work of the national research programmes and take the lead in the knowledge-based industry by systematically supporting, fostering and managing the twenty five government-funded research institutes (GRIs) in science and technology.

  
**nst**  
National Research Council  
of Science & Technology

.....  
[www.nst.re.kr](http://www.nst.re.kr)



# Magic food for skin rejuvenation - Inhibition of skin aging not by cosmetics

The most representative symptom of skin aging is wrinkling. To reduce skin wrinkles and other skin diseases, various cosmetics are used. However, these cosmetics have the limitations of short-term effect and the penetration to dermis is not easy due to skin barrier function, which is not a fundamental treatment. Furthermore, the problem in skin is not

only related with skin itself it is correlated with whole body system including organ, immune function and microbiota. Therefore, the development of edible materials more effective treatments for the alleviation of skin wrinkles is important in the field of medical, food, and cosmetic industries.



Commercially available product behind the science through the study from bench to bed.

## Development of functional food (nutraceutical) for anti-wrinkle and moisturisation

Aging of the human skin is a complex biological process which is influenced by endogenous (intrinsic) and exogenous (extrinsic) factors. Oxidative stress and photodamage resulting from ultraviolet radiation exposure play key roles in skin aging in terms of extrinsic factor. Photoaging is occurred by chronic exposure of the sun and ultraviolet irradiation, and leads to skin aging accompanied by deficiency of skin hydration. Ultraviolet B (UVB) exposure is the most important extrinsic factor that accelerates skin aging, a process that is commonly termed photo-aging and further develops skin cancer in the worst scenario. People in the world want to reduce skin wrinkles due to well-being trends, also skin condition is the mirror of health condition. This technique is important not only for aesthetics but also for health.

## The science behind the material of fermented honeybush

Herbs are important for the development of herbal medicines and functional foods. Among these plants, honeybush (*Cyclopia intermedia*) showed antioxidant activity together with anti-wrinkle properties. The aim of this study was to evaluate the protective effect of fermented honeybush extracts against ultraviolet B (UVB)-induced damage in vitro and vivo model and toxicity test in GLP facility. Fermented honeybush reduced the length and depth of skin wrinkles caused by UVB irradiation and inhibited thickening of the epidermal layer in animal model and showed cytoprotective effect in cellular system. For the safety, toxicity test was performed using Sprague-Dawley rats and beagles, resulting in the lethal dose to be higher than 5K mg/kg.

## Clinically proven and commercialisation

For clinical trial, a randomised, double-blinded, placebo-controlled study aimed to evaluate the efficacy and safety for skin rejuvenation. 120 subjects with crow's feet wrinkles were randomised to receive either low-dose extract (400 mg/day), high-dose extract (800 mg/day), or placebo (negative control, only dextran) for 12 weeks. Wrinkles were evaluated using JANUS® and PRIMO pico®. Skin elasticity, hydration and transepidermal water loss were measured. Skin wrinkle grade was significantly improved in both low-dose and high-dose groups compared to placebo group, as well as for skin hydration and elasticity. No adverse effects were shown during the study period. Daily supplementation with fermented honeybush could be helpful for protecting against skin aging. It is commercialised in the market.



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of Research and Technology Organisations

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