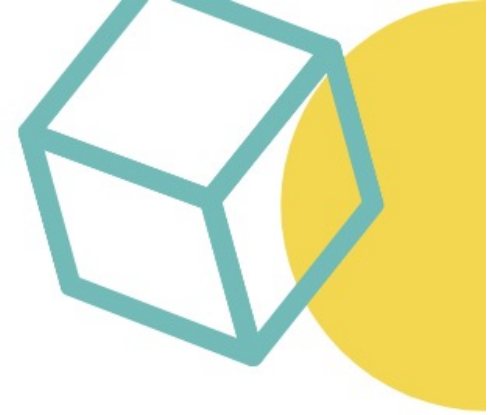


# Efficient and Sustainable Manufacturing

A Vanguard Initiative Pilot Project

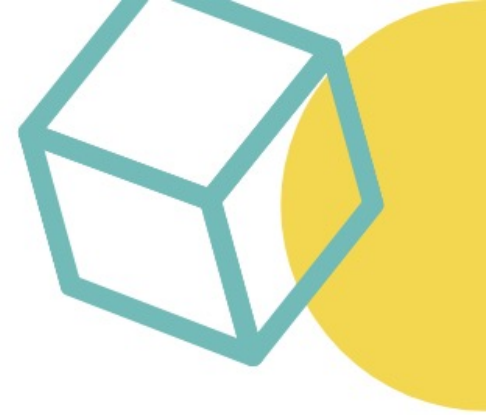
**António Almeida** ([antonio.h.almeida@inesctec.pt](mailto:antonio.h.almeida@inesctec.pt))  
**INESC TEC, Portugal**





## Agenda:

1. INESC TEC Presentation
2. Efficient and Sustainable Manufacturing Demo Case
3. INESC TEC Projects Examples



## Agenda:

1. INESC TEC Presentation
2. Efficient and Sustainable Manufacturing Demo Case
3. INESC TEC Projects Examples

## OUR VISION

To be a **relevant international player** in  
**science and technology** in the domains of  
**Networked Intelligent Systems, Power and  
Energy, Industrial and Systems  
Engineering and Computer Science**

## OUR MISSION

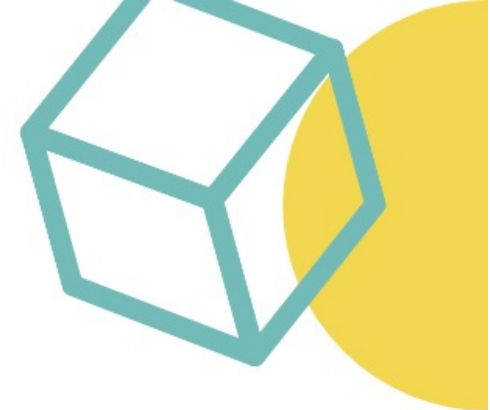
- **Foster Pervasive Intelligence**
- **Excellence in research**
- **Social and economic impact**

## ASSOCIATE INSTITUTIONS



## PARTNERSHIP WITH INTERNATIONAL UNIVERSITIES





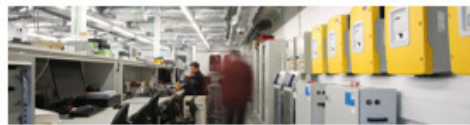
# A MULTIDISCIPLINARY ENVIRONMENT

## COMPETENCIES TO FOSTER PREVASIVE INTELLIGENCE



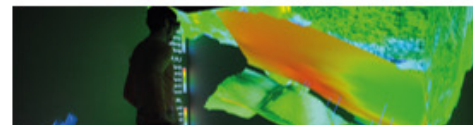
### NETWORKED INTELLIGENT SYSTEMS

- Applied Photonics
- Biomedical Engineering Research
- Robotics and Autonomous Systems
- Telecommunications and Multimedia



### POWER AND ENERGY

- Power and Energy Systems



### COMPUTER SCIENCE

- Advanced Computing Systems
- Artificial Intelligence and Decision Support
- High-Assurance Software
- Information Systems and Computer Graphics



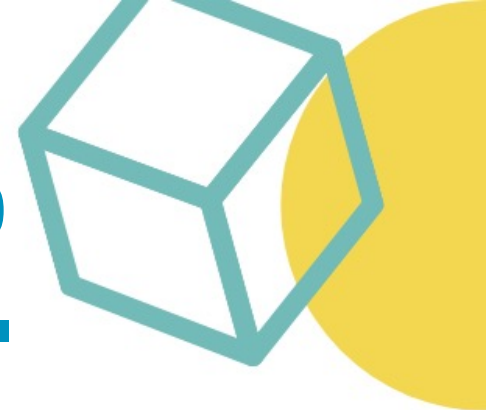
### INDUSTRIAL AND SYSTEMS ENGINEERING

- Enterprise Systems Engineering
- Industrial Engineering Management
- Innovation, Technology and Entrepreneurship
- Robotics in Industry and

Intelligent Systems



## KEY FIGURES IN 2020



---

**+700**

INTEGRATED  
RESEARCHERS

---

**350**

PHD  
RESEARCHERS

---

**18M€**

ACTIVITY

---

**37**

PATENT APPLICATIONS  
(7 GRANTED)

---

**+35**

NATIONALITIES

---

**+200**

PEOPLE GOING TO  
THE MARKET/YEAR

---

**+370**

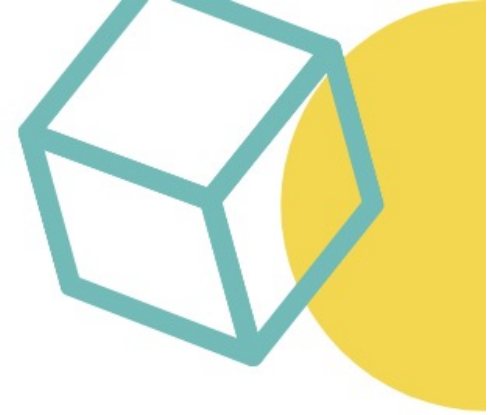
ONGOING R&D  
PROJECTS

---

**7**

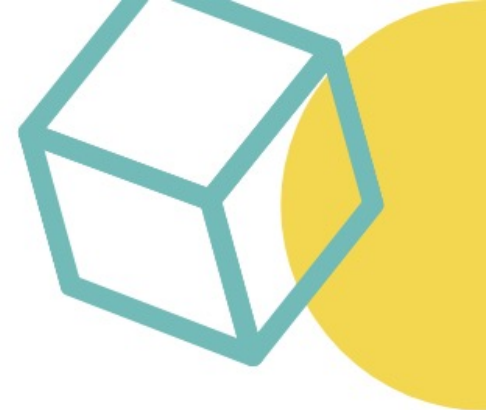
ACTIVE SPINOFFS  
(TRACK-RECORD: +20)





## Agenda:

1. INESC TEC Presentation
2. **Efficient and Sustainable Manufacturing Pilot**
3. INESC TEC Projects Examples



# Efficient and sustainable Manufacturing Pilot

The Vanguard Initiative Efficient and Sustainable Manufacturing (ESM) Pilot project addresses the development of a European network of pilot plants in the area of manufacturing efficiency and sustainability.

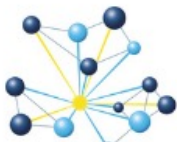
The focus is on technologies, methods and tools which aim at:

- Increasing throughput, quality, environmental and social sustainability of manufacturing activities while reducing costs;
- Reducing emissions, energy, resources and materials consumption,
- Increasing the inclusion of humans in factories





RIS3T Galicia-Região Norte



VANGUARD INITIATIVE



Interreg

España - Portugal

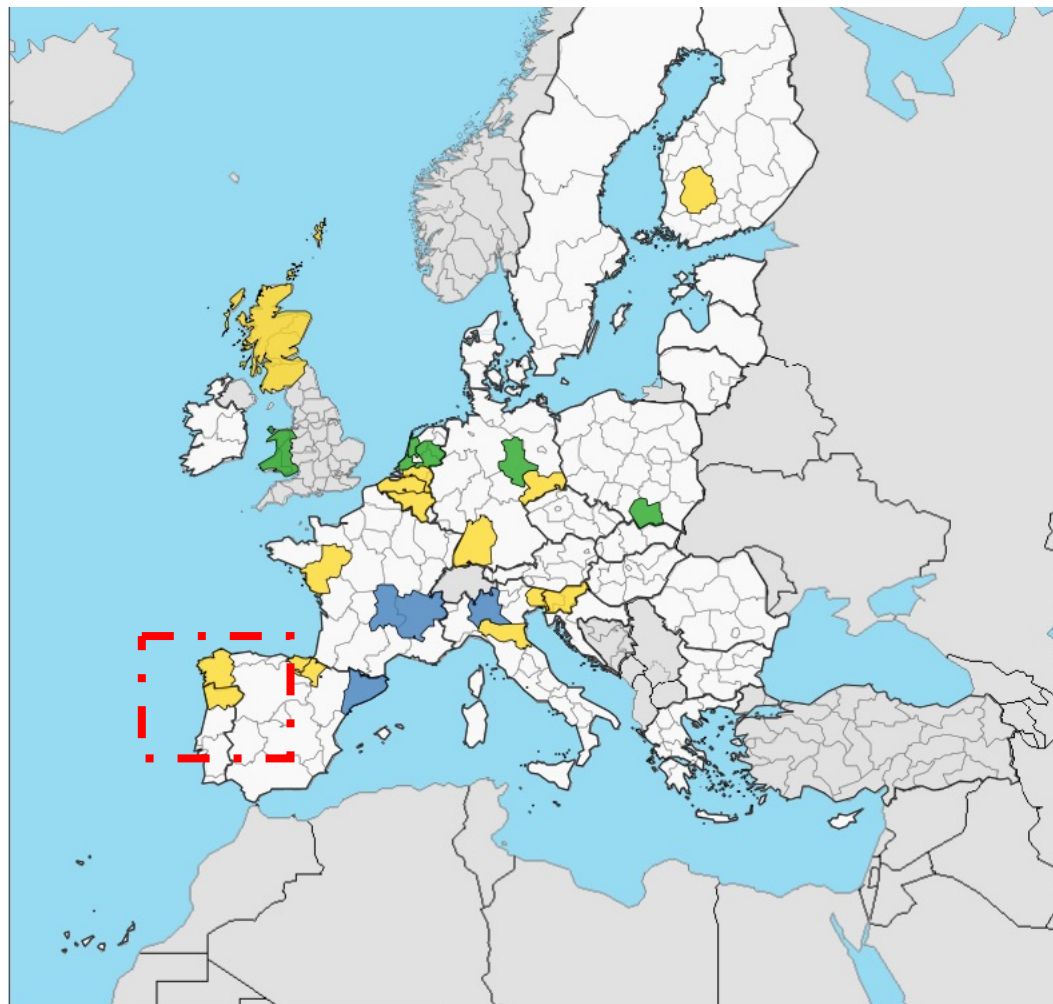
IMPACT RIS3T

Fundo Europeu de Desenvolvimento Regional  
Fundo Europeu de Desenvolvimento Regional



UNIÓN EUROPEA  
UNIÃO EUROPEIA

## List of Regions Involved



[Webtools](#) | [Leaflet](#) | [Boundaries of all countries](#) | [Disclaimer](#)

Leading regions

Participating regions

Interested regions

CCDRn

COMISSÃO DE COORDENAÇÃO E  
DESENVOLVIMENTO REGIONAL DO NORTE

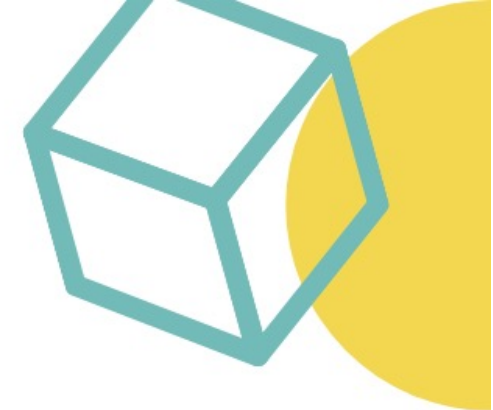


XUNTA  
DE GALICIA

gain  
AGÊNCIA DE INOVAÇÃO



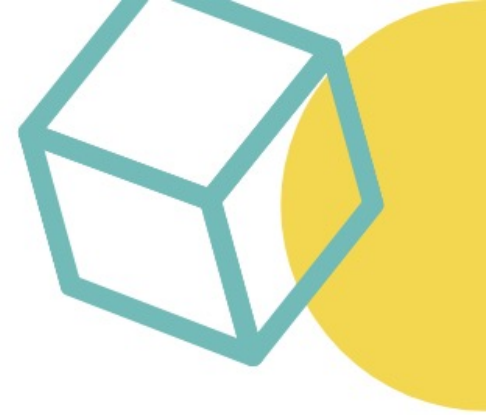
AGÊNCIA NACIONAL  
DE INOVAÇÃO



# Efficient and Sustainable Manufacturing Pilot

## Demo-Cases Involved:

- De- and Remanufacturing to recover and re-use functions and materials from End-Of-Life products
- Adaptive and intelligent manufacturing and assembly for personalised products and components
- Advanced Sustainable Surface and Coating Manufacturing Technologies on Polymer materials
- Digital and Virtual Factory integrating planning and simulation into operative environment
- Energy and Environmentally- efficient Manufacturing processes and solutions



# Digital and Virtual Factory integrating planning and simulation into operative environment

# Digital and Virtual Factory integrating planning and simulation into operative environment

## CPS-enabled Pilot Plants



## What-if Scenarios & Simulation



## Industrial IoT & Analytics



## Enriching Smart Factory CPSs with Digital Factory applications & Virtual Factory simulations

- **Next generation ICTs**, such as Internet of Things, Cloud/Big Data, Artificial Intelligence / Deep Learning
- **Exploit the potential of data** generated by CPS-oriented Industry 4.0 production systems
- **Enabling Digital Factory applications** in domains such as: production planning and optimization, diagnosis and maintenance, energy and waste management as well as by supporting Virtual Factory modelling and simulation environments where what-if scenarios could be designed, developed and experimented





**AI Regio** - Regions and DIHs alliance for AI-driven digital transformation of European Manufacturing SMEs (coordinated by POLITECNICO DI MILANO)

The AI REGIO will build a one-stop-shop platform that enables access to resources for AI-based solutions in efficient and sustainable manufacturing, with particular emphasis on resources that can lower the AI adoption barriers for SMEs.

**AI Regio Mission: Consolidate the collaboration in the pan-European network of Digital Innovation Hubs (DIHs) by enhancing the offering of regional DIHs to manufacturing SMEs on three levels:**

1. POLICY IMPACTS: Better coordination of regional smart specialisation strategies:
2. TECHNOLOGICAL IMPACT: Enhancing knowledge transfer across the network of DIHs:
3. BUSINESS IMPACT: Upgrade the offering of DIHs by AI-driven applications:

#### Project Information

##### AI REGIO

Grant agreement ID: 952003

##### Status

Ongoing project

##### Start date

1 October 2020

##### End date

30 September 2023

##### Funded under

H2020-EU.2.1.1.

##### Overall budget

€ 9 200 080

##### EU contribution

€ 7 999 207

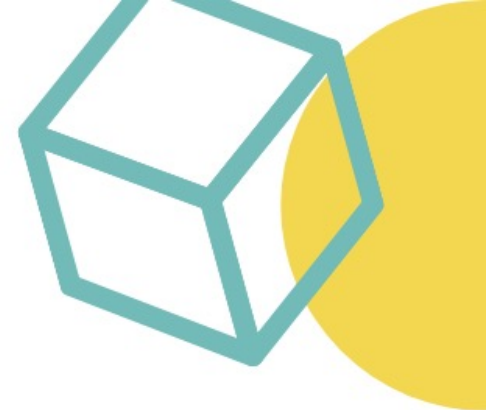
##### Coordinated by

POLITECNICO DI MILANO

 Italy







**AI Regio** - Regions and DIHs alliance for AI-driven digital transformation of European Manufacturing SMEs

## REGIONAL MANUFACTURING DIH



**NORTE region DIH experiment** is focused on the demonstration of how to integrate information collected through an IoT system into a production planning software for real-time planning adjustments.

### AI REGIO SOLUTION:

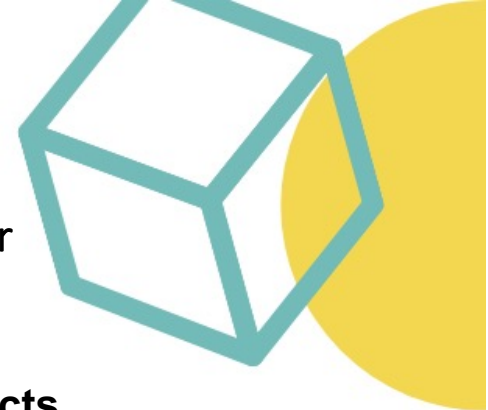
This pilot will show how to integrate information collected through the IoT system into a production planning software for real-time planning adjustments.

The aim is to adjust the running production schedule taking into account current delays and faults, by reassigning operations to another production resources, matching required and available skills in both sides.

### EXPECTED BENEFITS:

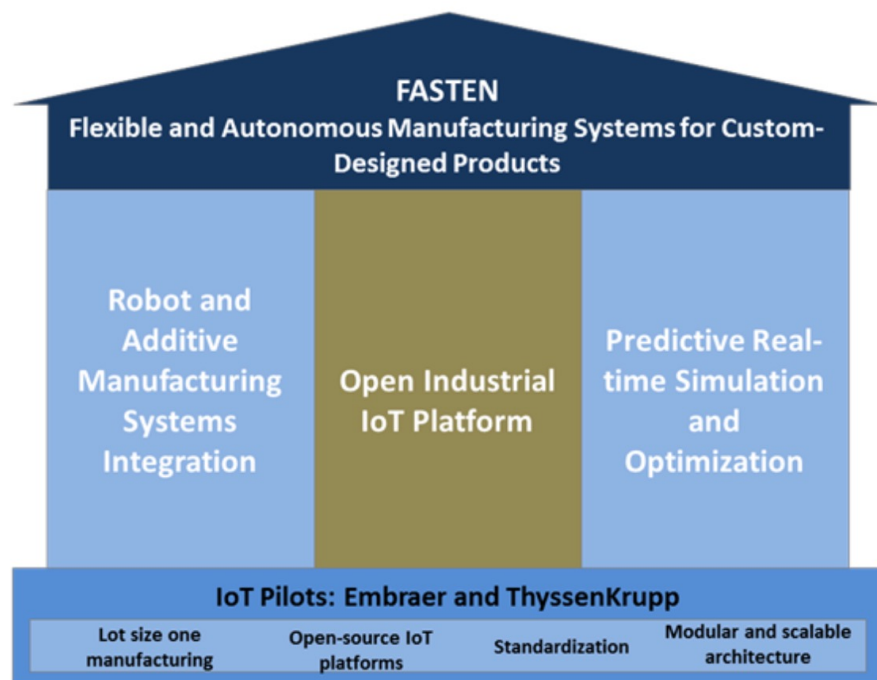
- production Planning and Optimisation
- increase the % (from 20% to 80%) of equipment and software connected to the IoT Platform
- increase the % of detected deviations

## Flexible and Autonomous Manufacturing Systems for Custom-Designed Products



**Open and standardized framework** to produce and deliver **tailored-designed products**.

Effectively pairing digital integrated service/products to additive manufacturing processes, on top of tools for decentralizing decision-making and data interchange.



### Project information

#### FASTEN

Grant agreement ID: 777096

[Project website](#)

Status

Ongoing project

Start date

1 November 2017

End date

31 October 2020

Funded under:

H2020-EU.2.1.1.

Overall budget:

€ 3 136 633,75

EU contribution

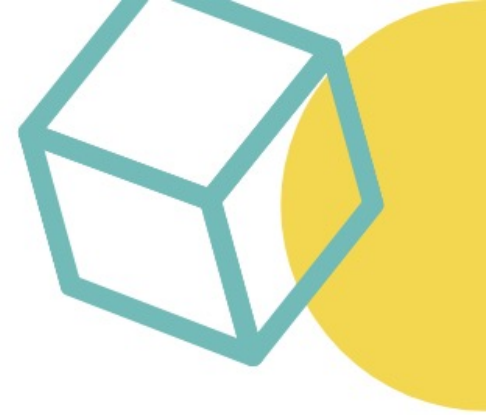
€ 1 452 937,50



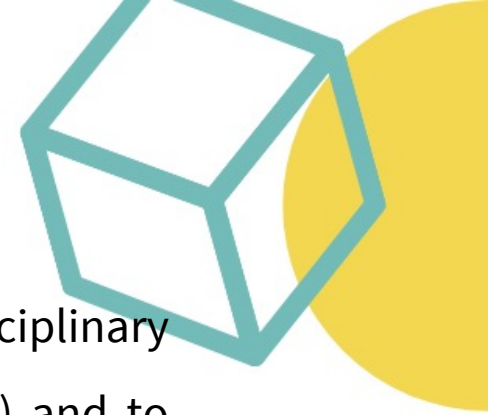
Coordinated by:

INESC TEC - INSTITUTO DE ENGENHARIA DE SISTEMAS E COMPUTADORES, TECNOLOGIA E CIENCIA

Portugal

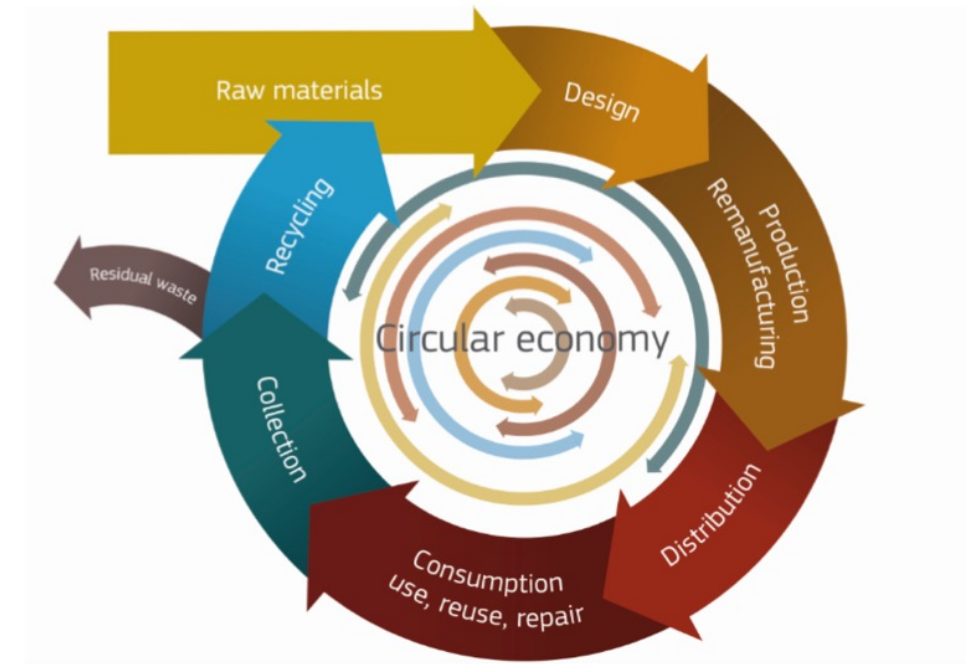


# De- and Remanufacturing to recover and re-use functions and materials from End-Of-Life products

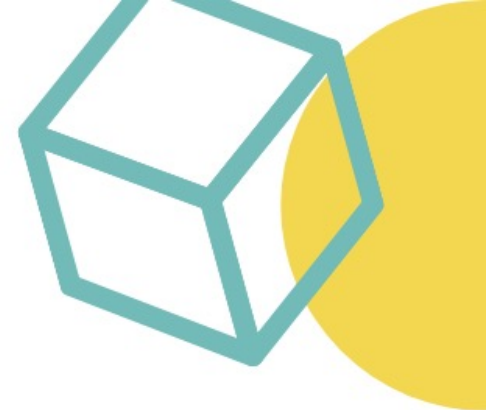


The main objective of the De-and Remanufacturing **pilot network** is to **integrate** a multidisciplinary set of **advanced and innovative enabling technologies and digital innovations** (TRL 7-8) and to exploit the **regional Smart Specializations** in synergic way to offer services to European end-users, mainly manufacturing companies, to solve specific **sustainability-oriented problems** related to their products.

The pilot network nodes will act as *Innovation Hubs for Circular Economy* (**Circular Innovation Hubs**), being a network of competence and technology centers and supporting future producer-driven replication at industrial scale (TRL 9).

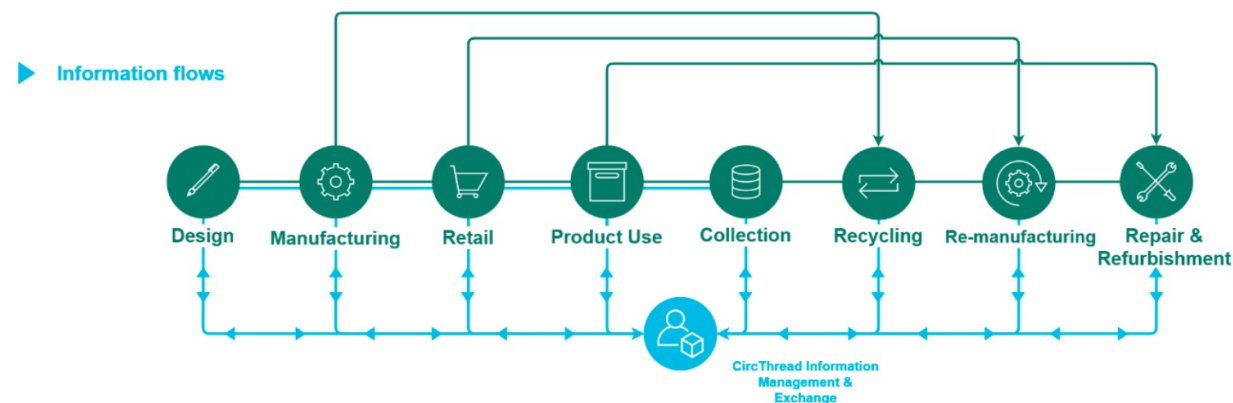




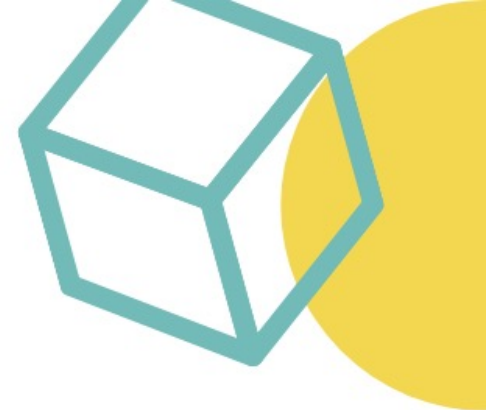


Building the Digital Thread for Circular Economy  
Product, Resource & Service Management

- Coordinated by Ekodenge to reply to SC5-31 H2020
- Enhance decision making **using information across the product life cycle** to improve product lifespan, repair, remanufacturing and recycling.
- Deliver an **information management system** to exchange product life cycle data across all stage of the product (incl. design, manufacturing, retail, use, collection, and end-of-life circular loops)
- Use the latest modern **digital technologies to enable exchange of information** in a scalable, transparent, secure and decentralised approach

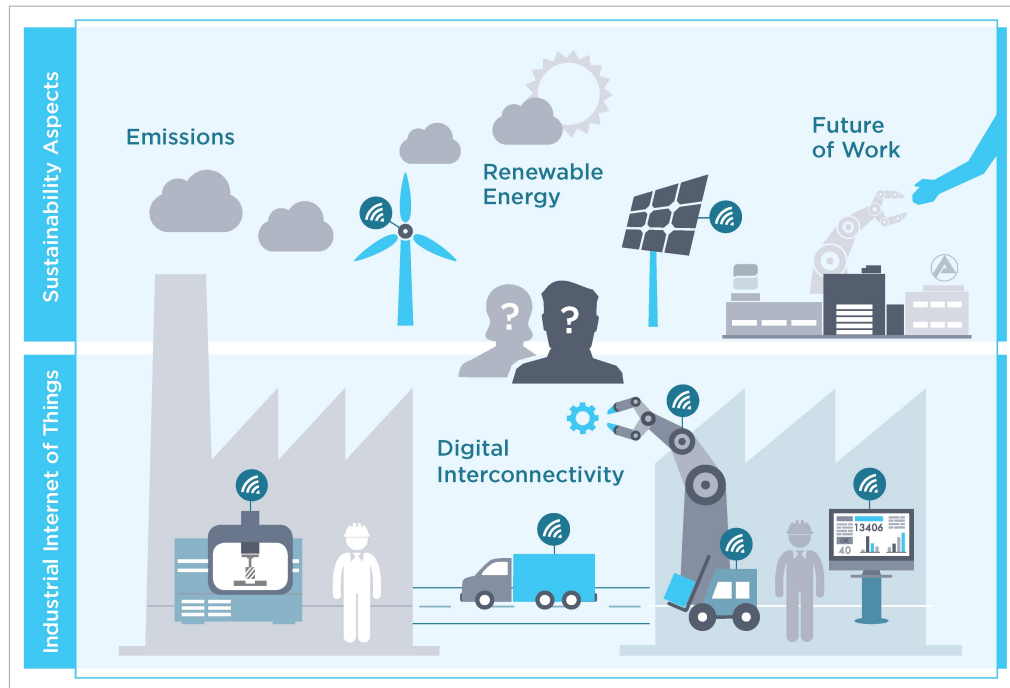






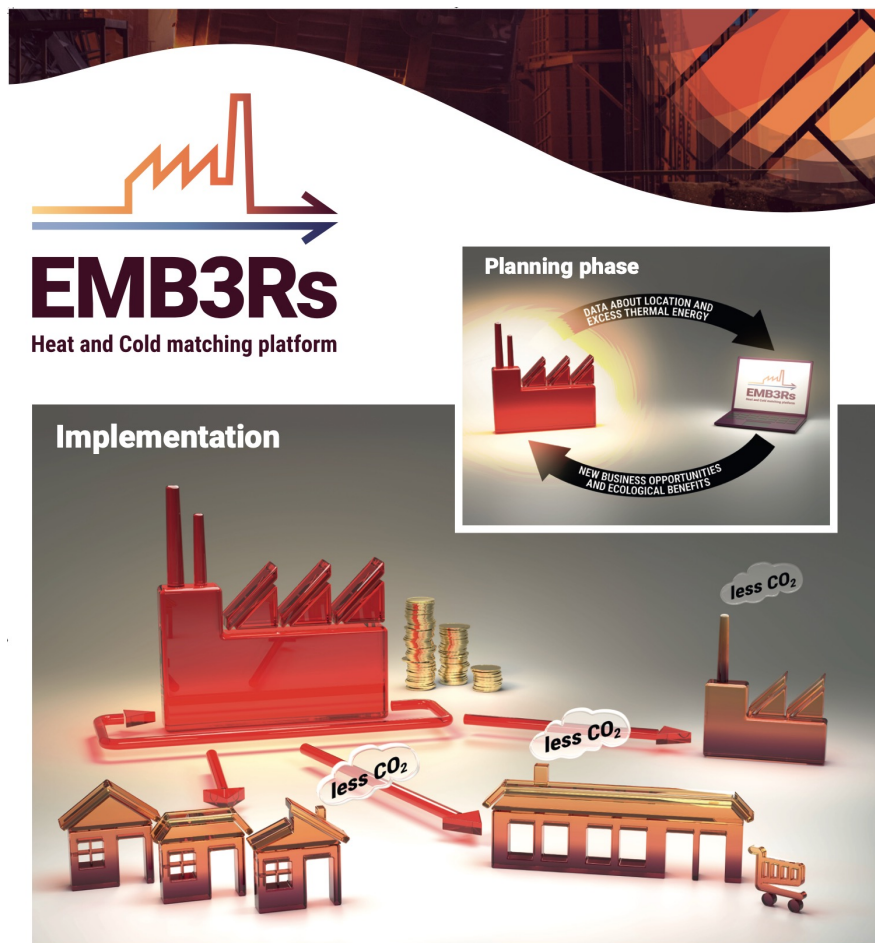
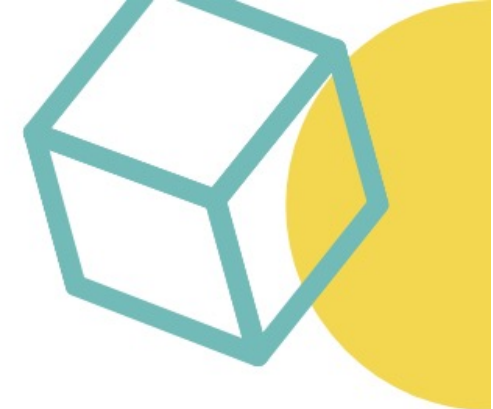
# Energy and Environmentally- efficient Manufacturing processes and solutions (Coord. INEGI)

# Energy and Environmentally- efficient Manufacturing processes and solutions (Coord. INEGI)



© IASS

The fundamentals are focused in **energy-related management in factories and technologies** to increased energy efficiency and aim to “Zero Waste and Zero Emissions” paradigm of 2050 Agenda Goals.

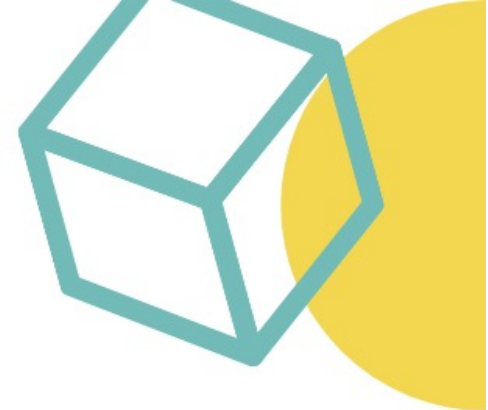


## EMB3Rs (coordinated by INEGI)

**INESC TEC Use Case Objective:** determine optimal synergies of HC and electricity within the district heat (DH) grid at Copenhagen's Nordhavn district (EnergyLab Nordhavn). To reach this a peer-to-peer (P2P) market structure will be applied.

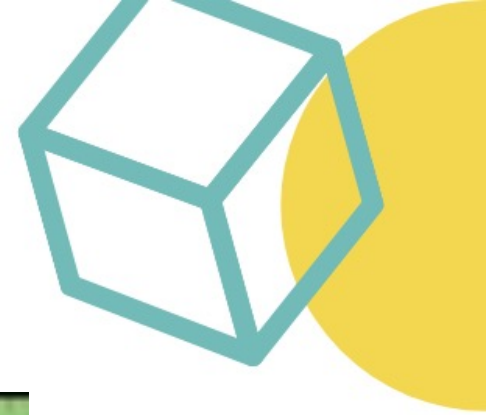
**Approach:** Test the EMB3Rs platform with 30 residential electricity and heat consumers connected to the DH grid at Copenhagen's Nordhavn district (EnergyLab Nordhavn). Smart meters in apartments of different residential buildings deliver the data on the daily electricity consumption. Representative data from the industrial partners regarding excess HC, to be used directly as heat (in DH or as process heat) and for electricity production, will be considered.

The EMB3Rs platform can show the cost-benefit of consuming locally generated surplus heat, with potential cost saving provided to the energy community in Nordhavn.



## Industry & Innovation Lab (iiLab)





## Industry and Innovation Lab (iiLab)





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- INESC TEC

- R DR. ROBERTO FRIAS

- 4200-465 PORTO

-  **INESCTEC**  
PORTUGAL

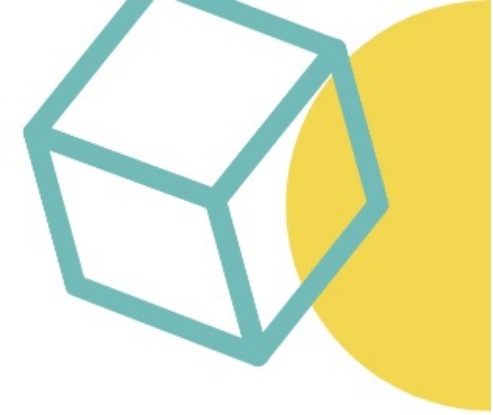
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F +351 222 094 050

info@inesctec.pt

www.inesctec.pt





## Open Call Strategy

Better Factory invites Small and Medium-sized Manufacturers (SMEs) to redesign their current product portfolio together with Business and Arts mentors and Technology experts. Manufacturers can tap into disruptive product innovation that responds to new market demands while keeping production resources optimal with RAMP IoT platform.

*RAMP (Robotics Automation Marketplace) is a free and open IoT platform (FIWARE) running on state of the art servers, with access to cloud storage and computing, enabling connection with robots, sensors, cameras, AR/VR and other equipment. RAMP will provide 3D simulation tool to create Digital Twin for virtual testing, co-creation space for teams to collaborate online among other digital services.*