European Commission

Welcome to the Member States Workshop of the Horizon Europe Programme Committee : CLUSTER 4 DIGITAL, INDUSTRY AND SPACE

Wednesday 24 April 2024
14h30 – 17h00

Advanced Materials Partnership

Research and Innovation

Agenda

Cluster 4 – Programme Committee
Member States Workshop
Wednesday, 24 April 2024
14.30 – 17.00

1. Welcome by Jürgen Tiedje, Head of Unit Industrial Transformation, DG Research and Innovation
2. Presentation by representatives of the future Partnership Innovative Materials for EU (I'M4EU) Followed by Q&A and discussion
3. Digital Infrastructures on Advanced Materials
4. Associated countries and their role under the Advanced Materials communication
5. Wrap-up

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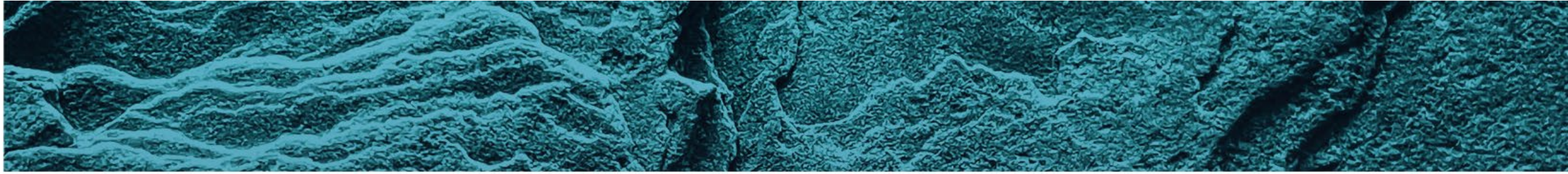
Interface with Programme Committee under Horizon Europe Cluster 4

- Work Programme topics and budget decisions focusing on cluster 4 will be taken by the Programme Committee
- Strategic orientations and implementation aspects to be discussed by Technology Council



The upcoming co-programmed Partnership under Horizon Europe

“Innovative Advanced Materials for Europe” (IAM4EU)

April 24, 2024

“Innovative Advanced Materials for Europe”

Building on the experience of…

EMIRi — *The Energy Materials Industrial Research Initiative*

EUMAT — *The European Technology Platform for Advanced Materials and Technologies*

GRAPHENE FLAGSHIP — *An EU flagship R&I initiative*

MANUFUTURE-EU — *The European Technology Platform for manufacturing technologies*

SUSCHEM — *The European Technology Platform for Sustainable Chemistry*

AMI2030 ADVANCED MATERIALS INITIATIVE

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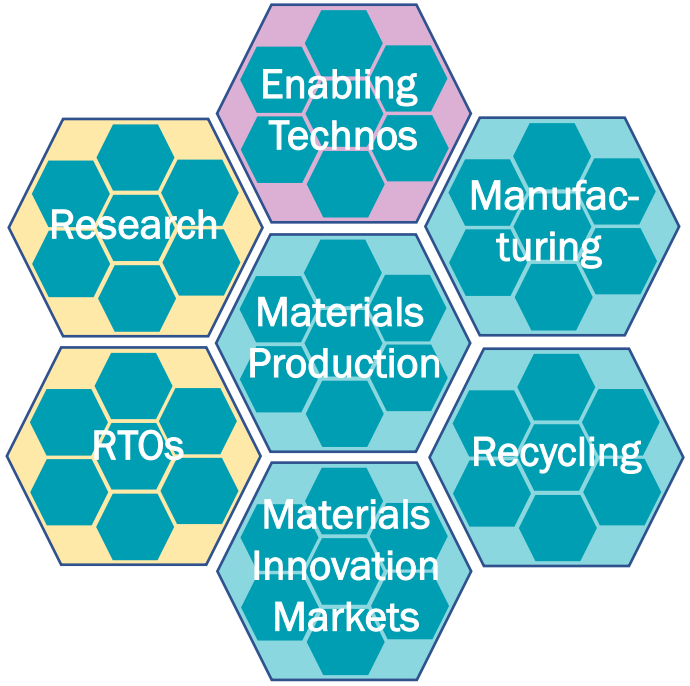
"Innovative Advanced Materials for Europe"

A co-programmed partnership between the EC and a dedicated Association

Preliminary sketch of the private-side association to gather all relevant stakeholders



Open, Inclusive, inter-disciplinary, gathering all stakeholders communities

- **Along the Materials Value Chain**
  - Producers (all materials types)
  - Transformers / Integrators
  - MIMs
  - Recyclers
- **From supporting/enabling technos**
  - Digital
  - Equipment & tooling
  - Characterization & testing
  - …
- **Along the Innovation Cycle**
  - Academic Research
  - RTOs
  - R & T Infrastructures
  - Industry (SMEs, Companies)

Transparent Governance

- Full Members (voting rights)
  - Companies
  - RTOs & universities
- Associate Members
  - Associations
  - NGOs
- Governing Bodies
  - Weighted representation from the different sectors
  - weighted voting system (75% industry / 25% research)
- Financial contribution
  - Per member category and size

Target #	Industry	RTO / Academic	Associations
Q4 2024	60	60	15
2027	100	100	30

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info@ami2030.eu

GRAPHENE FLAGSHIP 2DMIC
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Focus on Innovative Advanced Materials

Advanced Materials – what is covered?

- **Intentionally designed** and engineered materials[1] to have:
  - **new or enhanced properties**, and/or
  - **targeted or enhanced structural features**

  to achieve specific or improved **functional performance**.
- Advanced materials include both:
  - **new emerging** materials from innovative manufacturing processes (high tech materials) and
  - materials that are **manufactured from traditional** materials (low tech materials).

2

[1] Source: https://one.oecd.org/document/ENV/CBC/MONO(2022)29/en/pdf

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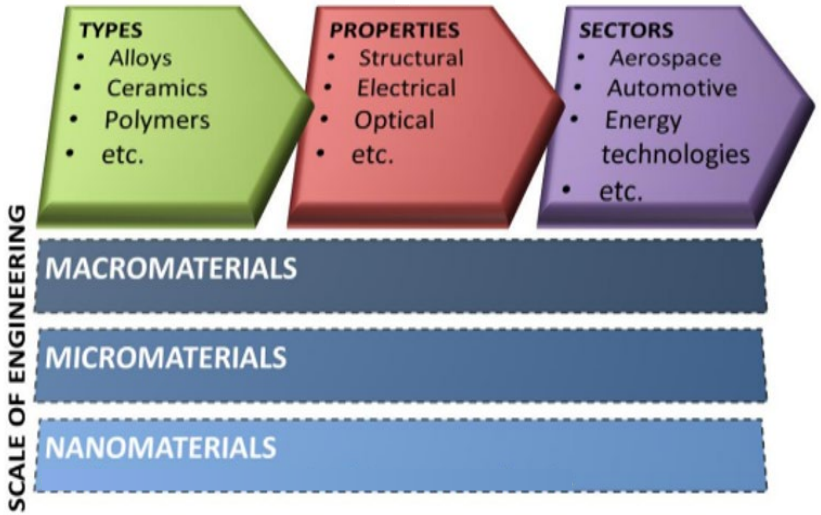
"**Innovative**" emphasizes the commercial potential of these materials / refers to innovative ways to use classical materials in new applications



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Problem Statement & Ambition

Main challenges, failures, gaps,…

The need for advanced materials addressing ever **more stringent requirements at an ever faster pace**

A **fragmented landscape** of stakeholders, competences, resources and initiatives

Lack of resilience and sustainability of the industrial value chains relying on materials

A multi-sectorial accelerator for the design, development and uptake of safe and sustainable advanced materials towards a circular economy

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Objectives and Expected Impacts

Aligning with Horizon Europe Strategic Plan for 2025-27
Contributing to implementing EC Policy on Advanced Materials for Industrial Leadership

	OBJECTIVES	EXPECTED IMPACTS
GENERAL	**EU leadership** in advanced materials innovation and **industrial competitiveness** in strategic markets	**Twin Green and digital Transitions** **Competitive & sovereign EU**
SPECIFIC	 IAMs and associated technologies	Resilient & circular industrial value chains, from IAM design to end-of-life
	 Cross-enabling tools & methodologies	High-level capabilities
	 Ecosystem enablers and synergies	A robust comprehensive innovation cycle, from low to high TRL

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IAM4EU Vision & Mission

Our Vision for 2035

The European industry is developing, producing and integrating more rapidly Innovative Advanced Materials that meet increasingly stringent application requirements, and ever more demanding sustainability and circularity constraints, while coping with global competition and ever shorter technology cycles.

Mission of the IAM4EU partnership

*To **establish and maintain** a cross-sectorial, multidisciplinary, collaborative Europe-wide **Research and Innovation ecosystem** that will significantly **accelerate** the time-to-market of **sustainable** innovative advanced materials and associated technologies designed for a **digital & circular economy**.*

Innovative Advanced Materials are the backbone of technological progress. They are pivotal in achieving the twin goals of the green and digital transitions and to boost Europe's competitiveness and sovereignty

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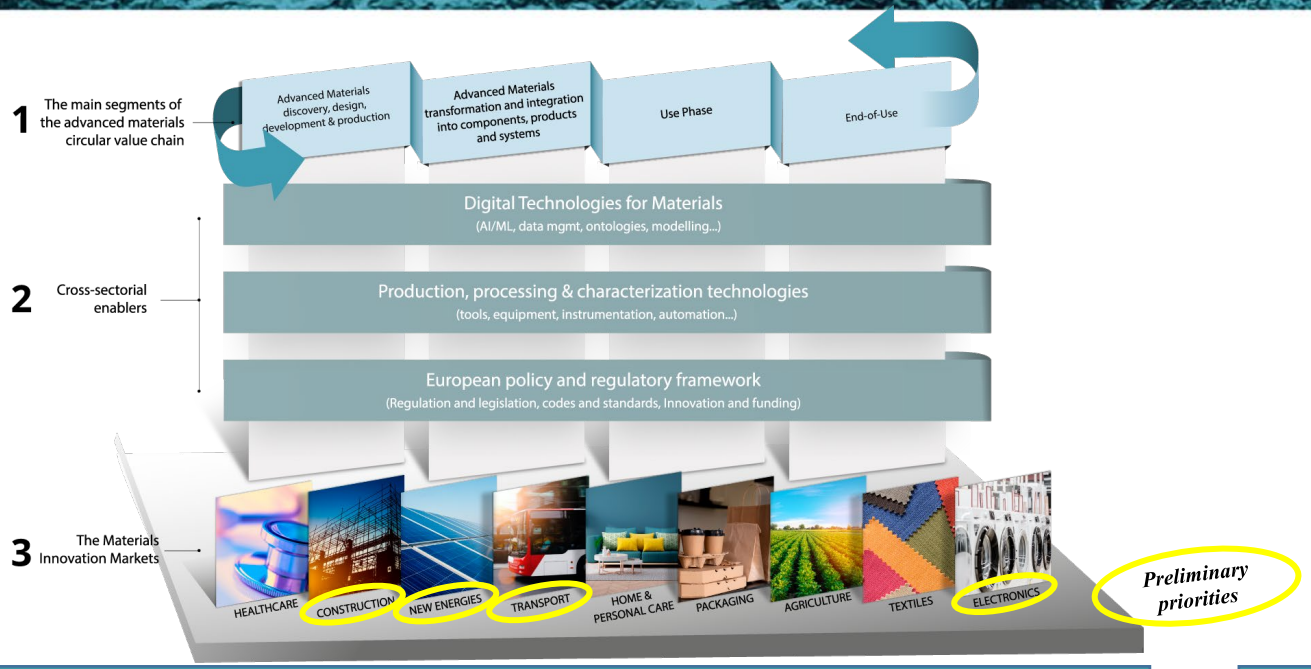
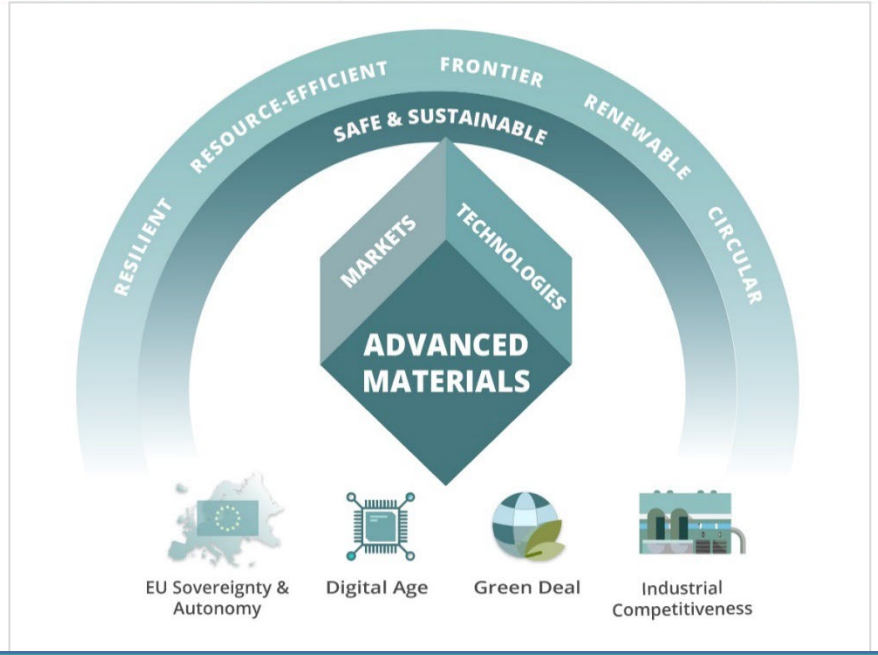
IAM4EU Guiding Principles





- IAM4EU will **cover all the segments of the industrial value chains, relying on SSbD materials towards** circularity
- IAM4EU will **support and accelerate the IAMs innovation cycle** from basic research to market uptake (leveraging on infrastructures, business services,…)

- IAM4EU will recognize the key **enabling role of all types of IAMs**.
- As a co-programmed partnership with industry, IAM4EU will ensure that **research investments meet industrial needs** and **boost uptake into marketable products**.

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Building synergies with other partnerships

Contacts with Process4Planet / Made in Europe / EIT Raw materials / ERA-MIN / Raw Materials partnership proposal / European Metrology (EURAMET) / PARC / Photonics21 / AI Data Robotics / KDT / Chips JU / BATT4EU / Clean Hydrogen / B4P / 2Zero / Clean Aviation / Circular bio-based Europe / EOSC

Joint Interest (examples)

- ❑ with MiE and P4P on energy & resource efficiency; end of use & recycling and the setting up of a federated digital framework covering the life cycle of materials
- ❑ with EIT Raw Materials and RM partnership proposal to articulating research priorities with industrial needs, address new skills and upskilling and the networking of cross-border infrastructures in the field of materials (in general) and critical/strategic raw materials
- ❑ …

Heatmap of joint interest of partnership across IAM4EU R&I priorities (SRIA)

	RM	EIT RM	Chips JU	2Zero	Clean Aviation	CBE JU	BATT4EU	PARC	EOSC	MIE	CLEAN H2	B4P	P4P	EURAMET	Photonics	AIDR
Σ	#	#	#	#	#	#	#	#	16	#	81	#	#	#	#	
1.1 Eco-design, harnessing the full potential of Innovative Advanced Materials in their design, production and processing	#	1	0	2	3	3	3	3	3	1	3	3	3	2	2	2
1.2 Innovative Advanced Materials with cutting-edge functionalities â¦ pushing the frontiers on materialsâ™ performan	#	1	0	2	3	3	2	3	3	0	3	3	2	1	3	3
1.3 Reducing CRMs dependencies through Innovative Advanced Materials	#	3	3	2	3	3	1	3	2	0	3	3	1	1	2	2
1.4 Innovative Advanced Materials with minimized resource usage throughout their lifecycle	#	2	0	2	3	3	2	1	3	0	3	3	2	3	1	2
1.5 Innovative Advanced Materials purposed for secondary use	#	0	0	1	3	2	1	1	3	0	3	2	2	2	1	1
1.6 Innovative Advanced Materials sourced from sustainable and renewable resources	#	0	3	2	3	3	3	1	3	0	3	3	3	2	1	3
1.7 Innovative Advanced Materials transformation by Generative Design (GD) and 3D printing (3DP)	#	0	0	0	1	3	1	0	3	0	3	2	2	0	2	3
1.8 Innovative Advanced Materials for (mass) customization of products and components	21	0	0	1	0	3	2	2	1	0	3	2	1	2	1	3
2.1 Enhancing component and product longevity	#	2	0	2	3	3	2	2	3	0	2	3	3	0	2	3
2.2 Smart components & productsâ™ maintenance and repair strategies	#	0	0	2	3	3	1	0	3	0	2	2	2	1	2	3
2.3 Recovery technologies (including for multi-materials), to reclaim valuable materials from end-of-life components & p	#	2	0	3	3	3	2	3	3	0	2	3	3	3	1	2
2.4 Innovative Advanced Materials recycling technologies for second use	31	2	3	2	2	3	3	1	3	0	2	3	2	3	1	1
3.1 Establish an integrated, trusted, federated digital framework covering all the materials lifecycle	31	0	0	1	2	3	2	3	3	2	3	1	3	3	3	2
3.2 Model driven SSbD and LCA materials development tools	#	0	0	2	0	3	3	3	3	1	2	3	3	2	2	3
3.3 Digitalization of materials performance management systems	#	0	0	2	3	3	1	3	3	1	2	2	3	1	3	3
3.4 Innovative Advanced materials identification and traceability connecting Digital Materials and Product Passports	#	1	3	1	3	3	3	3	3	0	2	2	3	2	3	1
4.1 Life Cycle Analysis (LCA) data for informed materials design	#	1	2	3	3	3	3	2	3	2	1	3	2	2	2	3
4.2 Multi-physics, multi-scales modeling and characterisation to accelerate materials design	#	0	0	2	1	3	1	3	3	0	1	3	1	1	3	2
4.3 Digital methods enhancing characterization and testing	#	1	0	3	1	3	2	3	3	0	1	3	3	0	3	3
4.4 Materials knowledge systems and models	#	1	0	2	1	3	1	2	3	0	1	3	2	2	3	2
5.1 SSbD as an Integrated Part of Innovative Advanced Materials Development	#	1	0	3	0	3	3	1	3	0	1	3	2	3	2	3
5.2 Harmonized Testing Guidelines That Address the Specifics of Innovative Advanced Materials	#	0	0	2	0	3	3	1	3	1	1	3	3	0	3	2
5.3 Regulations Keeping Pace with Innovation	#	3	0	3	0	3	3	3	3	0	1	1	1	1	3	1
6.1 Articulating research priorities with industrial needs	#	3	3	3	3	3	3	3	2	0	1	3	2	1	2	1
6.2 Contributing to new skills and upskiling	#	3	3	3	3	3	3	2	3	2	1	3	2	1	2	2
7.1 Networking of cross-border infrastructures	#	3	3	2	0	3	3	2	3	3	1	3	2	0	3	2
7.2 Digital infrastructures, including decentralized, federated materials data spaces	#	1	0	1	0	3	1	3	3	3	1	2	2	2	3	2
7.3 Technology infrastructures (DITBs, MAPs,...)	#	2	0	0	0	3	2	3	3	0	1	3	3	0	3	1
7.4 Portfolio of R&I and Business development services	#	2	2	2	1	2	1	1	3	0	1	1	3	1	2	1
8.1 Advanced Materials end-of-use strategies and circular business models	#	2	3	2	3	3	3	2	3	0	1	3	2	3	1	1
8.2 Building up synergies and cross-exploitation of Innovative Advanced Materials across strategic markets	#	0	0	1	1	2	3	1	3	0	1	3	1	1	1	2
8.3 Feedstock marketplace for Innovative Advanced Materials	18	1	2	1	0	3	3	0	3	0	1	1	1	1	1	0

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Areas of Intervention (AoIs) developed in the SRIA

3 Areas of intervention

8 R&I Areas

I – IAMs AND ASSOCIATED TECHNOLOGIES TOWARDS RESILIENT & CIRCULAR INDUSTRIAL VALUE CHAINS

1. Enabling and enhancing resilience and circularity by IAMs
2. Breakthrough products through cutting-edge IAMs

II - HIGH-LEVEL CAPABILITIES THROUGH CROSS-ENABLING TOOLS & METHODOLOGIES

3. Materials modelling, characterisation and testing *(generating data)*
4. Materials knowledge through digitalization *(managing/exploiting data)*

III - ECOSYSTEM ENABLERS AND SYNERGIES FOR A ROBUST COMPREHENSIVE INNOVATION CYCLE

5. Fostering the maturation of IAMs low-TRL research to meet applications needs
6. Accelerating industrial take-up in key application areas
7. Leveraging technology infrastructures to support design, development, testing and scale-up
8. Supporting European policy and regulatory framework

KPIs for Specific Objectives - 2025-2027

(preliminary)

IAMs and associated technologies towards resilient & circular industrial value chains	High-level capabilities through cross-enabling tools & methodologies	Ecosystem enablers and synergies for a robust comprehensive innovation cycle

• # of **SSbD IAMs technologies** (concept / prototype) along industrial VCs
  • raw materials & CRMs
  • renewables (fossil-free) & resource efficiency
  • circularity (secondary raw materials)
 	
• # of **cutting-edge** IAMs technologies
• # of **IAMs scalable technologies** (demo) per/across sector(s)
• # of **IAMs technologies uptake** and markets
• # of **circular business models**
• …
	• # of modelling, characterization, testing tools & methods
	• # of digital tools & methods (MAP, ML, digital twin…)
	• # of inter-operable data sources
	• # of digitalized IAMs cases (incl. data management approaches)
	• # of implementation of materials traceability serving DPP
	• # of SSbD & LCA tools & methods
	• # of operationalization of SSbD & LCA tools
	• …
		• # of access to, **use of**, contribution to **digital infrastructures, data spaces, pilot lines, OITBs**
		• # of **education and skillset** identification
		• # of supported **start-up, SMEs**
		• **Revised SRIA by 2027,** covering the full innovation cycle, fully endorsed by the different stakeholders
		• **Stakeholder** engagement, balance and diversity (incl. U13)
		• # of collaborations with other **partnerships and other initiatives**
		• Collaboration with **ERC / EIC / EIT**
		• **International cooperation**
		• # of standardization support / policy recommendations
		• # of publications, patents, licenses
		• …

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Proposals of priorities for WP'25

#	Suggested priorities	TRL	AoI I	AoI II	AoI III
1	**IAMs for photonics, enabling low-power and ultra-broadband performance for telecommunication networks**	**3-6**			
2	**IAMs for conformable, flexible or stretchable electronics**	**2-6**			
3	**IAMs for advanced coatings, sealants, adhesives and functional surfaces**	**2-6**			
4	**IAMs For Product Monitoring, Enabling Smart Maintenance And Repair Strategies**	**3-5**			
5	AI and ML based models, tools and services to accelerate IAMs design and to optimize IAMs compositions and structures	5-7			
6	IAMs with broadband performance for hyperspectral sensor and imaging applications across visible, Infrared and longer wavelengths	1-5			
7	Commonly applicable and validated tools and methods for the Safe and Sustainable-by-design (SSbD) framework	n.a			
8	IAMS for high-performance permanent magnets with significantly decreased content of rare earth	3-7			

+ Joint action with EIC (Accelerator Challenge) targeting SMEs and start-ups

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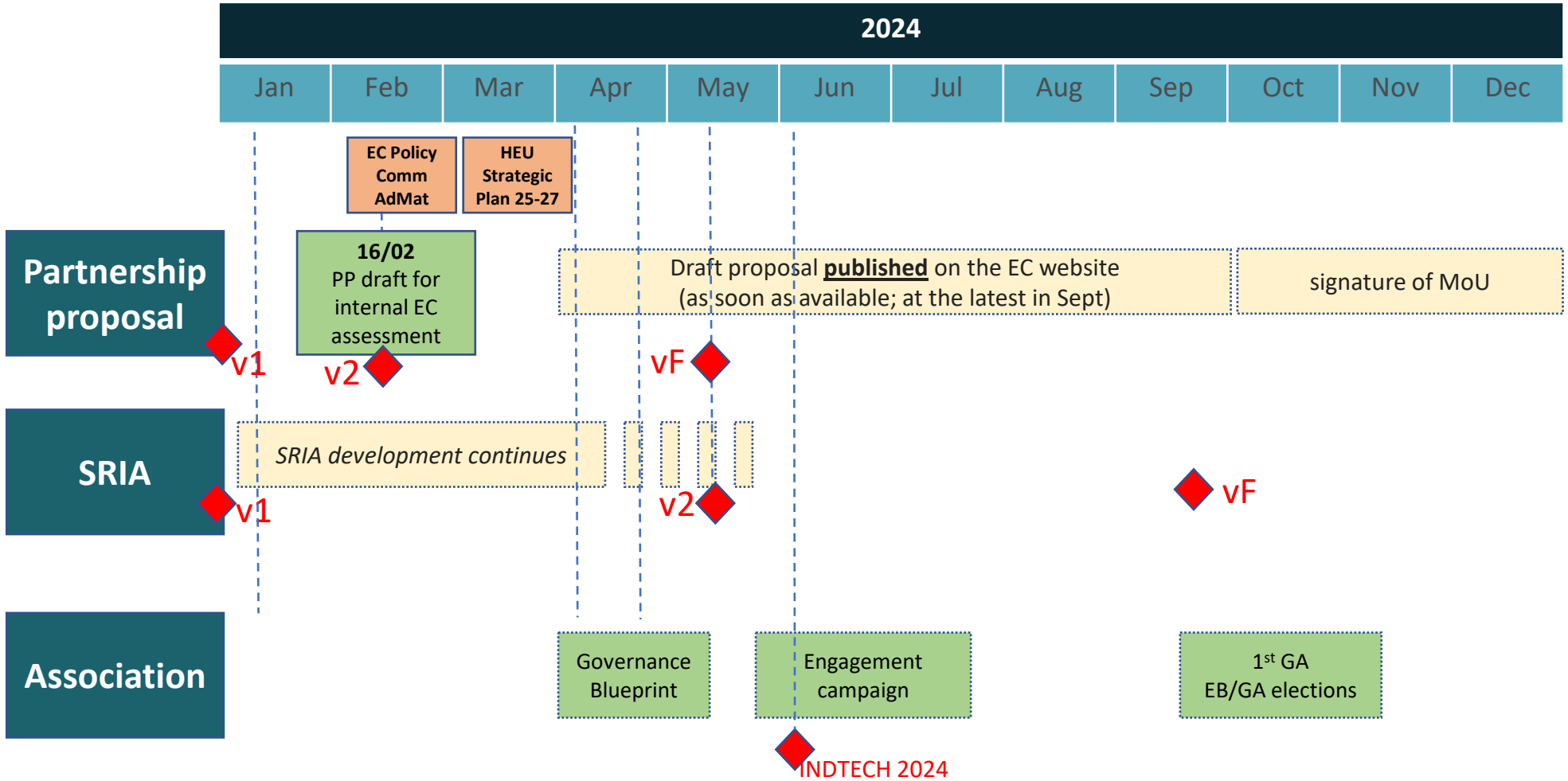
NEXT STEPS


2024
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EC Policy Comm AdMat
HEU Strategic Plan 25-27
Partnership proposal
16/02
PP draft for internal EC assessment
Draft proposal published on the EC website
(as soon as available; at the latest in Sept)
signature of MoU
v1
v2
vF
SRIA
SRIA development continues
v1
v2
vF
Association
Governance Blueprint
Engagement campaign
1st GA
EB/GA elections
INDTECH 2024

Be prepared to join the IAM4EU Association
JOIN US!

Any Question? Please contact us

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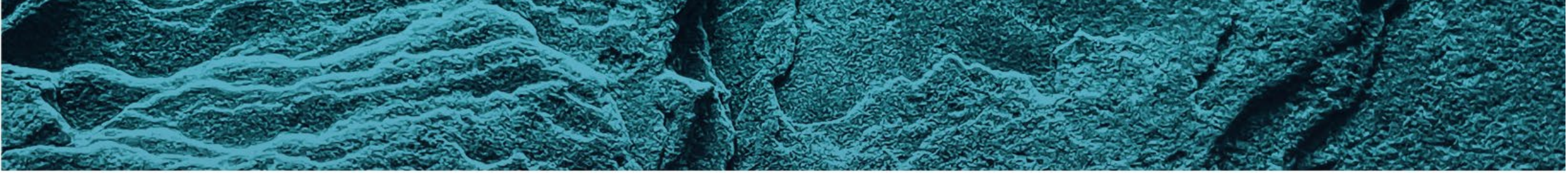

Questions?

Thank you

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Jointly funded EIC Challenges

- Joint budget contribution (50:50)
- Clusters can deploy EIC Accelerator (mono-beneficiary, access to equity investments and co-investments) to provide scale-up finance to individual SMEs and startups focused on the objectives of the Cluster/ initiative.
- Opportunity to identify and support new and disruptive solutions that tackle topics of high policy interest through start-ups and SMEs, who are often new participants – about 70% of the companies supported by the Accelerator are newcomers to EU programmes.
- Align objectives of the EIC (scaling up breakthrough innovations) with the relevant cluster (e.g. deployment of technologies in the market) with a stronger likelihood of success in Challenge area.
- Open “fast track” for SMEs from the Cluster to access EIC Accelerator for follow up funding to deploy to market results from a collaborative project.
- Access to relevant EIC Business Acceleration Services (e.g. EIC corporate days and innovation procurement programme) in the area of the Challenge, in collaboration with the Cluster.

Materials Commons

Materials Commons

Accelerate the R&I processes for advanced materials

Get access to capacities that are not achievable at national level

Reduce fragmentation of the European research and innovation ecosystem

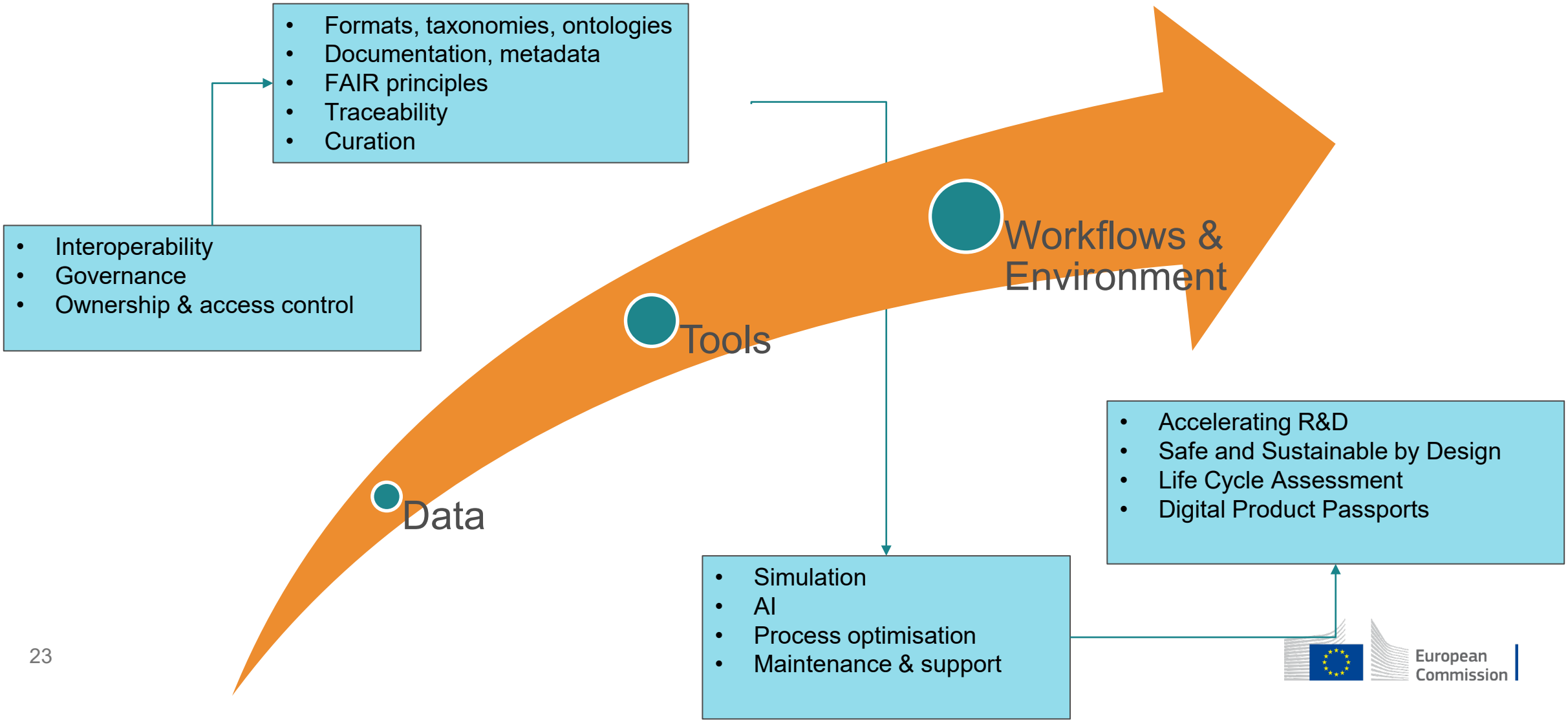
Create opportunities and remove obstacles for European industry

Alignment to prepare for **future regulation** such as the Digital Product Passport

How:

- Trustworthy resource for all stakeholders: academia, RTOs, industry and SMEs
- Interoperability through common data formats, materials taxonomies, ontologies
- From design, development and testing of new advanced materials up to products
  - Virtual design of materials and digitalisation of manufacturing processes
  - In-depth knowledge on material flows

Materials Commons – from data to working environment



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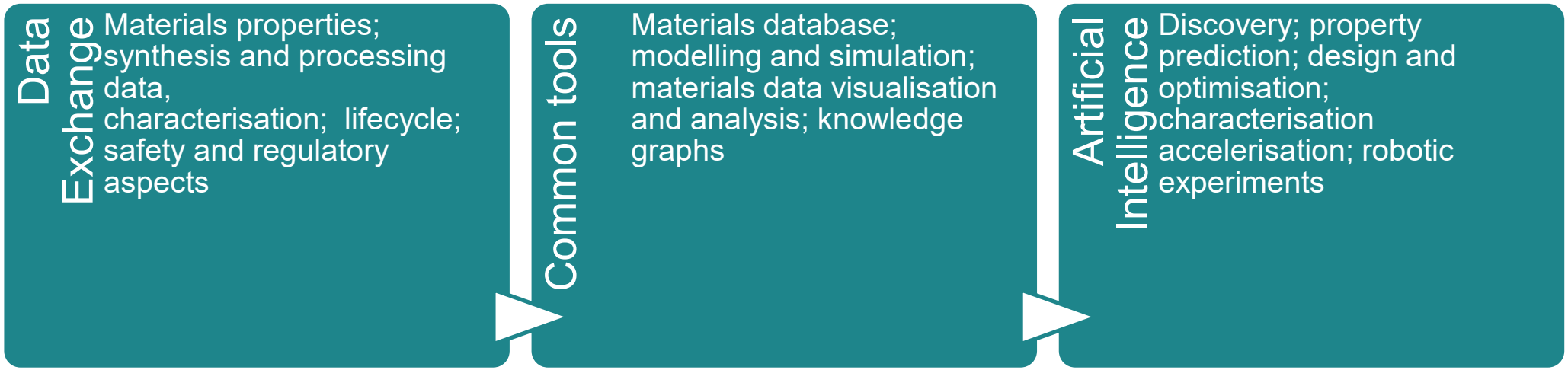
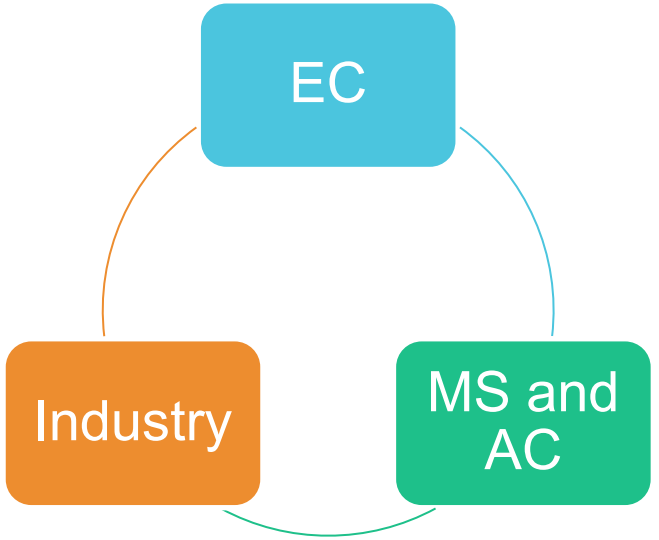
Materials Commons – adoption of tools and AI



- Use the power of data: enabling the rapid analysis and synthesis of vast datasets
- Wider use of tools that automate routine tasks in the R&D process, freeing researchers to focus on more innovative aspects of material science
- Use AI to predict behavior and performance of new materials without the need for exhaustive physical testing
- Optimise existing materials for better performance and cost-effectiveness

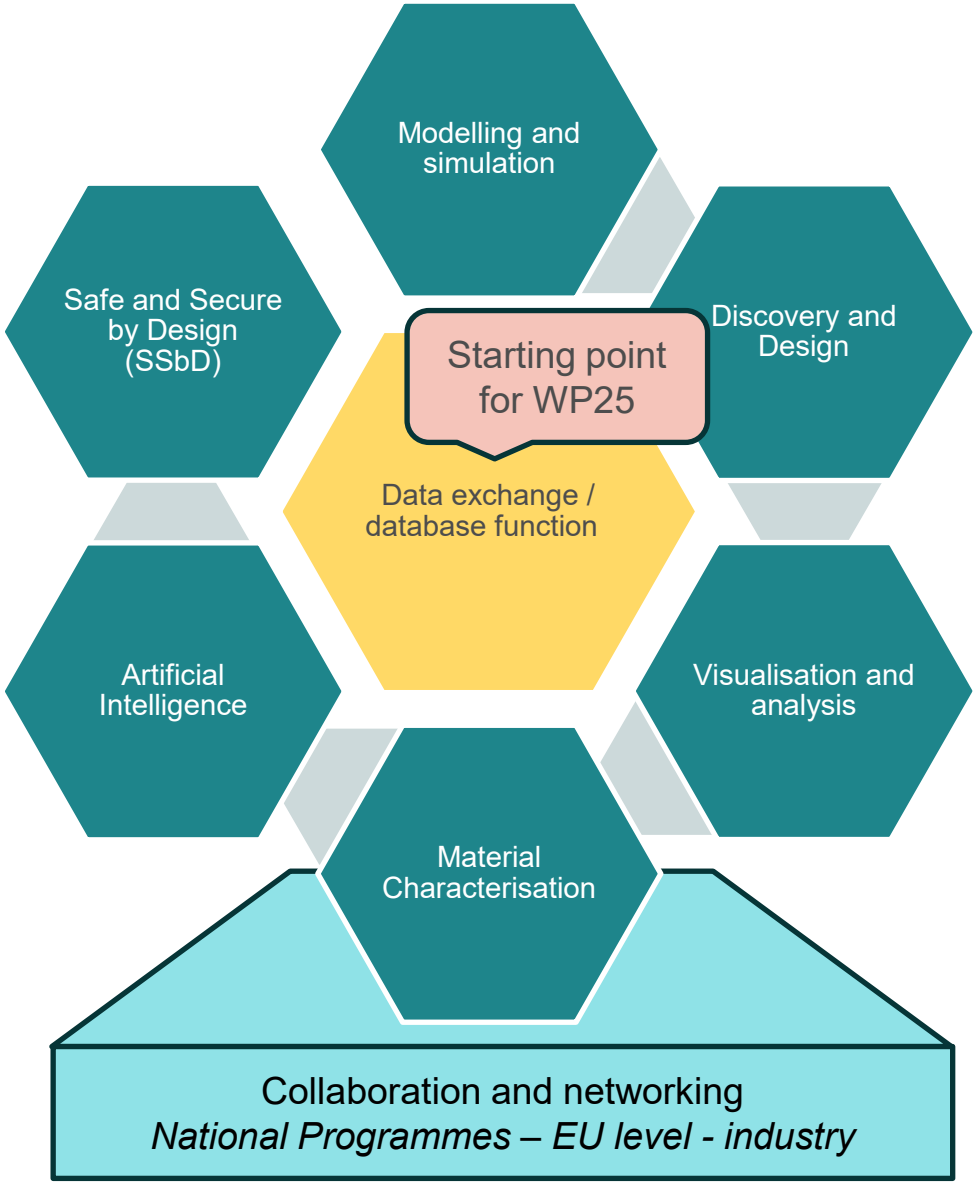
Materials Commons

- **Trilateral** approach crucial
  - Sharing expertise
  - Collaborative innovation
  - Market relevance and competitiveness
- **Investment** from Member States needed
  - Need for big leap
  - Aligning with national initiatives and priorities
  - Building on resources at national level
- **Maintenance, sustainability and linkage**
  - Gradual build up with clear responsibilities
  - Need to think beyond Horizon Europe
  - Linking to policies such as Safe and Sustainable by Design and Digital Product Passport



Materials Commons elements & services

- Data (generation, formats, metadata, documentation, ontologies, …)
- Data governance (FAIR principles, ownership & access, traceability, curation, …)
- Workflows (process optimisation, data management, collaboration, …)
- Tools (standards, access rights, maintenance, support, …)
- Artificial Intelligence (machine learning, robotics, …)
- SSbD, LCA, Digital Product Passports
- Past & ongoing initiatives
- Management and sustainability



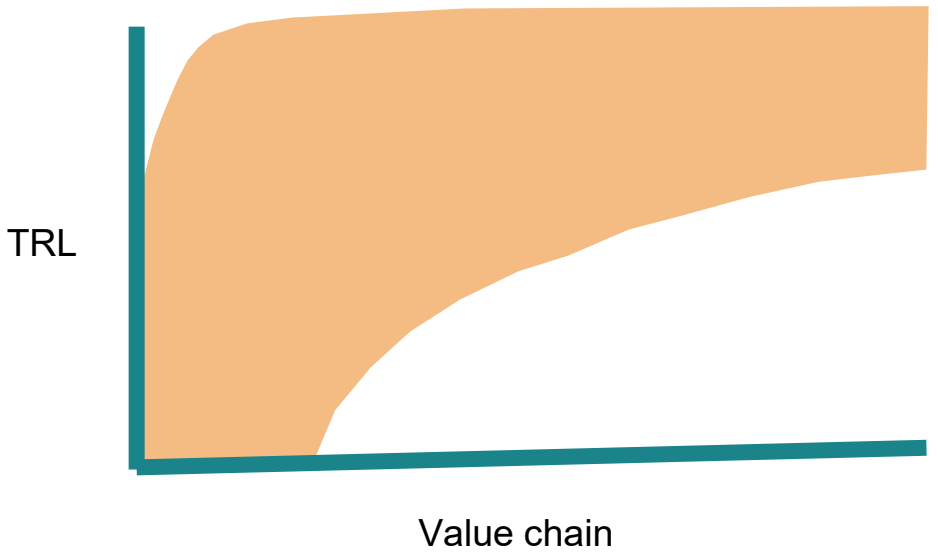
Materials Commons – Crossing the boundary of research and market

A digital infrastructure offers:

- Opportunities for scientific breakthroughs:
  - ✓ e.g. discovery of new materials by predicting the properties of possible new materials
- Opportunities further into the development process:
  - ✓ e.g. simulation and modelling and high-throughput screening

Aspects further down the value chain, up to the recycling stage, are also crucial, e.g. in the case of digital product passports.

Combining research data and product information onto a single platform offers significant advantages



Materials Commons – Building up and federating

Set-up

- Contributing infrastructures
- Gap analysis
- Functional and non-functional requirements

Build

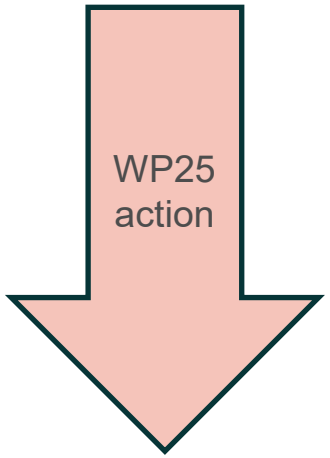
- Adopt standards for data formats and taxonomies, build interconnectors
- Set up data governance framework
- Incorporate datasets/tools, including where these are provided by third parties

Extend

- Incorporate more advanced tools (visualisation, modelling, simulation).
- Support for workflows and collaborative environments
- Support for SSbD, DPP.

Integrate advanced tools

- AI for discovery, property prediction and acceleration of design and optimisation, characterisation, etc.
- Support for robotic experiments



Materials Commons – context

- Initiatives at national level
- Initiatives funded at European level
  - DIGIPASS, IRISS projects
  - IAM4EU candidate partnership
  - Data Spaces and EOSC
  - Testing and Experimentation Facilities
- European Materials Modelling Council
- European Materials Characterisation Council

Materials Commons – WP action

Innovation action targeting Member States:

- Create the basis for a federated digital infrastructure for advanced materials
- Give researchers from industry and academia access to interoperable heterogeneous data sources and computational tools that support the workflows for the design and development of advanced materials;
- Make state-of-the-art artificial intelligence (AI) technologies, machine learning algorithms, and predictive modelling techniques accessible to researchers in industry and academia.

Strategic:

- Joint strategic vision
- Concrete action plan
- Inclusive approach with contributions from industry and academia
- Complementarity: EU, national, regional actions, partnership, Dataspaces/EOSC

Practical:

- Studies (requirements), data sets, trust infrastructures, software tools, remote access

Thank you