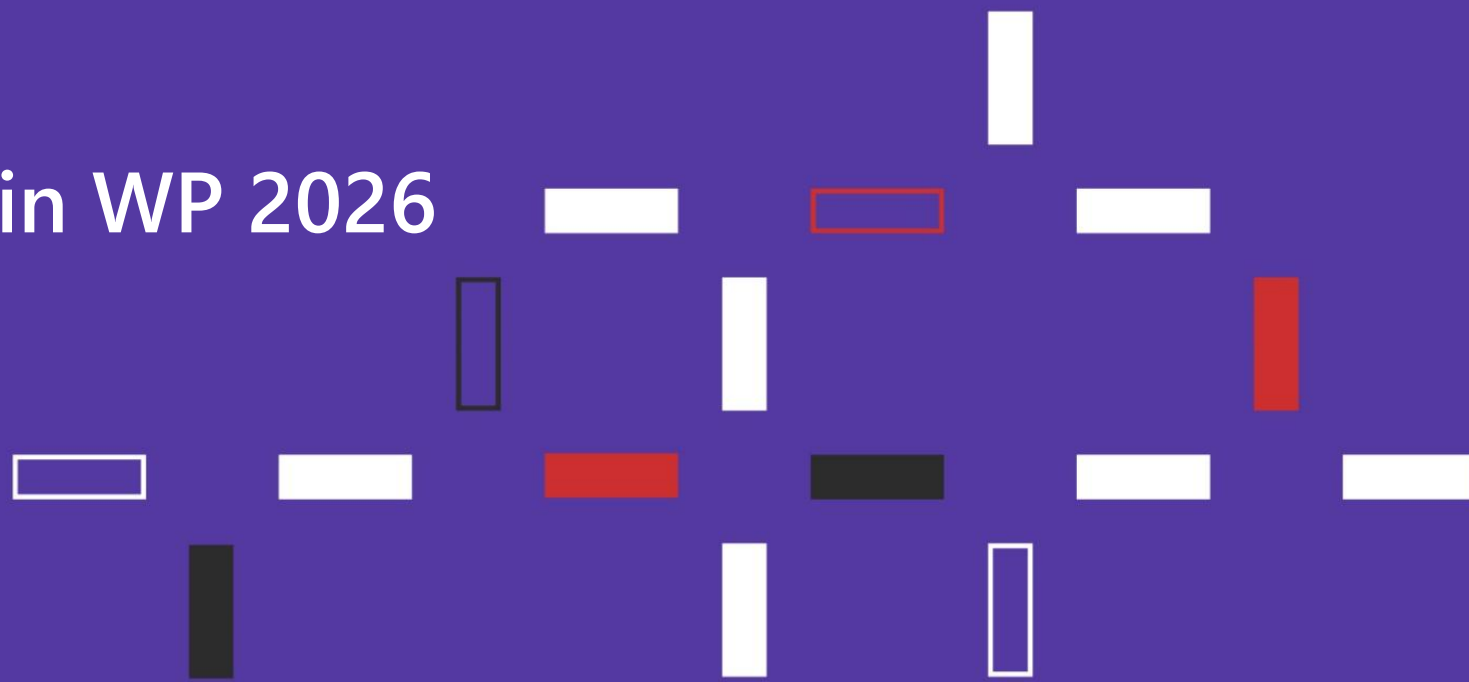




# Backing visionary entrepreneurs

Proposal for a Challenge in WP 2026

Programme Manager, EISMEA 01



11/02/2026

Title of the Challenge

**Pathfinder Challenge**

# Advanced Materials for Miniaturised Energy Harvesting Systems

Paolo Bondavalli

EIC Programme Managers on Advanced Materials  
for Energy and Environmental Sustainability

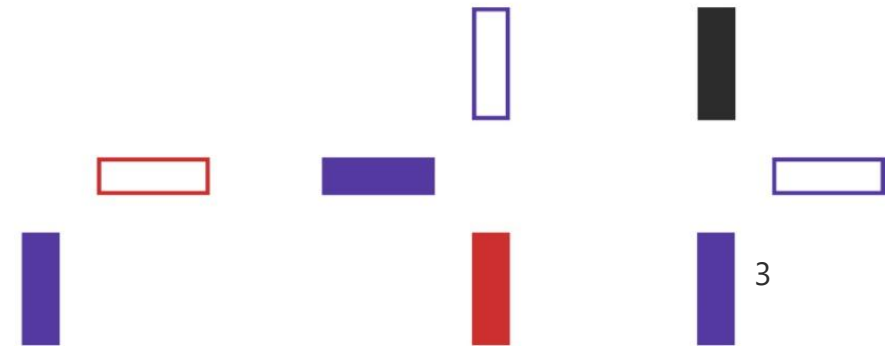
European  
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Council





# Outline

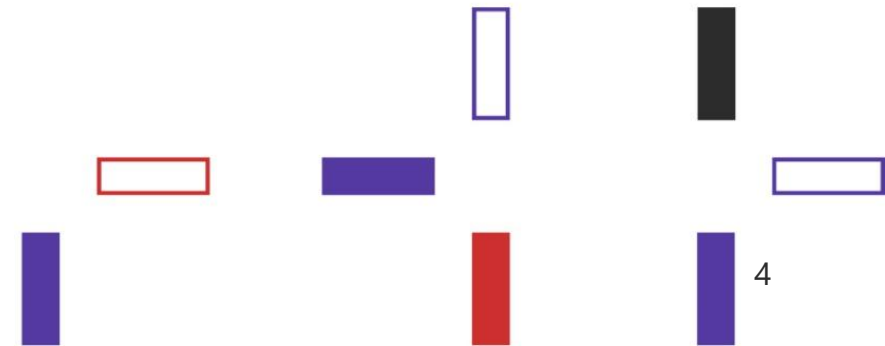
- Challenge topic proposed – background
- Specific objectives of the Challenge
- Expected outcomes and impacts
- Portfolio approach (Pathfinder)
- Ecosystem maturity and TRL level
- Time to impact and primary target group



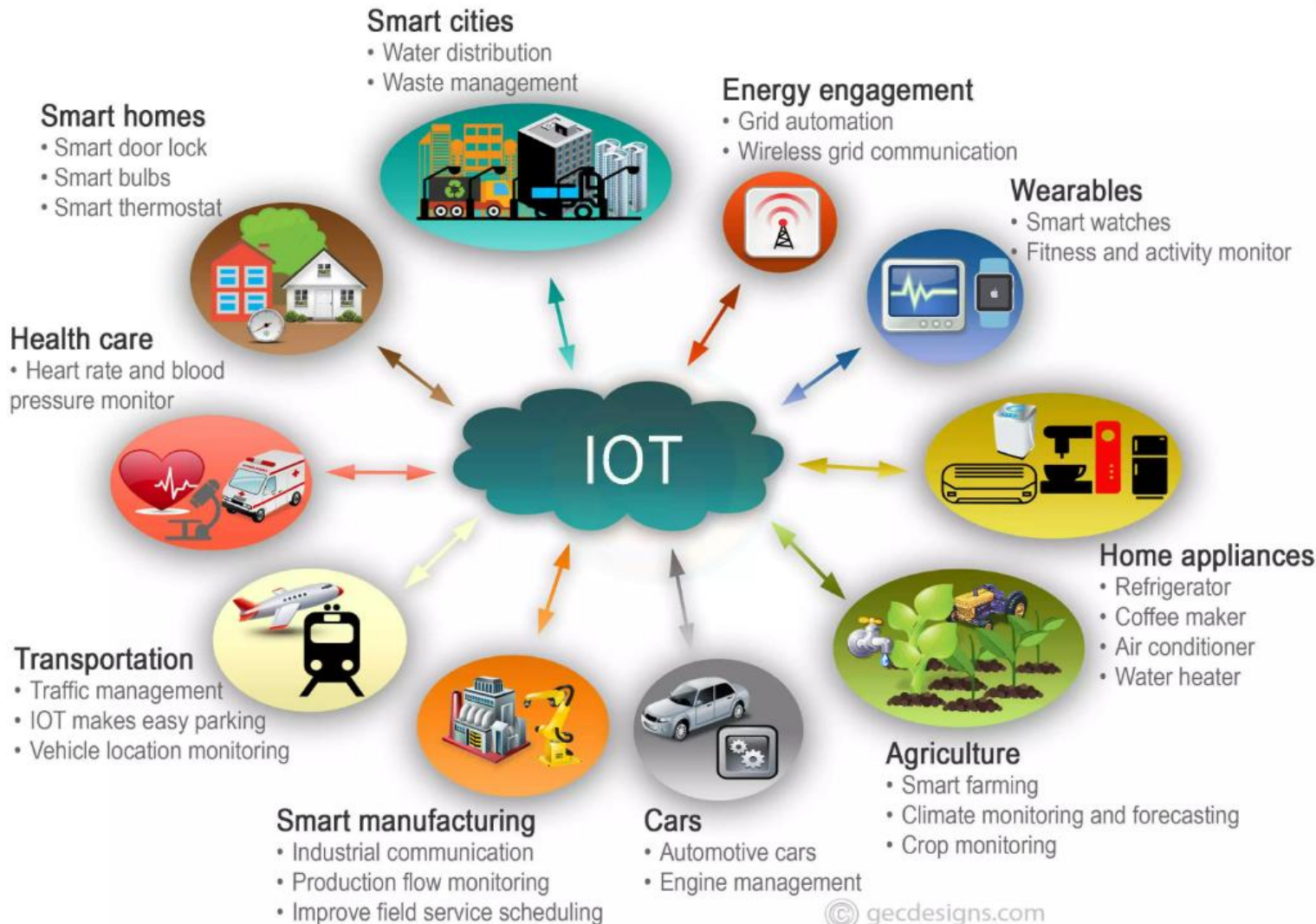


# Outline

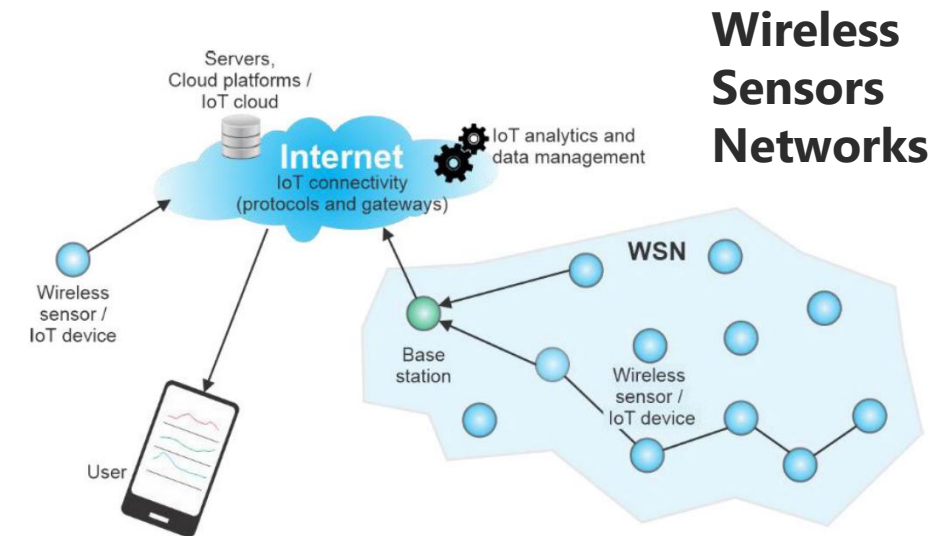
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# Challenge topic proposed – background (1)



## A short introduction on IoTs and WSN



doi: 10.1109/ACCESS.2021.3064066

# Challenge topic proposed – background (1)



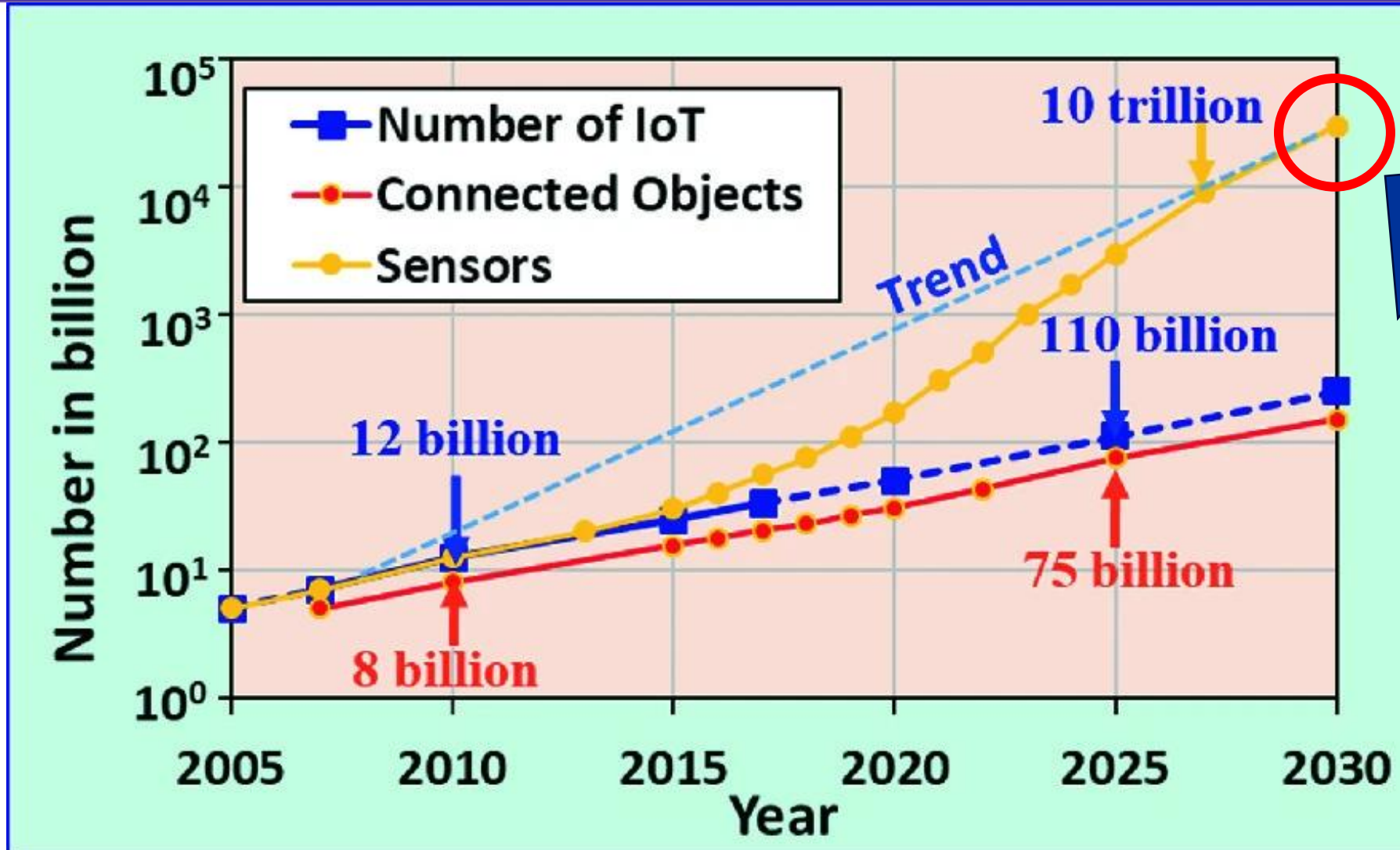
- Industrial communication
- Production flow monitoring
- Improve field service scheduling

- Automotive cars
- Engine management

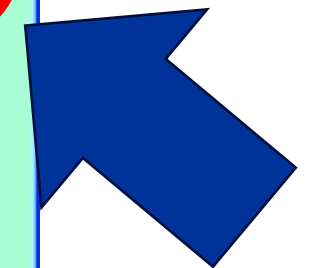
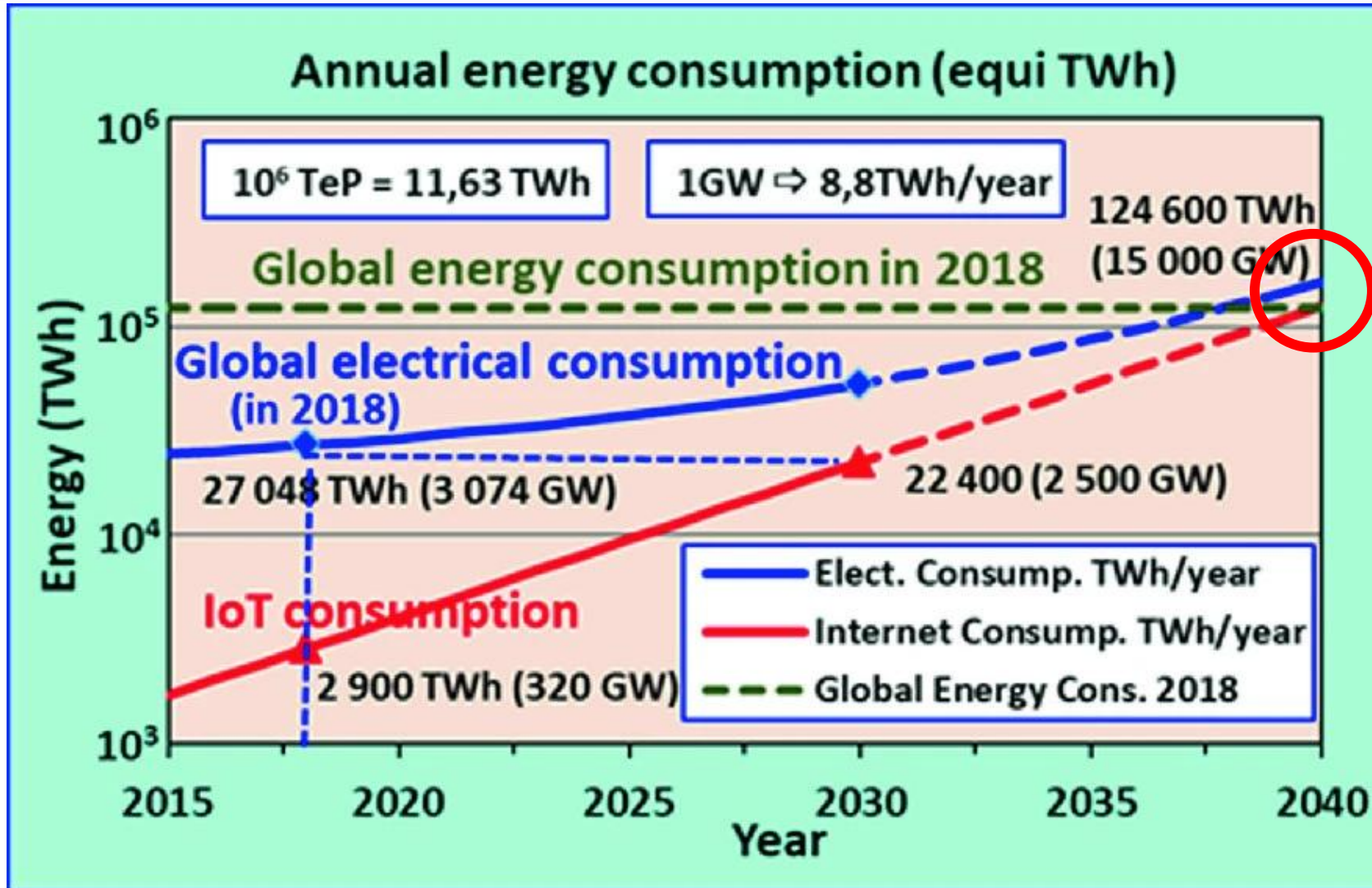
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# Challenge topic proposed – background (2)



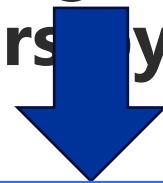
# Challenge topic proposed – background (3)



# Challenge topic proposed – background (4)



- **All the global electric energy consumption will be devoted to IoTs by 2030** with strong impact on energy production and CO2 emissions
- **Strong impact on sustainability:** to implement the WSN for IoTs if we use batteries, we need to change each day around **80 millions of batteries (10 trillions of sensors by 2027)**



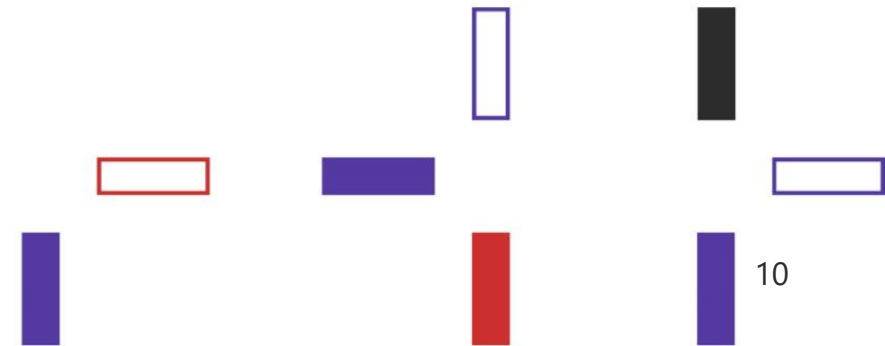
**We need to find solutions to reduce energy consumption and improve sustainability developing new energetically autonomous sensors.**

**To do that we need a new generation of advanced materials to implement highly efficient miniaturized energy harvesting systems with performances higher than the existing ones**



# Outline

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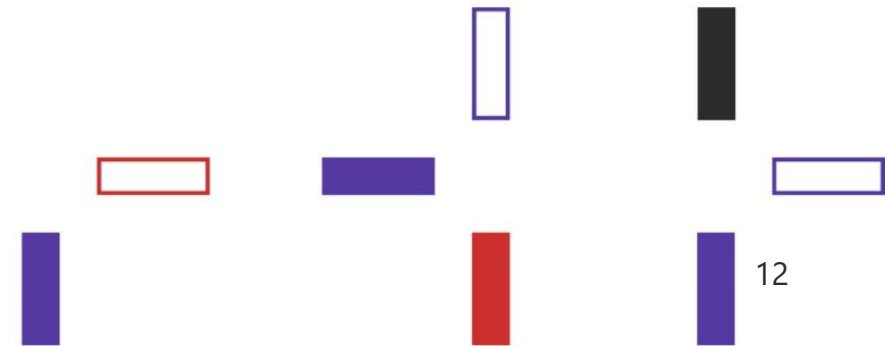
# Specific objectives of the Challenge

- **The identification and development of innovative advanced materials for energy harvesting, harnessing new physical/ chemical phenomena**, leading to a radical shift in application range and performance while reducing the reliance on Critical Raw Materials (CRMs)
- **The implementation of the advanced materials in a miniaturised energy harvesting module**, such as, but not limited to, miniaturised solar cells, thermoelectric generators (e.g. TEG), nanotribological/ piezoelectric devices, electromagnetic wave harvesting devices
- **Integration of the miniaturised energy harvesting modules in energetically autonomous systems (e.g. wireless integrated sensors)** and
- **Benchmarking the harvesting modules in a representative use case in a laboratory environment (TRL 4)** with a view to demonstrating significant efficiency improvements, in terms of energy harvested, compared to the state of the art.



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# Expected out comes:

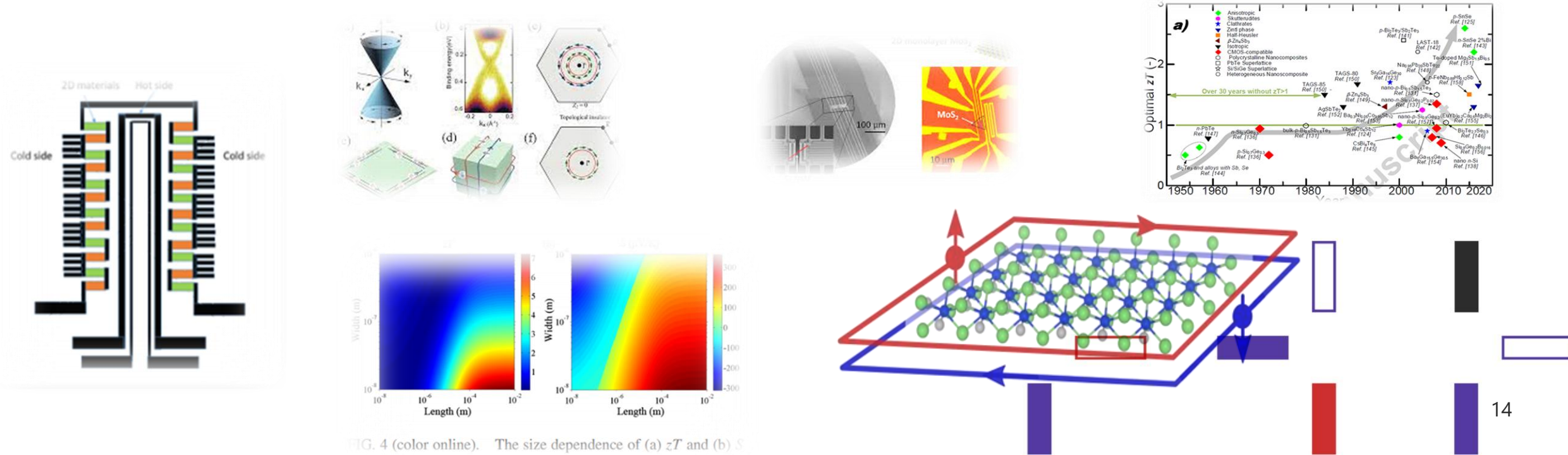


- Identify a new generation of advanced materials for miniaturised energy harvesting modules
- Achieve TRL 4 for the resulting energetically autonomous systems.

# Expected outcomes and impacts

## Scientific and technological impact

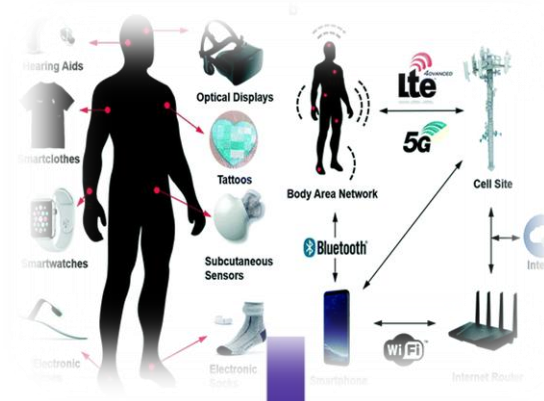
- To unveil new physics and potential paradigm shifts (game changer technology).
- To foster the growth of a new generation of skilled young researchers in the field.
- To give a strong push on technologies enhancing the performances exploiting breakthroughs.



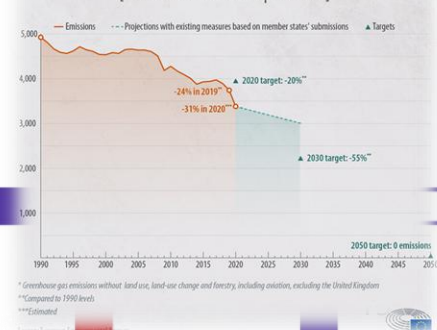
# Expected outcomes and impacts

## ■ Societal Impact

- New highly efficient advance materials for energy harvesting will become instrumental in fostering sustainability in energy consumption and production (RePowerEU, GreenDeal) and recycling.
- New energetically autonomous systems based on new advanced materials will change the everyday life of Europeans citizens enabling new services (e.g. Point of care diagnostics, Smart Sustainable Cities, Smart management...)
- Enhanced sustainability (e.g. 80 million of batteries to change each day by 2030) and reduced maintenance.



Greenhouse gas emission trends  
Emissions, projections and targets for the EU  
[million tonnes of CO<sub>2</sub> equivalents]



# Expected outcomes and impacts



## ■ Economic impact

- The demand for battery-free, ultralow-power devices is skyrocketing across various fields. Efficient autonomous devices exploiting a new generation of advanced materials for highly efficient energy harvesting can have a strong impact on a huge panel of applications and markets (Health, Mobility, Space, Avionics, Energy smart management, Agriculture and safety and security...).

**Intelligent aircraft health monitoring**

**Smart agriculture**

**Sensors for satellites prequalification phase**

**Sensors for in orbit satellites/stations**

**Sensors for cars and for traffic management**

**Sensors for safety (e.g gas sensing)**

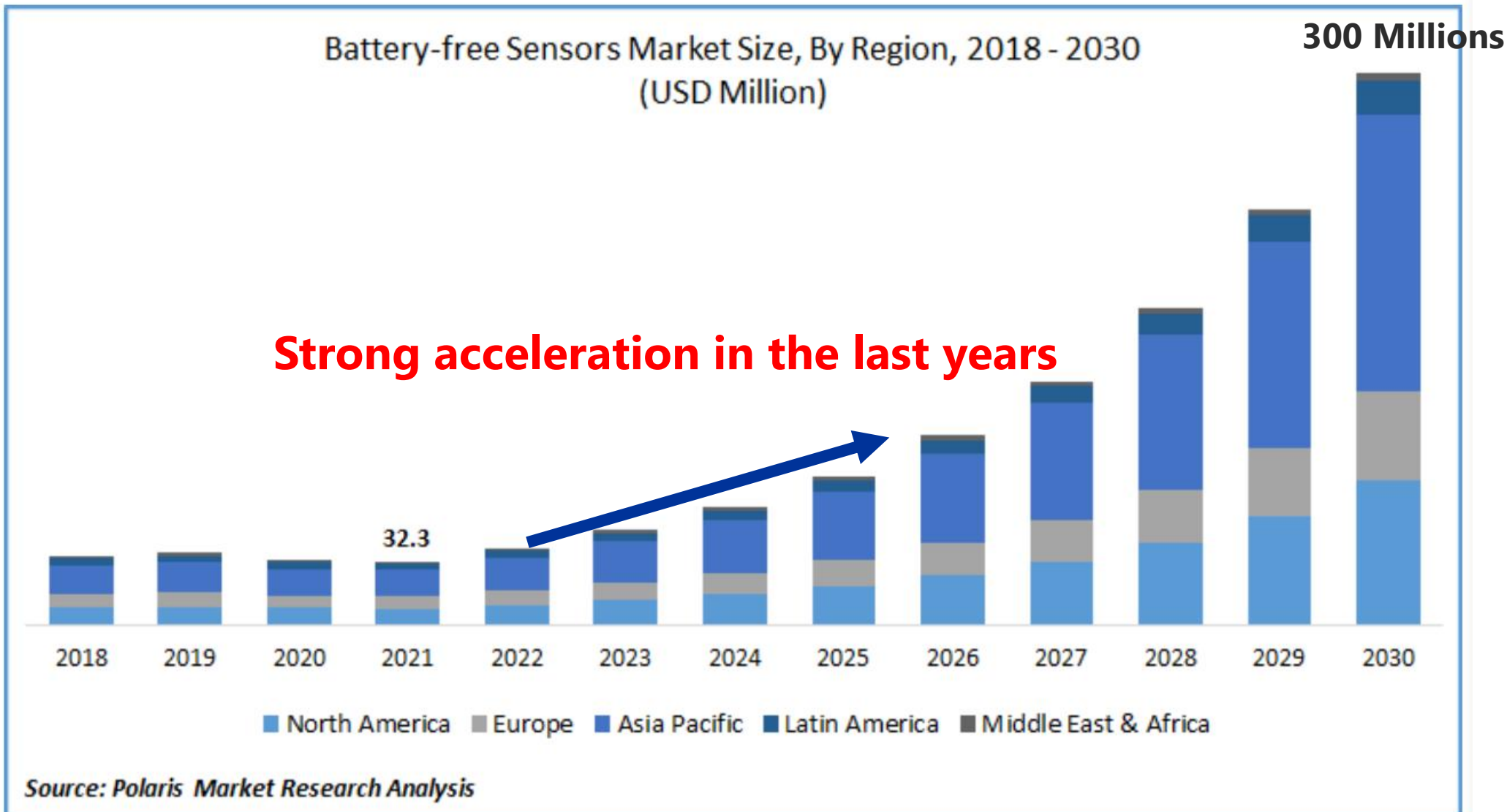
**Energy smart management**

**Smart Manufacturing**

**Wearable sensors for health monitoring**

**rigid TE materials no ceramic substrates**

# Expected outcomes and impacts

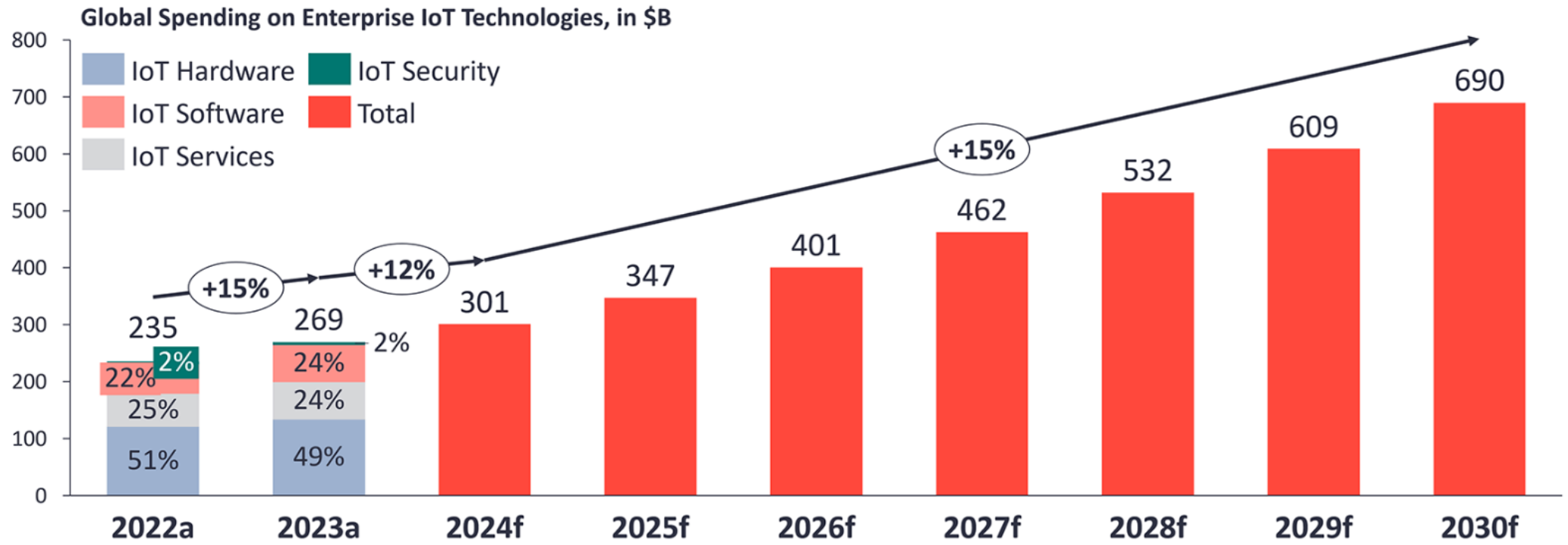


# The development of energetically autonomous sensors impacts directly the booming market of IoTs.



## The enterprise IoT market by technology 2023–2030

Data as of June 2024



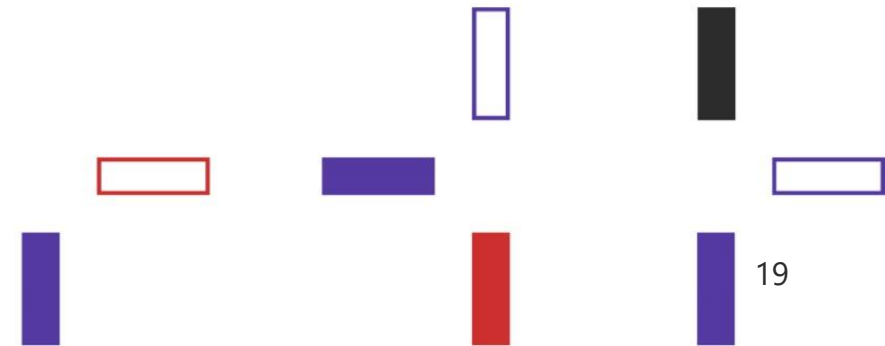
**Note:** IoT Analytics defines IoT as a network of internet-enabled physical objects. Objects that become internet-enabled (IoT devices) typically interact via embedded systems, some form of network communication, or a combination of edge and cloud computing. The data from IoT-connected devices is often used to create novel end-user applications. Connected personal computers, tablets, and smartphones are not considered IoT, although these may be part of the solution setup. Devices connected via extremely simple connectivity methods, such as radio frequency identification or quick response codes, are not considered IoT devices. Since the last update in 2023 our definition of the enterprise IoT tech stack slightly changed.  
a: Actuals, f: Forecast  
**Source:** IoT Analytics Research 2024 – Global IoT Enterprise Spending Dashboard (Q2/2024 update). We welcome republishing of images but ask for source citation with a link to the original post or company website.





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## Technologies benchmarking

- The Portfolio approach allow performing a **benchmarking of the different technologies, of their potential and maturity.**

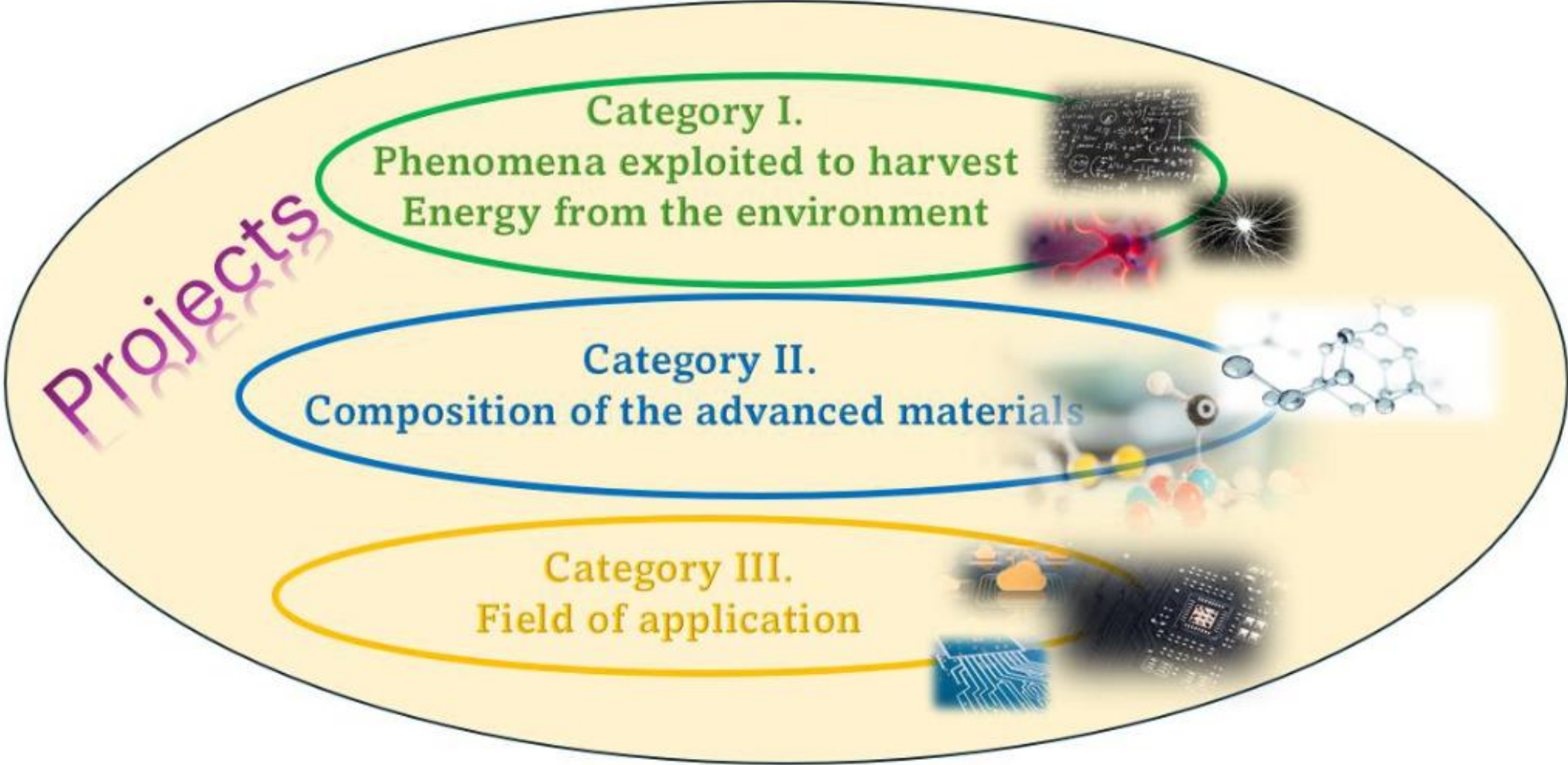


## Enhancing the impact

- The different project can **share insights on integration steps** accelerating coupling energy harvesting module with electronic board for energy optimization and with energy storage devices and antennas for data transmission.
- For a large panel of applications, the combining of different technologies can be an extremely important option to **be able to have the necessary amount of energy. An integrated approach can allow integrating more functionalities.**



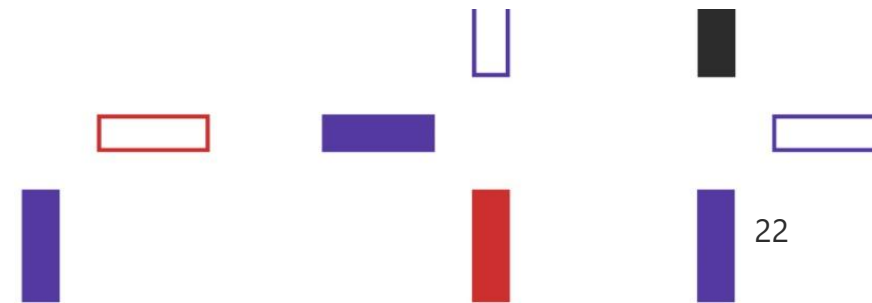
# Classification of the projects



# Classification of the projects



<b>Categories</b>	<b>Subcategories</b>
I. Phenomena exploited for the harvesting of energy from environment	
II. Advanced materials used	
III. Field of application	



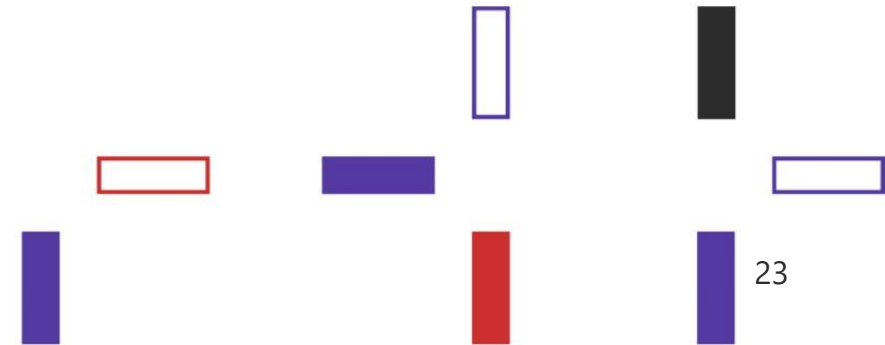


**WG 1: Technology/Science**

**WG 2: Regulatory issues**

**WG 3: Transition of technology to innovation**

**WG 4: Communication, dissemination and outreach activities**



# Added value of the portfolio approach

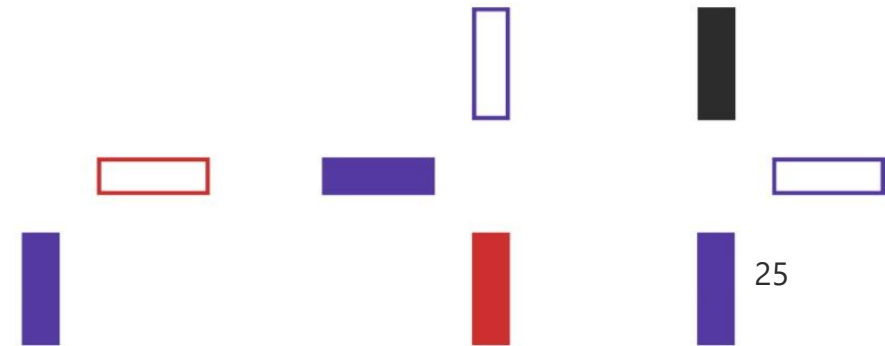
Tools through which projects can receive additional support. Projects in the portfolio may be offered additional support, either individually or collectively, in order to reinforce portfolio activities or explore the transition to innovation. Such additional support includes:

- **Booster grants of up to €50k (see Annex 5 of the EIC Work Programme).**
- **Access to additional EIC Business Acceleration Services**  
(see [https://eic.ec.europa.eu/eic-funding-opportunities/business-acceleration-services\\_en](https://eic.ec.europa.eu/eic-funding-opportunities/business-acceleration-services_en))
- **Access to the Fast Track to the EIC Accelerator**, which would follow a project review (see Annex 3 of the EIC Work Programme).
- **The possibility to apply for EIC Transition if your Pathfinder project** resulted in an experimental proof of concept (TRL 3), or a technology validated in the lab (TRL 4)
- **Interactions with relevant projects and initiatives outside the portfolio**, including other EU funding initiatives as well as those supported by national, regional or other international bodies.



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# Ecosystem maturity and TRL level

From computational materials science to advanced materials fabrication, SMEs companies working on micro-energy harvesting to end-users (specie, automotive, electronics, mobile phone, avionics, health...)



**Advanced materials scientific community (working on new materials)**

**Theoretical physics/chemistry, computational materials scientific community**

**Innovative SME in the field of Energy Harvesting (new approach)**

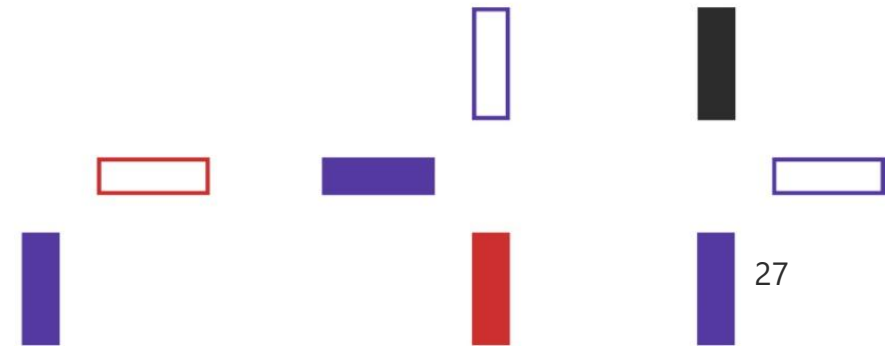
**Large companies (End-users) defining precise use-cases**

Logos visible in the background include: CiNTRA, Aix-Marseille Université, GDR GRAPHENE S CO, ICMAB, Tekniker, LIST, cesa, liten, umec, C2N, IMM, ICN2, cesa, leti, pavegen, EnOcean, greenteg, KINERGIZER, TEGMAT, AEInnova, nexperia, VIEZO, Perovskia, GLOBAL OTEC, Osium AI, UNIVERSITÀ DI PAVIA, exomatter, LIÈGE université, ENS, PSL, TECHNISCHE UNIVERSITÄT DRESDEN, CETHIL, UMR 5008, ICN2, Institut Català de Nanociència i Nanotecnologia, DEMOKRITOS, Institut Català de Nanociència i Nanotecnologia, N A M E, GDR NanoMaterials For Energy applications, DTU, Trinity College Dublin, The University of Dublin, Fraunhofer ITWM, Utrecht University, SIEMENS, PHILIPS, NOKIA, STELLANTIS, THALES, ThalesAlenia Space, RENAULT, Valeo, AIRBUS, BMW, VOLVO, una, DISRUPTIVE TECHNOLOGIES, hoopo, Telefónica Tech, ERICSSON, Schneider Electric, BOSCH, W, and 26.



# Outline

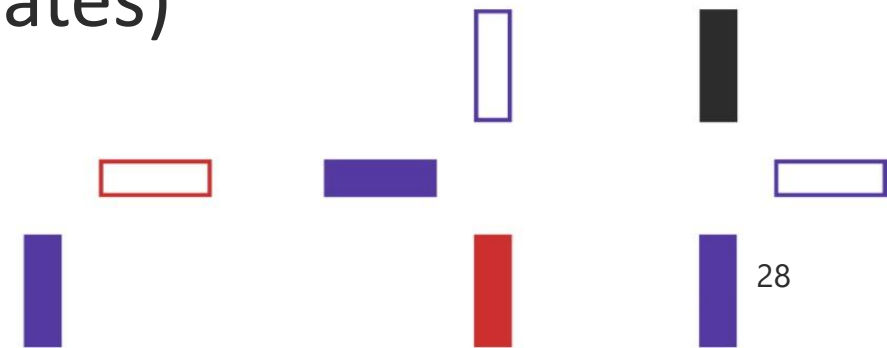
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# Time to impact and primary target group



- **Target Group:** Universities, Research institutions involved in Energy Harvesting technologies collaborating with SMEs or Corporates.
- **Research activity:** applied
- **Interdependency:** The approach is to bring together the necessary skills to identify and fabricate advanced materials, to integrate them in energy harvesting systems and this following specifications provided by companies (e.g. SMEs or Corporates)
- **Time to impact:** 5-10 to years (2030-2045)

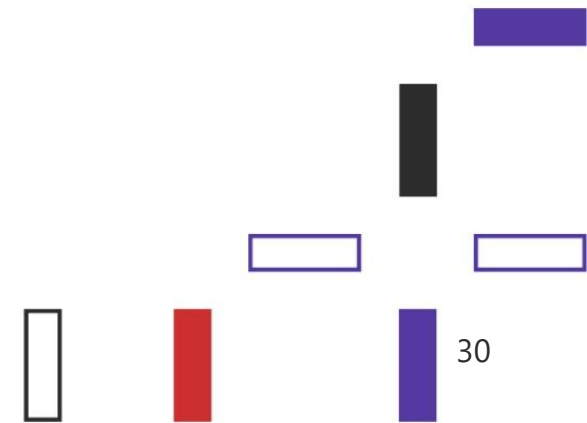


# The good project

- Technology needs to constitute a tangible breakthrough
- Clear and concrete potential advantages compared to existing solutions (Positioning and benchmarking)
- Fundamental science is important but the innovation at the mid-long term needs to be pointed out and justified
- Aligned with a potential market (mid long term)

# The bad project

- KPIs are not clearly identified
- The objectives are too broad
- The potential applications are not clear
- The implementation is not convincingly addressed
- The advantages compared to existing solutions are not clear (positioning)

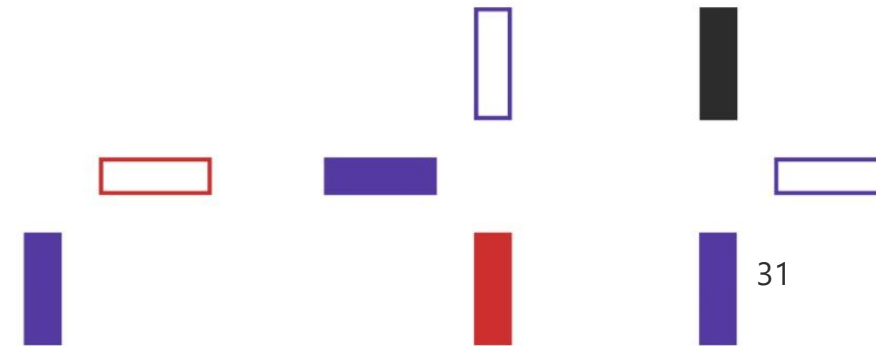


# Deadline



Call	Who can apply	What for	Deadlines	Indicative Budget (EUR million)	EIC Challenge	Deadlines/Cut-offs	Indicative Budget (EUR million)
<b>EIC Pathfinder</b>	Open call: only consortia can apply. Challenges call: smaller consortia (at least two eligible entities) or single applicants as well as larger consortia.	Grants up to EUR 4 million. Higher amounts if duly justified. Projects to achieve the proof of principle and validate the scientific basis of breakthrough technologies (starting from early TRLs aiming at achieving TRL3 or 4)	12/05/2026	166	II.2.1 Advanced Materials for Miniaturised Energy Harvesting Systems II.2.2 Biotechnology for Healthy Ageing II.2.3 DeepRAP: Deep Reasoning, Abstraction & Planning towards trustworthy Cognitive AI Systems	28/10/2026	96

[https://eic.ec.europa.eu/eic-funding-opportunities/eic-pathfinder/eic-pathfinder-challenges-2026\\_en](https://eic.ec.europa.eu/eic-funding-opportunities/eic-pathfinder/eic-pathfinder-challenges-2026_en)





# Thank you!

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