



Workshop on Advanced Materials and Environmental Sustainability Challenges with Member States representatives

On 26 September 2022, [Francesco Matteucci](#), the EIC Programme Manager (PM) for advanced materials for energy and environmental sustainability, organised a workshop to present and discuss the EIC challenges under his umbrella to invited representatives from European Union Member States and European Union Associated States. The virtual workshop was moderated by Anne-Marie Sassen, Head of Unit of the Programme Managers' Office. She opened the session by introducing the role and the activities performed by the Programme Managers as EIC's in-house sectorial experts, working in their respective area of specialisation and giving support to the European R&D&I ecosystem development. She further gave a brief overview of the intention of this workshop session.

Matteucci followed up by elaborating on the EIC hands-on strategy and aims, its three support schemes (Pathfinder, Transition, and Accelerator) and the content-wise services offered to beneficiaries. He emphasised the PM's role in connecting the EIC to sectorial initiatives lead by other European institutions and outside partners (e.g. Clean Hydrogen Joint Undertaking, ARPA-E). Additionally, he explained the thematic *portfolio mechanism*, an innovation facilitation tool through which PMs can content-wise cluster different EIC beneficiaries coming out of open or challenge-based calls to one portfolio. Matteucci created together with [Antonio Marco Pantaleo](#), the PM for energy systems and green technologies, different thematic portfolios. One example of such a portfolio is the group of projects funded through the 2021 Pathfinder challenge call *novel routes to green hydrogen production*. In October 2022, both PMs will organize the first kick-off portfolio meeting. This meeting is aimed at promoting common scientific and exploitation activities of the different projects thanks to the proactive management role of the PMs together with Project Officers and external experts.

For 2022, Matteucci presented the following challenges, divided by EIC funding scheme: *Carbon dioxide & Nitrogen management and valorisation* and *Mid-long term and systems integrated energy storage* in Pathfinder, *Process and system integration of clean energy technologies* and *Green digital devices for the future* in Transition, and *Technologies for 'Fit for 55'* in Accelerator. In the upcoming years, he proposed to submit an Accelerator challenge on energy storage solutions and a challenge on environmental monitoring and remediation technologies. All Accelerator challenges are not only build upon technologic state of the art in their areas, but also validated by VC and state-funded investments and market trends, as analysed by Matteucci.

During the workshop, representatives from European Union Member States and European Union Associated States took multiple occasions to deliver their feedback input to PM Matteucci. The representatives were

pointing at policy aspects of the challenges and appreciated Matteucci's offer, to connect the EIC better to the national contact points. They were agreeing on the idea that an inter- and multidisciplinary approach for deep-tech was needed to find synergies and create the needed environment for European start-ups to grow.

For any question to Programme Manager Matteucci, please reach out to EISMEA-D.02@ec.europa.eu.

26th of September 2022

European
Innovation
Council



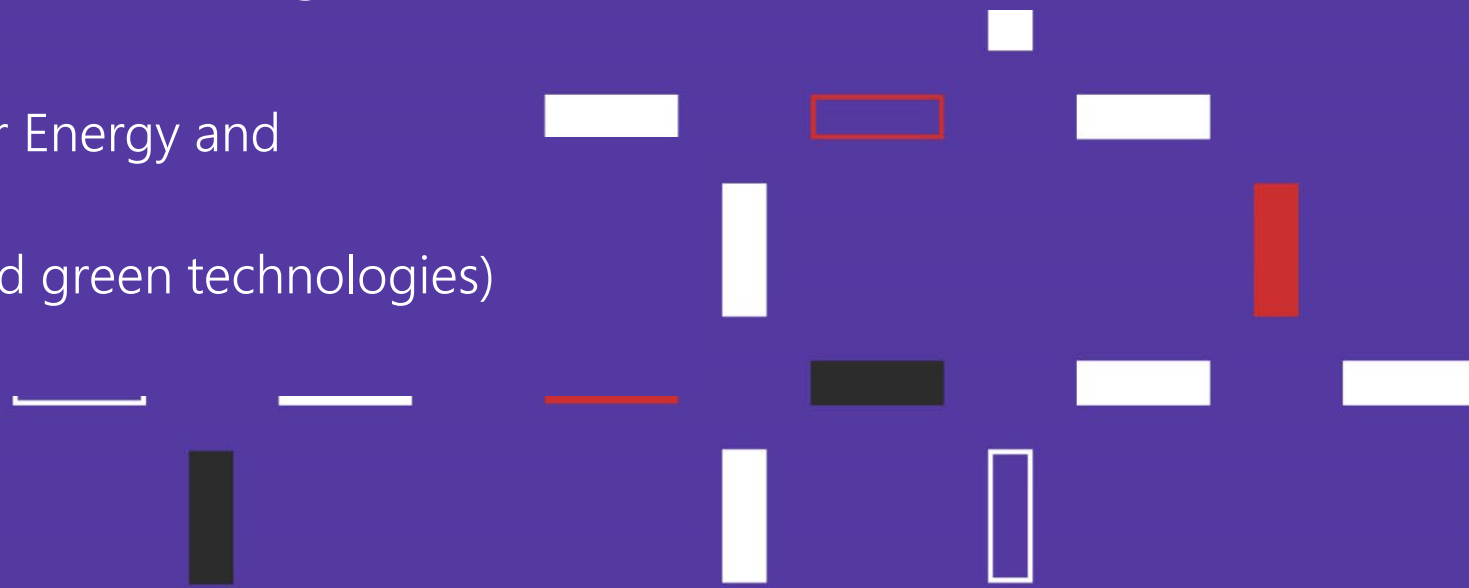
Energy and Environment research and Innovation Key Topics

Advanced materials for energy and environmental sustainability

Francesco Matteucci (Advanced Materials for Energy and
Environmental sustainability)

Antonio Marco Pantaleo (Energy Systems and green technologies)

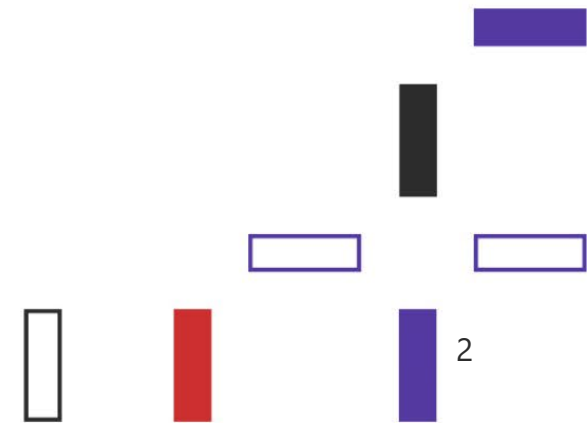
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Commission





Outline

- Guiding principles in topics selection
- Past experiences and lessons learnt
- List of Research and Innovation topics
- Discussion on future topics





The main EIC Support Schemes

Pathfinder

For advanced research on
breakthrough / game-changing
technologies

Pathfinder Open: bottom-up
approach; no predefined topics

Pathfinder Challenges: top-
down challenge-driven calls for
tackling specific issues by
portfolios of projects

Transition

For transforming research results
into innovation opportunities;
follow up results from EIC
Pathfinder and ERC Proof of
Concept

Transition Open: no topic
prescription

Transition Challenges: selected
challenges

Accelerator

For individual companies to
develop and scale up
breakthrough innovations with
high risk and high impact

Grant Funding
Equity Funding
Business Acceleration Service

EIC Fund: VC fund – EC shareholder / Bridging equity funding gap at early stage / Crowding in other investors

Business Acceleration Service: access to advice, to business partners and to innovation ecosystems & peers



Programme Managers main activities

**Strategic intelligence and identifying future challenges
for Europe's deep-tech roadmap**

Hands on approach of ongoing projects

Strategic assessment and clustering of projects in portfolios
Selection and management of projects under EIC Challenges
Scientific / Business portfolios pro-active management

Outreach and Visibility

Networking with other programmes and innovation ecosystem communities
Stakeholder engagement / Community management
Organization, participation to events/workshops

**EIC
Proactive
Management**



Guiding principles for selection of topics

High innovation potential and recognized industrial interest/market needs

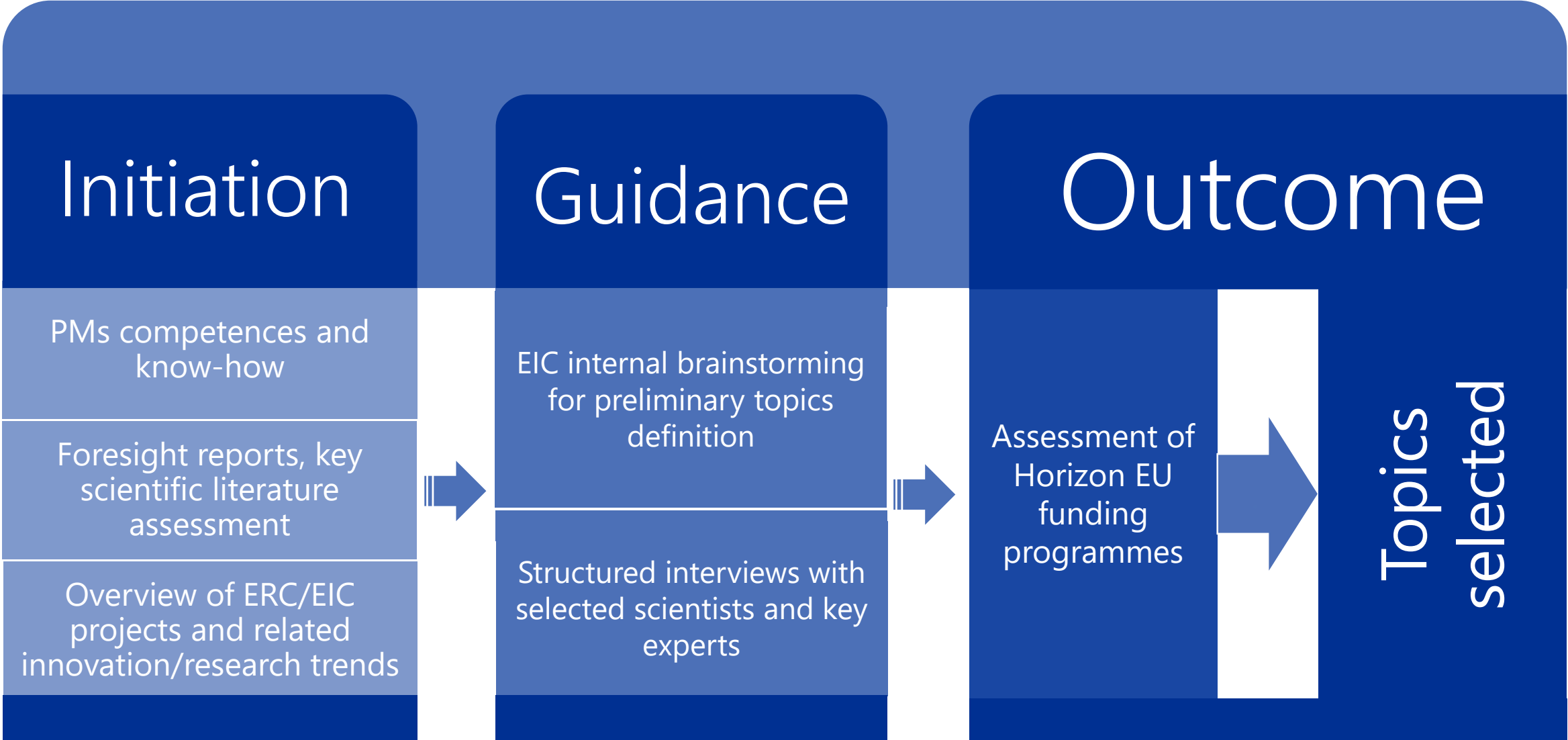
Relevance for EU technological autonomy and expected economic/social implications

Synergies with other Horizon EU programmes

Non incremental research opportunities
(Pathfinder)

EU positioning in the global innovation ecosystem and critical mass of EU stakeholders/researchers

Process of Selection (Methodology)



EIC challenges so far



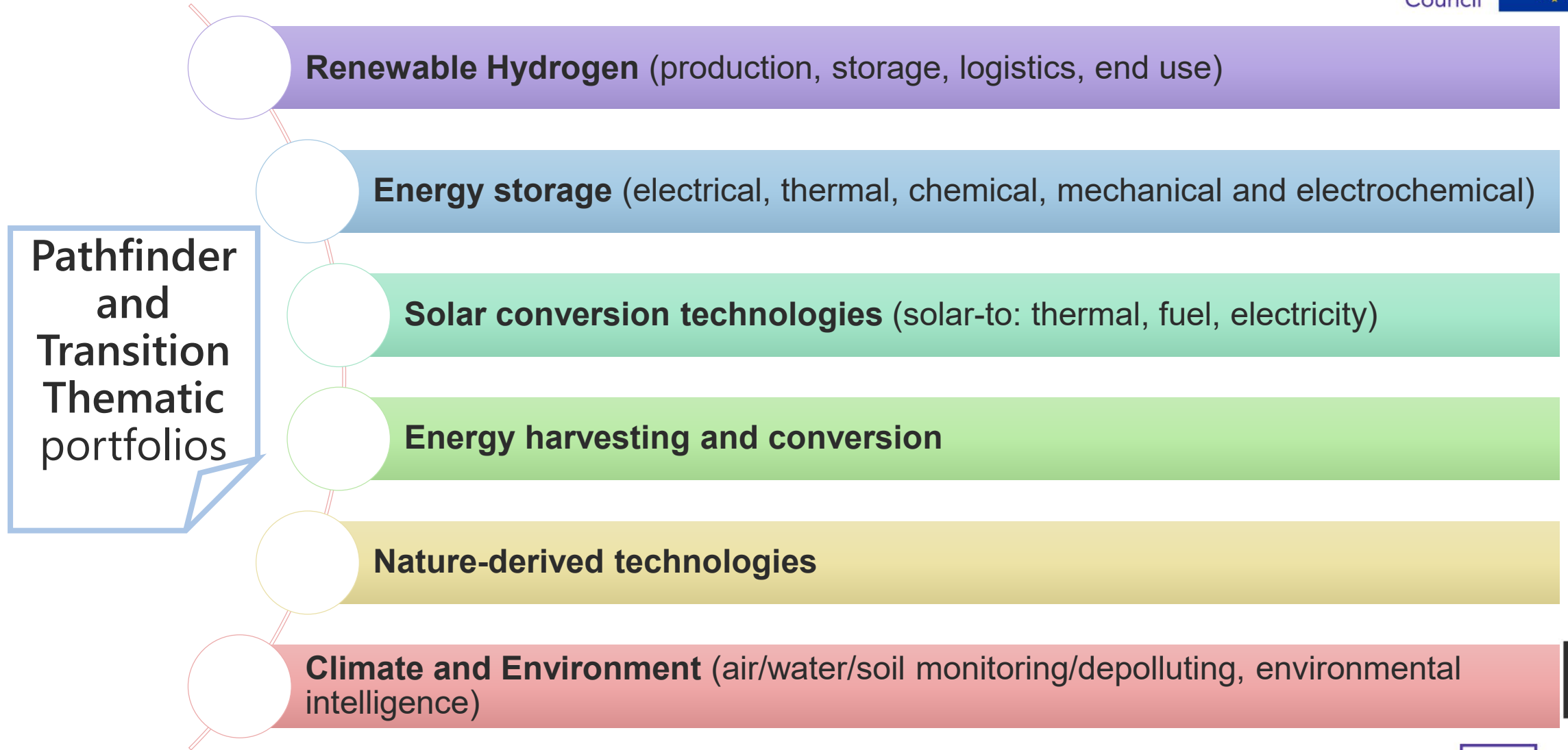
EIC Challenges 2021

	Pathfinder (5)	Transition (2)	Accelerator (2)
Green	<ul style="list-style-type: none"> Novel routes to green hydrogen production Engineered living materials 	<ul style="list-style-type: none"> Energy harvesting and storage technologies 	<ul style="list-style-type: none"> Green Deal innovations for the economic recovery
Digital	<ul style="list-style-type: none"> Awareness inside 		<ul style="list-style-type: none"> Strategic Health and Digital Technologies
Health	<ul style="list-style-type: none"> Tools to measure & stimulate activity in brain tissue Emerging Technologies in Cell & Gene Therapy 	<ul style="list-style-type: none"> Medical devices 	

EIC Challenges 2022

	Pathfinder (6)	Transition (3)	Accelerator (2)
Green	<ul style="list-style-type: none"> Carbon dioxide & Nitrogen management and valorisation Mid-long term, systems-integrated energy storage 	<ul style="list-style-type: none"> Process and system integration of clean energy technologies Green digital devices for the future 	<ul style="list-style-type: none"> Technologies for 'Fit for 55'
Digital	<ul style="list-style-type: none"> DNA-based digital data storage Alternative Quantum Information Processing, Communication, Sensing 		<ul style="list-style-type: none"> Technologies for Open Strategic Autonomy
Health	<ul style="list-style-type: none"> Cardiogenomics Healthcare Continuum technologies 	<ul style="list-style-type: none"> RNA-based therapies and diagnostics for complex or rare genetic diseases 	

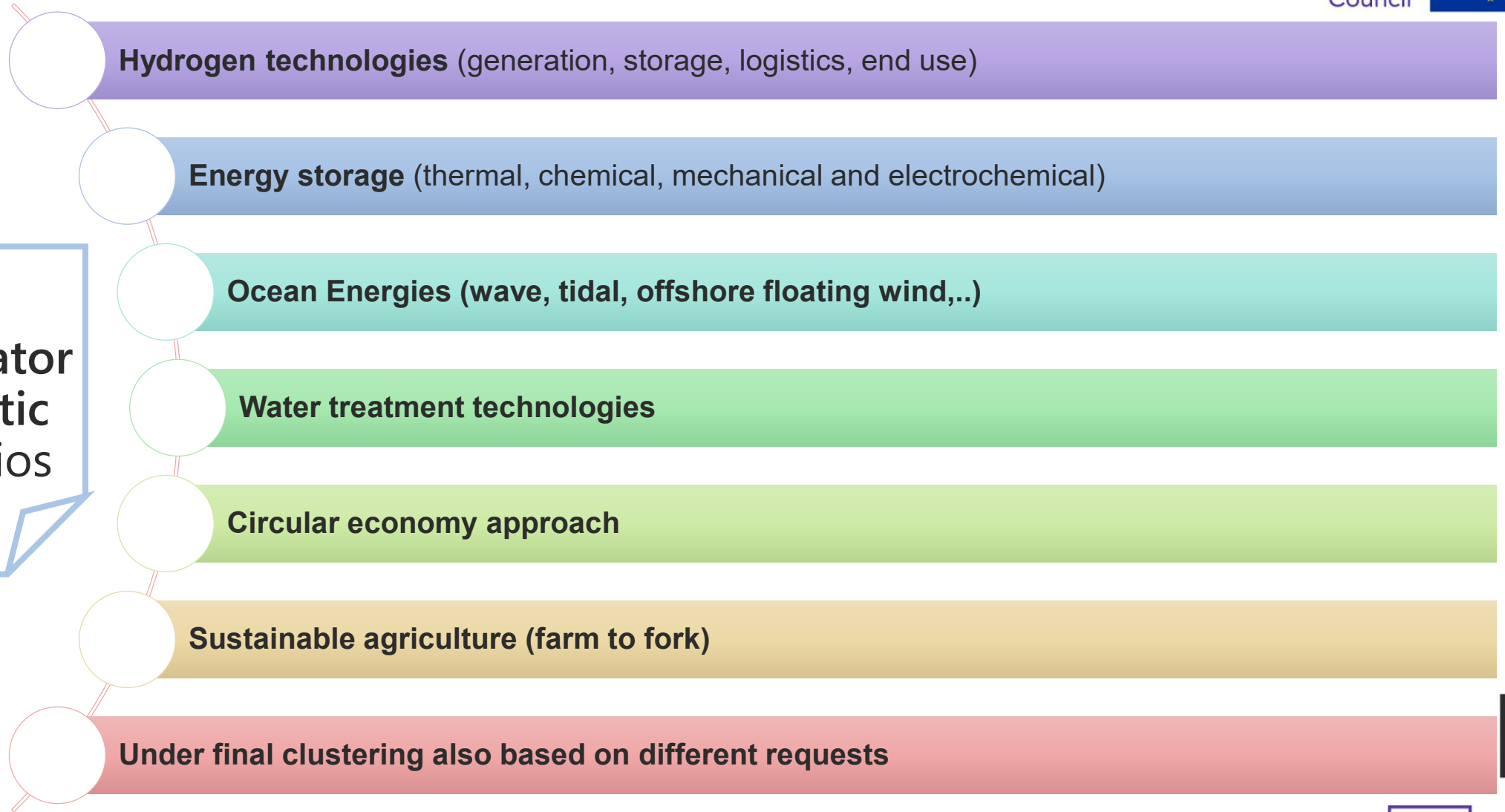
Thematic Portfolios & content-wise approach



Portfolios approach



Accelerator
Thematic
portfolios





For transforming research results into innovation opportunities

<p>New funding scheme to bridge gap between research phase (proof of concept) and innovation application</p>	<p>Mainly open ("bottom up"), but also Transition challenges (for medtech, energy storage)</p>	<p>Single applicants or small collaborations (max. 5 partners)</p>	<p>Grants up to 2.5M</p>	<p>In first phase, only for follow up to results from EIC Pathfinder and ERC PoC</p>
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Proposals for S&T subject areas for Transition

EIC instrument	Macro-area	S&T subject area	Code
Transition	Green	Environmental monitoring and remediation technologies	Present in EIC WP2023



Scope/specific objectives

- Proposals should focus on materials, processes and systems – including bio-inspired, nature-based, chemical, biological and physical technologies-solutions – aimed at detecting/monitoring, preventing, reducing or eliminating environmental recalcitrant and/or emerging contaminants present in air, soil or hydrosphere. Proposals should focus on technologies that, without using critical raw materials or ensuring their full recycle/reuse, will enable the onset of synergies between sensors and artificial intelligence, at the interface of environment/sustainability and data science, so allowing the implementation of environmental monitoring and/or remediation actions.
- Solutions are encouraged to combine, analyze and interpret data (environmental intelligence), also coming from different sources – *in situ* (e.g. biological, chemical or physical sensors) or remotely (e.g. satellite) – eventually enabling the making of decision-ready information-based policies.
- Technologies should minimize their carbon footprint, measured through a full life-cycle analysis, in order to ultimately protect/clean the environment from contaminations and to avoid the exposure of people to contaminants as well as to mitigate or reverse the effects of climate change.

Expected impacts

- Reduction of environmental pollution through technologies demonstrated by means of safe and sustainable pilot-scale prototypes able to perform environmental monitoring and/or remediation actions
- Increase of awareness of the critical balance between humanity and Natural systems
- Improvement and simplification of environmental policy making through environmental intelligence
- Promotion of the development of an EU “environmental monitoring/remediation-based” economy



Rationale

- The increasing human-based pollution, both persistent and emerging, seriously compromises the health of ecosystems and poses serious unprecedented risks for the health of soil, hydrosphere, air and human beings.
- Several physical-chemical methods have been explored so far to remove pollutants in the environment but they are much too complex, energy-consuming or expensive. To prevent/minimise the risks due to the accumulation of these pollutants in the environment it is key to establish low-cost/green methodologies for their monitoring and treatment. Moreover, critical raw materials and energy issues urgently request alternative technologies for pollutants removal featuring intrinsic safety, sustainability and resilience.
- The detection of key environmental parameters through biological (including bio-inspired and/or nature-based), chemical, and physical sensors – eventually integrated into complex networks – will allow distributed information processing as well as (AI-based) modelling. The ability to integrate data and information from multiple, inter-related sources provides a step-change in our understanding of the complex interactions between the environment, climate, natural ecosystems, socio-economic systems and health.
- Environmental intelligence will support the shaping of better policies and guidelines to improve environmental sustainability, biodiversity loss prevention, economic growth and human health.

Relevance to EU policies and initiatives

- New Green Deal, Fit for 55, HEU Missions (Soil, Water, Cities),
- Zero pollution action plan, Farm-to-fork strategy, Partnerships: bioeconomy/environment, (



Synergy/ complementarity with other EU programmes

Leadership in enabling and industrial technologies:

- ICT-37-2020
- CE-BIOTEC-04-2018
- CE-BIOTEC-05-2019
- CE-BIOTEC-08-2020

Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy

- LC-FNR-13-2020
- CE-FNR-17-2020

Underpinning evidence

- <https://www.eea.europa.eu/data-and-maps/indicators/progress-in-management-of-contaminated-sites-3>
- UNEP/MAP–EEA Joint Work Plan 2022-2030 (<https://www.eea.europa.eu/about-us/documents/unep-map2013eea-joint-work-plan>)
- Evaluation of the Urban Waste Treatment Directive SWD(2019) 700 final
- Decision 2018/5 Long-term strategy for the Convention on Long-range Transboundary Air Pollution for 2020–2030 and beyond - United Nations Economic Commission for Europe (ECE)



For startups & SMEs to develop and scale up innovations with high risk and high impact

For individual companies (startups, SMEs)

Continuously open for applications (also from individuals intending to start a company and investors intend to support a company)

Mainly open but also Accelerator challenges in Green Deal, Strategic Digital & Health Technologies

Mainly blended finance (grant + investment), but options for "grant only" and "grant first" (with investment follow up)





Proposals for S&T subject areas for Accelerator

EIC instrument	Macro-area	S&T subject area	Code
Accelerator	Green	Energy storage solutions	Present in EIC WP 2023

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Scope/specific objectives

- The proposal supports technologies to store electric and/or thermal energy at low cost, high density, high charging/discharging efficiency and enhanced durability.
- The proposal focuses on technological approaches (chemical, electrical, electrochemical, mechanical, thermal) for energy storage at different **scales** (centralized at large industrial facilities premises or distributed and at small scale level – mobile electronics), **duration** (short – millisecond to day, medium – days to month and long term – months to seasons) and **uses** (from stationary to mobile). Proposals should focus on technologies that, without using critical raw materials or ensuring their full recycle/reuse, minimize their carbon footprint measured through a life-cycle analysis (including cost and social impact evaluation).

Expected impacts

- To enable a strong penetration of intermittent renewable energy resources by addressing the spatial and temporal mismatches between generation and demand,
- To set up decarbonized, interconnected, sector-coupled and flexible energy systems.



Rationale

- The development of flexible, sector-coupled energy systems is crucial to achieve the EU Green Deal, Fit for 55 and Repower EU action targets.
- The possibility to store electrical or thermal energy at low cost, high density, high charging/discharging efficiency and for different duration (from short to long) will not only pave the way towards flexible energy systems but will also enable a strong penetration of intermittent renewable energy by addressing the spatial and temporal mismatches between generation and demand.
- To reach these goals, it is crucial to develop a range of breakthrough solutions for electrical and thermal energy storage. The scale-up of these technologies will set up European coupled and flexible energy systems that will realize the highly strategic EU energy autonomy.

Relevance to EU policies and initiatives

- FIT-for-55
- Repower EU
- Partnerships: battery, clean hydrogen



Synergy/ complementarity with other EU programmes

Secure, clean and efficient energy

- LC-SC3-B4E-5-2020: Upgrading smartness of existing buildings through innovations for legacy equipment (TRL6-8)

Underpinning evidence

- EU COM(2022) 108 REPower EU
- IEA Report on Energy Storage, 2021
- JRC – Current status of Chemical Energy Storage Technologies, 2020
- IRENA – Innovation Outlook Thermal Energy Storage, 2020

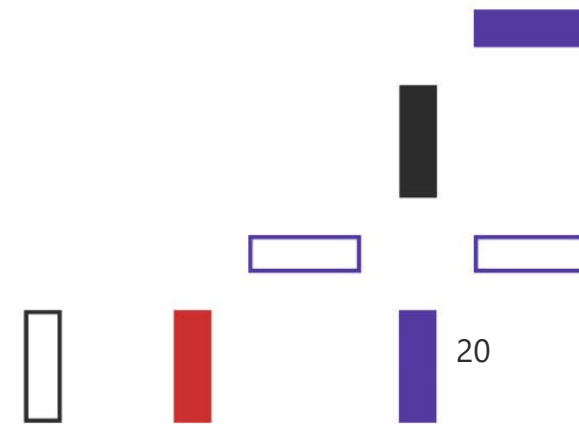


Europe and Israel		Overall investments
SECTOR	COMPANIES	SUM OF TOTAL PAID IN CAPITAL (\$)
Advanced materials	30	624.933.448,00
Biofuels & biochemicals	1	19.300.000,00
Energy efficiency	17	80.305.735,00
Energy storage	317	9.437.946.095,00
Fuel cells & hydrogen	13	352.042.400,00
Hydro & marine power	2	3.592.500,00
Nuclear	1	0,00
Other cleantech	5	60.425.214,00
Recycling & waste	2	15.242.648,00
Smart grid	9	134.088.985,00
Solar	14	982.000,00
Transportation	11	372.264.857,00
Water & wastewater	1	0,00
Wind	2	0,00
(Blank)	6	230.000.000,00
GRAND TOTAL	431	11.331.123.882,00



Proposals for S&T subject areas for Accelerator

EIC instrument	Macro-area	S&T subject area	Code
Accelerator	Green	CO2 and Nitrogen capture and valorisation	Future topic





Scope/specific objectives

- Process/technology/material to capture, convert and use CO₂ and/or N, addressing a specific sector/application.
- The main target applications are CO₂ capture and use (so, not sequestration) from concentrated streams or air capture, and/or N recovery and recycle from air, soil, water or organic waste.
- The technologies can address only CO₂, only N or CO₂/N cycles in an integrated fashion. Solutions that focus only on capture and/or storage and do not address a final use are out of the scope of the call.
- Technologies for CO₂ and N capture and valorization at different scales - centralized at large industrial facilities premises or distributed at small scale level - avoiding toxic and critical raw materials or demonstrating their full re-use or recycle.

Expected impacts

- To set in place safe and sustainable technologies for CO₂ and N capture and valorization.
- To reduce environmental pollution.
- To prevent biodiversity loss.
- To abate environmental emissions and deploy more sustainable natural resources.





Rationale

- Carbon capture and utilization (CCU) and an optimization of N-cycle are recognized as **enabling** technologies for climate neutrality
- To encourage a circular and sustainable approach to CCU and N-cycle.

Relevance to EU policies and initiatives

- New Green Deal,
- Fit for 55,
- HEU Missions (Soil, Water, Cities),
- Zero pollution action plan,
- Farm-to-fork strategy,
- Partnerships: bioeconomy/environment, climate/health

Drivers

- **Policy:** CCUS is part of government mitigation strategies. Carbon markets such as EU European Emissions Trading Scheme (ETS), provide incentives and penalties. Significant public infrastructure and R&D funding: Horizon 2020 (Europe) and DOE and NETL (US).
- **Industry commitments:** Industrial emitters in steel, cement/concrete, oil and gas pledges to reduce emissions. CCU/S is core to many strategies.
- **Corporate sustainability:** Start of a private carbon market: Big tech (Stripe, Microsoft) is offsetting via CCU/S pathways at over \$100 per metric ton.
- **Monetizing carbon:** Innovators are creating technologies to utilize captured carbon to create new chemicals, mineralized and fuel-based products.



Synergy/ complementarity with other EU programmes

Climate action, environment, resource efficiency and raw materials

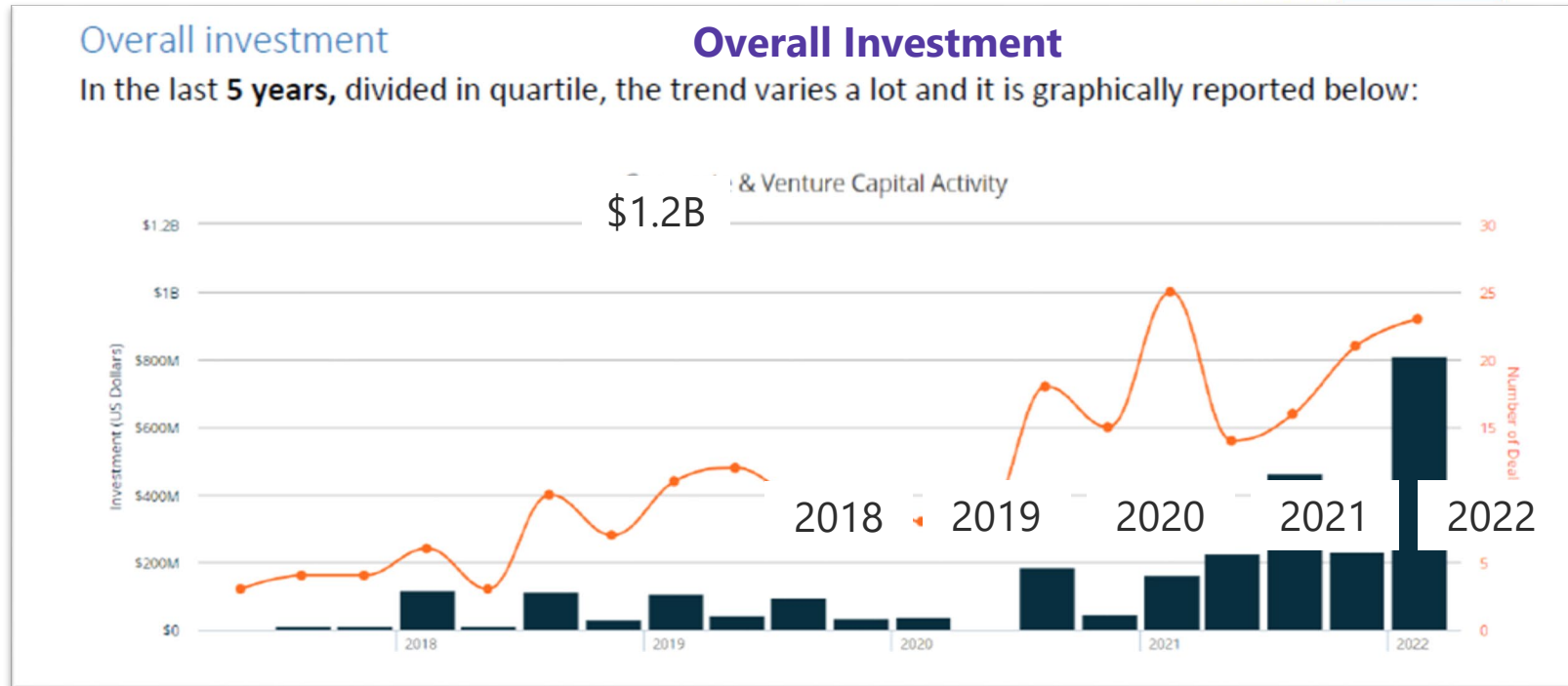
- LC-CLA-02-2019, LC-CLA-11-2020, CE-SC5-29-2020, SC5-11-2018, SC5-33-2020, SC5-21-2019-2020

Cross-cutting activities

- CE-NMBP-41-2020, CE-SC5-07-2020, LC-SC3-NZE-5-2020, LC-GD-8-1-2020

Underpinning evidence

- I. Butnar, *et al.*, Review of Carbon Capture Utilisation and Carbon Capture and Storage in future EU decarbonisation scenarios, CCUS SET-Plan, 2020
- IPCC report, Summary for policymakers, 2018
- Sutton et al 2013, Our nutrient world, Global overview on nutrient management
- W. Winiwarter, *et al.*, The INI European Regional Nitrogen Centre: Concepts and Vision, Just Enough Nitrogen, Springer, 2020
- IEA, Energy Technology Perspectives, Special report on CCUS, 2020





For advanced research to underpin breakthrough / game-changing technologies

Mainly open ("bottom up"), but also Pathfinder challenges (for emerging health, energy and digital technologies)

Mainly collaborative (3 or more partners)

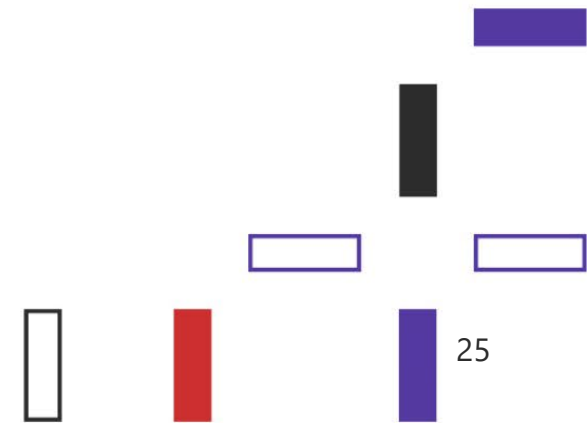
Grants up to €3/4 Mt €3/4 million

Management of portfolios of projects by Programme Managers

Proposals for S&T subject areas for Pathfinder



EIC instrument	Macro-area	S&T subject area	Code
Pathfinder	Green	Nature-inspired solution for environmental remediation	Future topic





Scope/specific objectives

- This proposal focuses on new biological, chemical, physical routes that integrate artificial, natural and/or hybrid materials, chemicals and systems, including living micro-organisms and plants, to be adopted for environmental remediation. These routes should also minimize the use of energy and include the use of renewable energy as input. Through a biomimetic-design approach, including non-critical raw materials (CRM) use, system integration and circular thinking, the proposals should provide a proof-of-concept (PoC) or lab-scale-validated innovative technology that, inspired by natural systems and strategies, may demonstrate the prevention, reduction or elimination of recognized and emerging contaminants while avoiding negative side-effects or side-products over its whole life-cycle.

Expected impacts

- Reduction of the use of critical raw materials
- Reduction of side-effects and the production of side-products
- Reduction of the use of energy-intensive remediation systems
- Reduction of the environmental impact of anthropogenic activities





Rationale

- There is a strong need for reducing costs, chemicals and energy consumption of current environmental technologies.
- Emerging contaminants are posing serious unprecedented risks for the health of soil, hydrosphere and air.
- Critical raw materials and energy issues urgently request alternative technologies which may be inspired by nature towards an intrinsic safety, sustainability and resilience

Relevance to EU policies and initiatives

- EU missions (Soil, Water and Cities),
- FIT-for-55,
- Zero pollution action plan,
- Farm-to-fork strategy,
- Partnerships: bioeconomy/environment, climate/health





Synergy/ complementarity with other EU programmes

Climate action, environment, resource efficiency and raw materials

- LC-CLA-02-2019, LC-CLA-11-2020, CE-SC5-29-2020, SC5-11-2018, SC5-33-2020, SC5-21-2019-2020

Leadership in enabling and industrial technologies

- ICT-37-2020, CE-BIOTEC-04-2018, CE-BIOTEC-05-2019, CE-BIOTEC-08-2020

Underpinning evidence

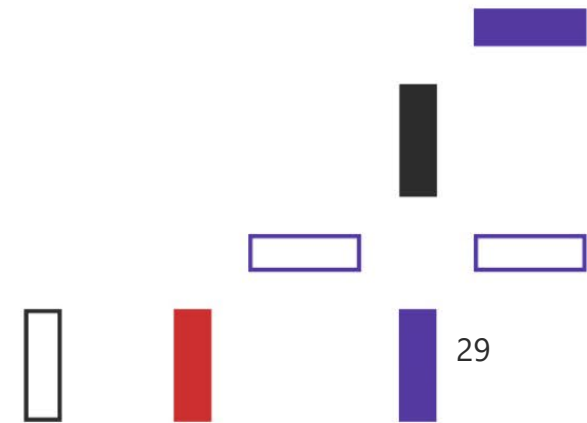
- <https://ec.europa.eu/environment/integration/research/newsalert/pdf/issue-24-2021-02-the-solution-is-in-nature.pdf>
- <https://doi.org/10.2305/IUCN.CH.2020.09.en>
- <https://op.europa.eu/en/publication-detail/-/publication/8bb07125-4518-11eb-b59f-01aa75ed71a1>
- <https://www.eea.europa.eu/publications/nature-based-solutions-in-europe>



Discussion

Niche areas that would deserve special attention for the future

- Circular approach for critical raw materials in energy applications
- Advanced materials for energy applications avoiding critical raw materials
-





Thanks for your kind attention

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