Damjana, Drobne

Green deal inspired correlative imaging-based characterization for safety profiling of 2D materials

ACCORDs

Predstavitev izkušenj in dobrih praks s prijavami projektov Obzorje 2020 in Obzorje Evropa

5. december 2023

ACCORDs General information (2023-2026)

Programme

Horizon Europe Framework Programme (HORIZON)

Investments under CL4- Cluster 4 – Digital, Industry and Space

Call

Digital and emerging technologies for competitiveness and fit for the green deal (HORIZON-CL4-2022-DIGITAL-EMERGING-01)

Type of action

HORIZON-RIA HORIZON Research and Innovation Actions (RIA)

Univerza *v Ljubljani*

ACCORDs partners

University of Ljubljana

Biotechnical faculty

Biological centre

Participant No.	Participant organisation name	Short name	Country
1 (Coordinator)	Univerza v Ljubljani	UL	SL
2	Bundesanstalt für Materialforschung und –prüfung	BAM	DE
3	University of Birmingham	UoB	UK
4	University of Torino	UniTo	ITA
5	University of Oxford	UOxf	UK
6	North-West University	NWU	ZA
7	Wageningen University & Research	WFSR	NL
8	Haydale Ltd	HAY	UK
9	IDONIAL Technology Center	IDO	SPAIN
10	Edelweiss Connect GmbH	EwC	CH
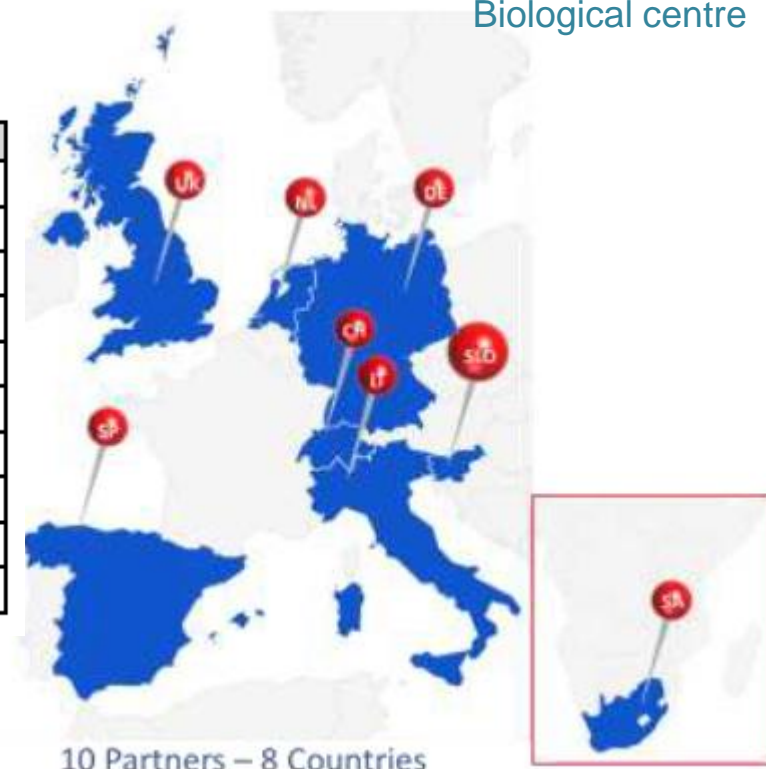
10 Partners – 8 Countries
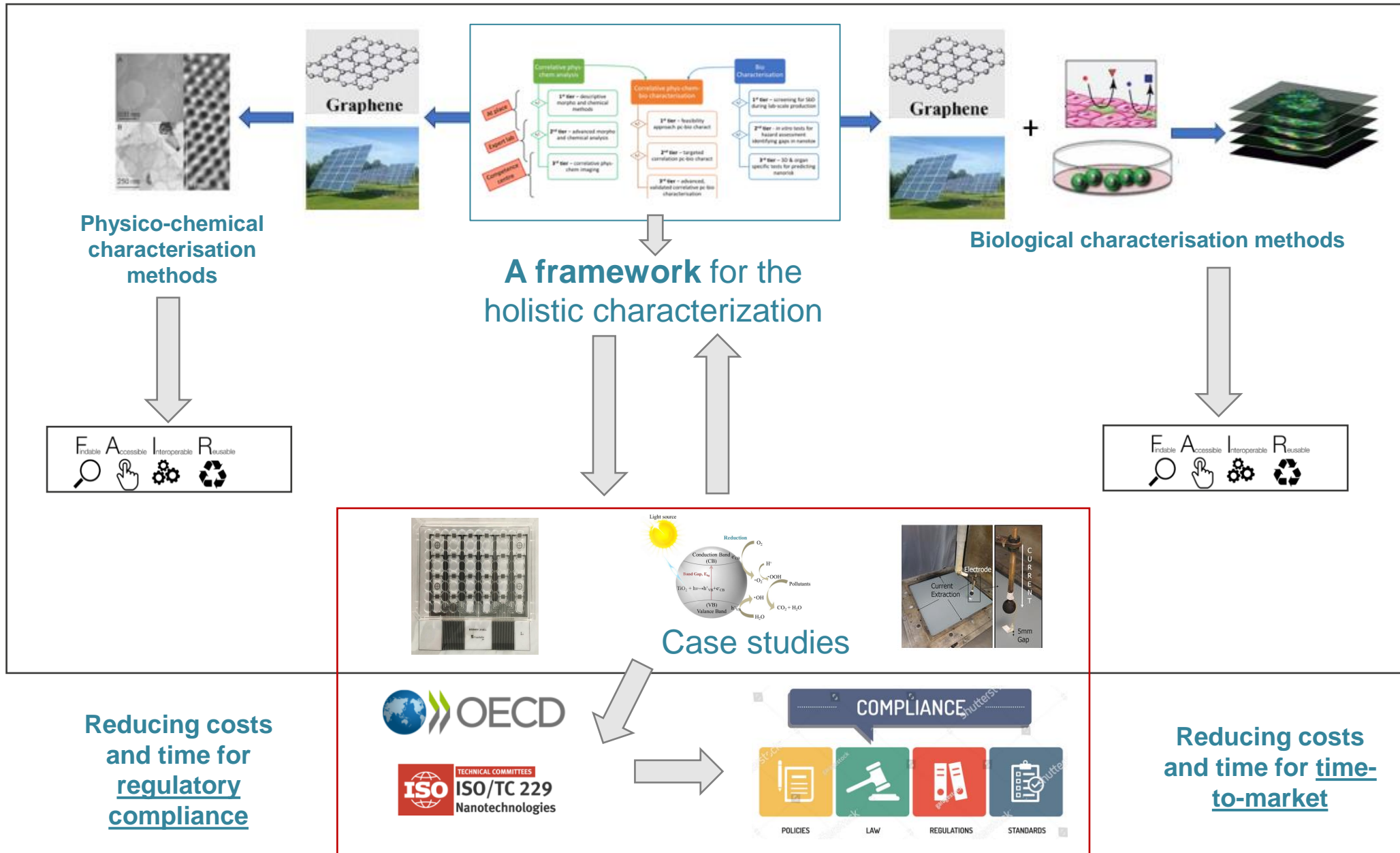
Digital and emerging technologies for competitiveness and fit for the green deal (HORIZON-CL4-2022-DIGITAL-EMERGING-01)
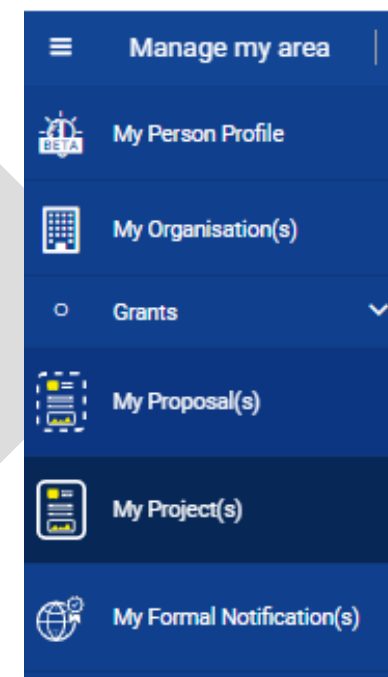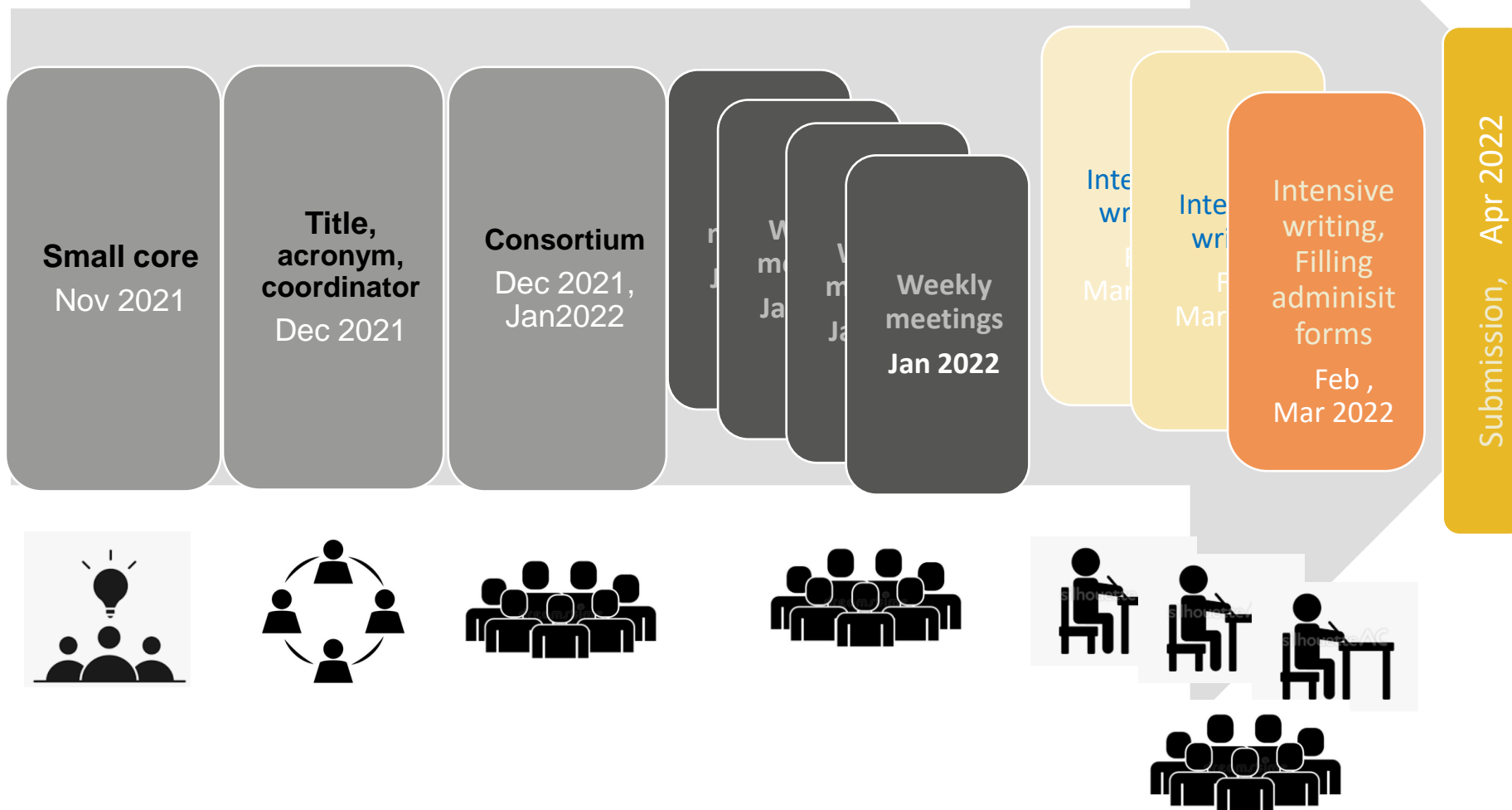
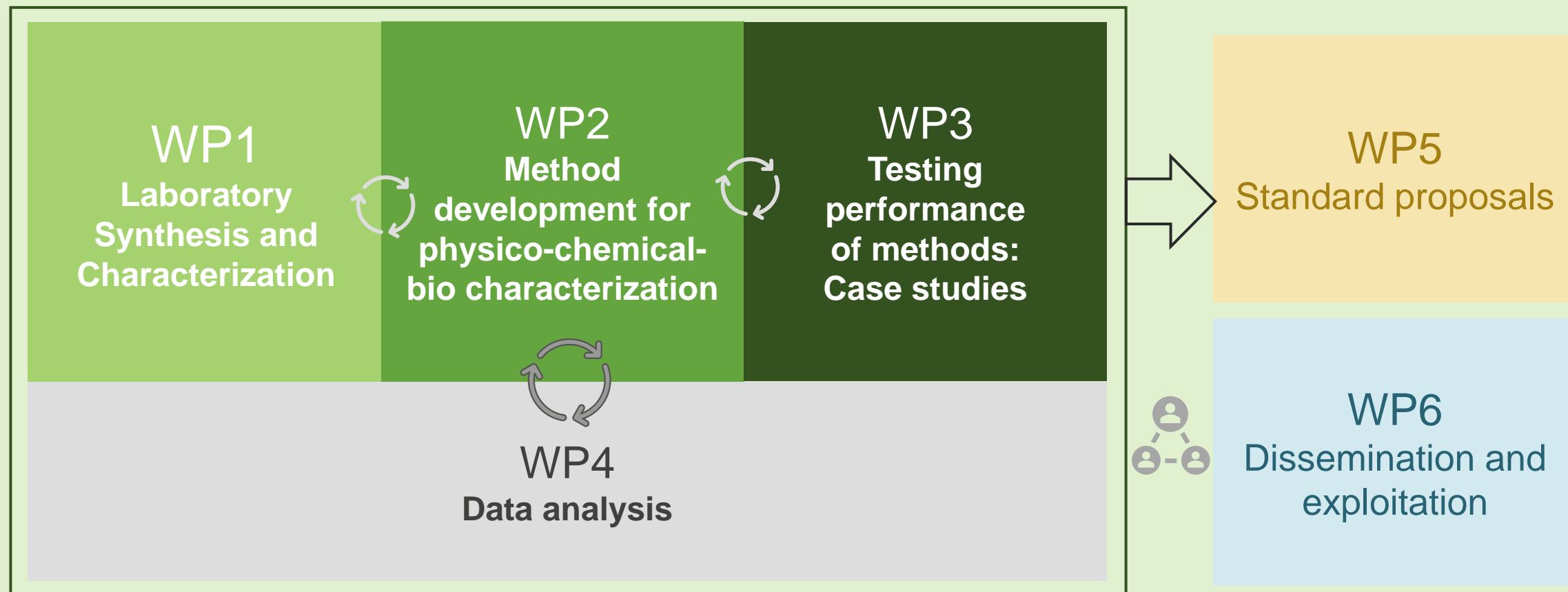# ACCORDs concept: Correlative imaging-based characterization for safety profiling

Physico-chemical characterisation methods

Biological characterisation methods

A framework for the holistic characterization

Case studies

Reducing costs and time for regulatory compliance

Reducing costs and time for time-to-market

Increase the efficiency and effectiveness **of materials and product development**

The ACCORDs pathway

WP5 + WP6
Proposals for **new standards** and **guidelines** and **dissemination**

Finish line

WP3
Testing performance of ACCORDs **framework** on real case commercial **GFM** nanomaterials and in **products**

WP1
Laboratory synthesized GFM for elaboration of correlative characterizing **framework**

WP2
ACCORDs framework for correlative physico-chemical-bio characterization for **2D** nanomaterials
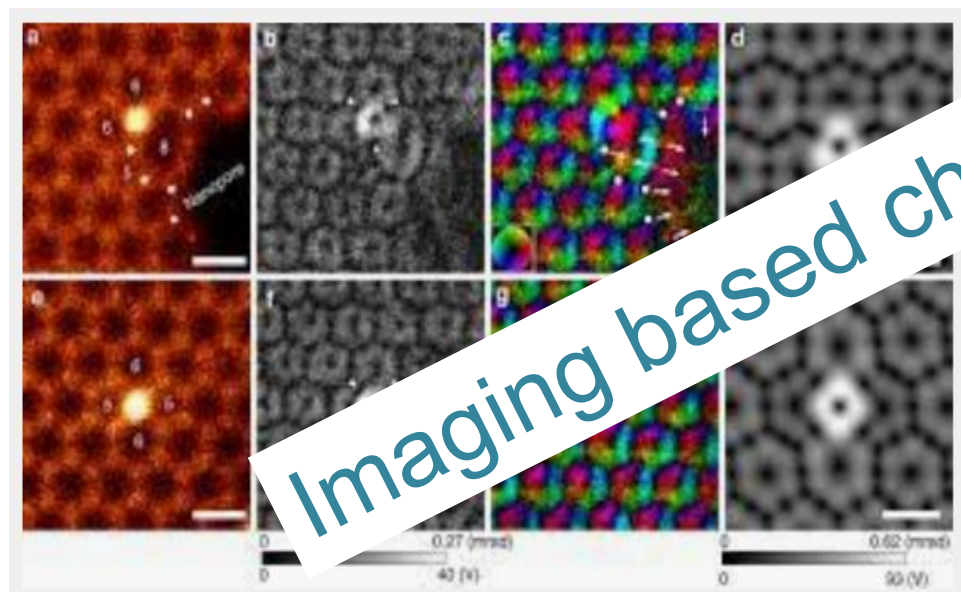
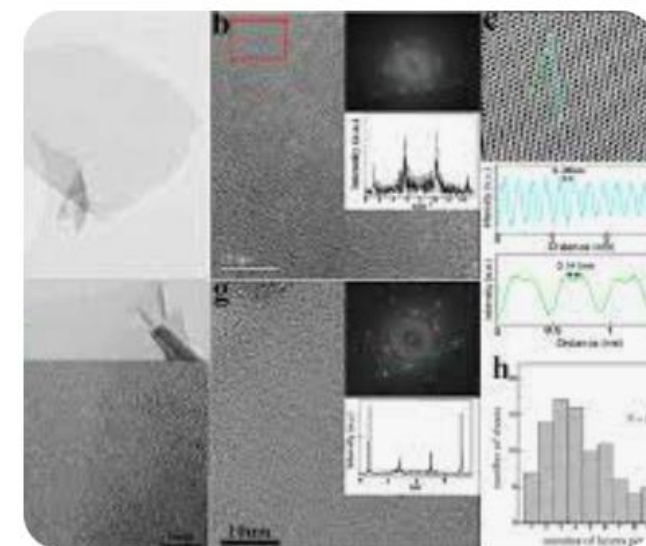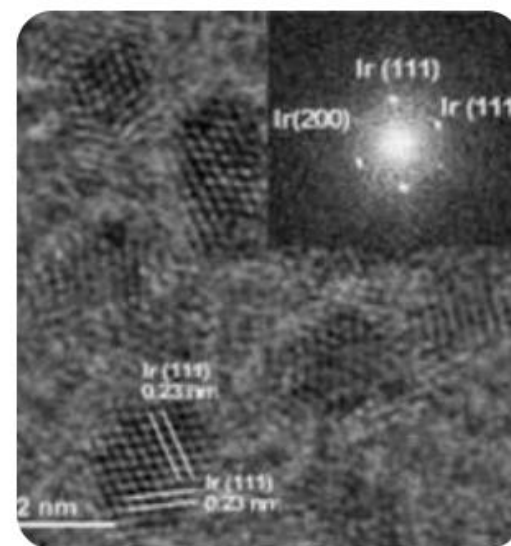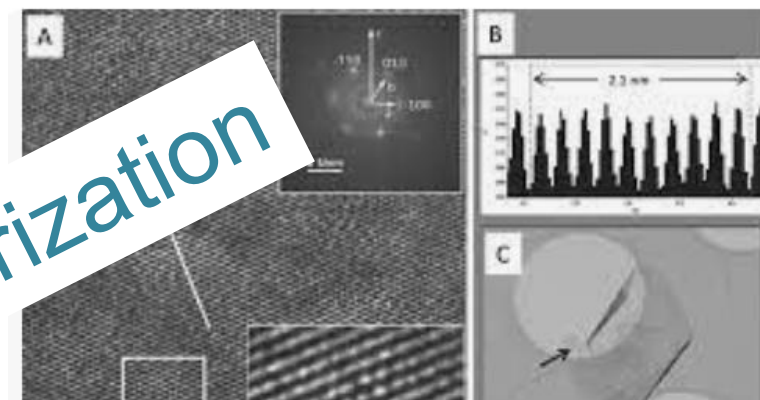Project coordination and data analysis

WP4
+
WP7
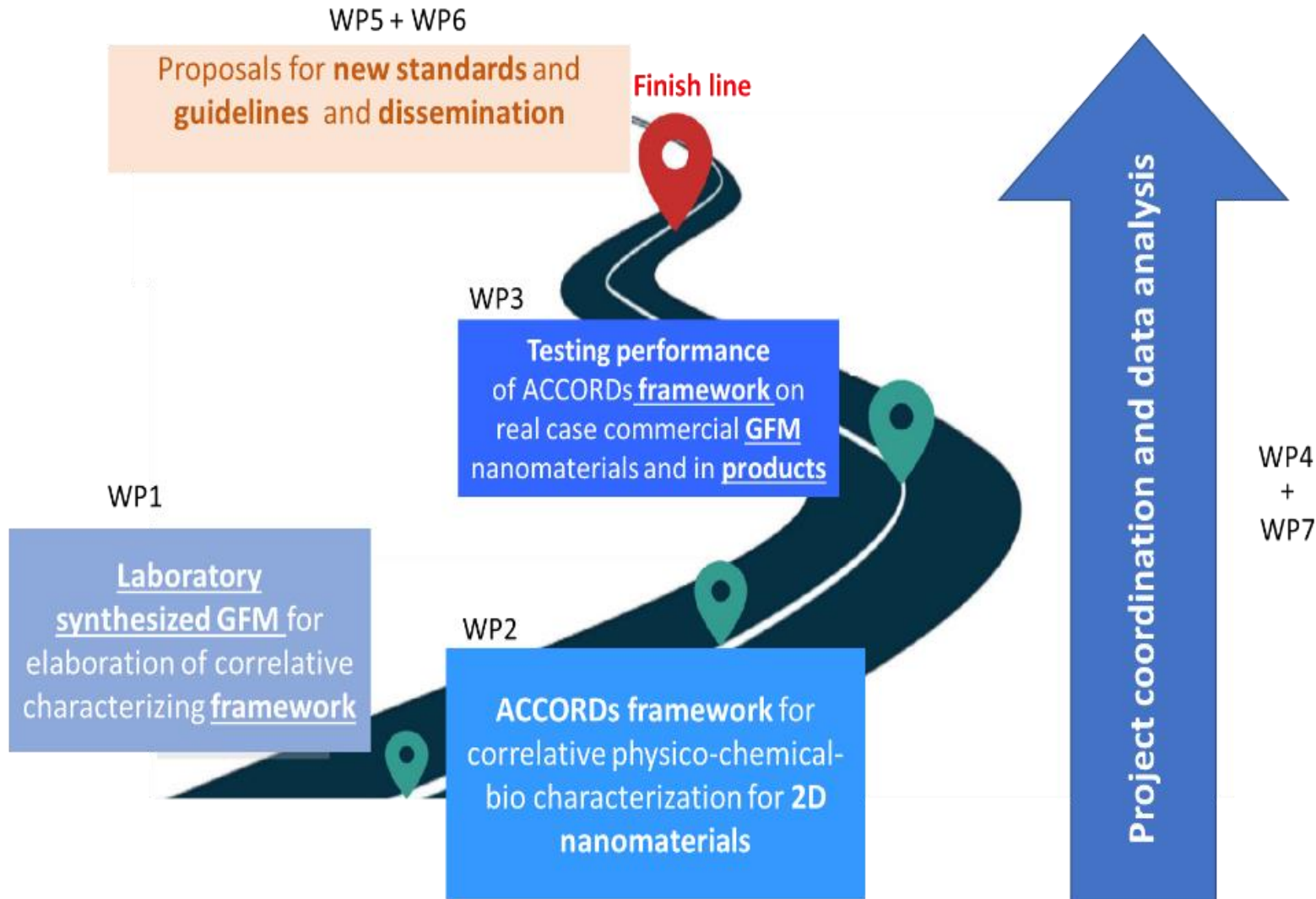
The ACCORDs pathway for developing a material characterization methodology to guide 2D producers and downstream users during product development as laid out in the developed WPs.
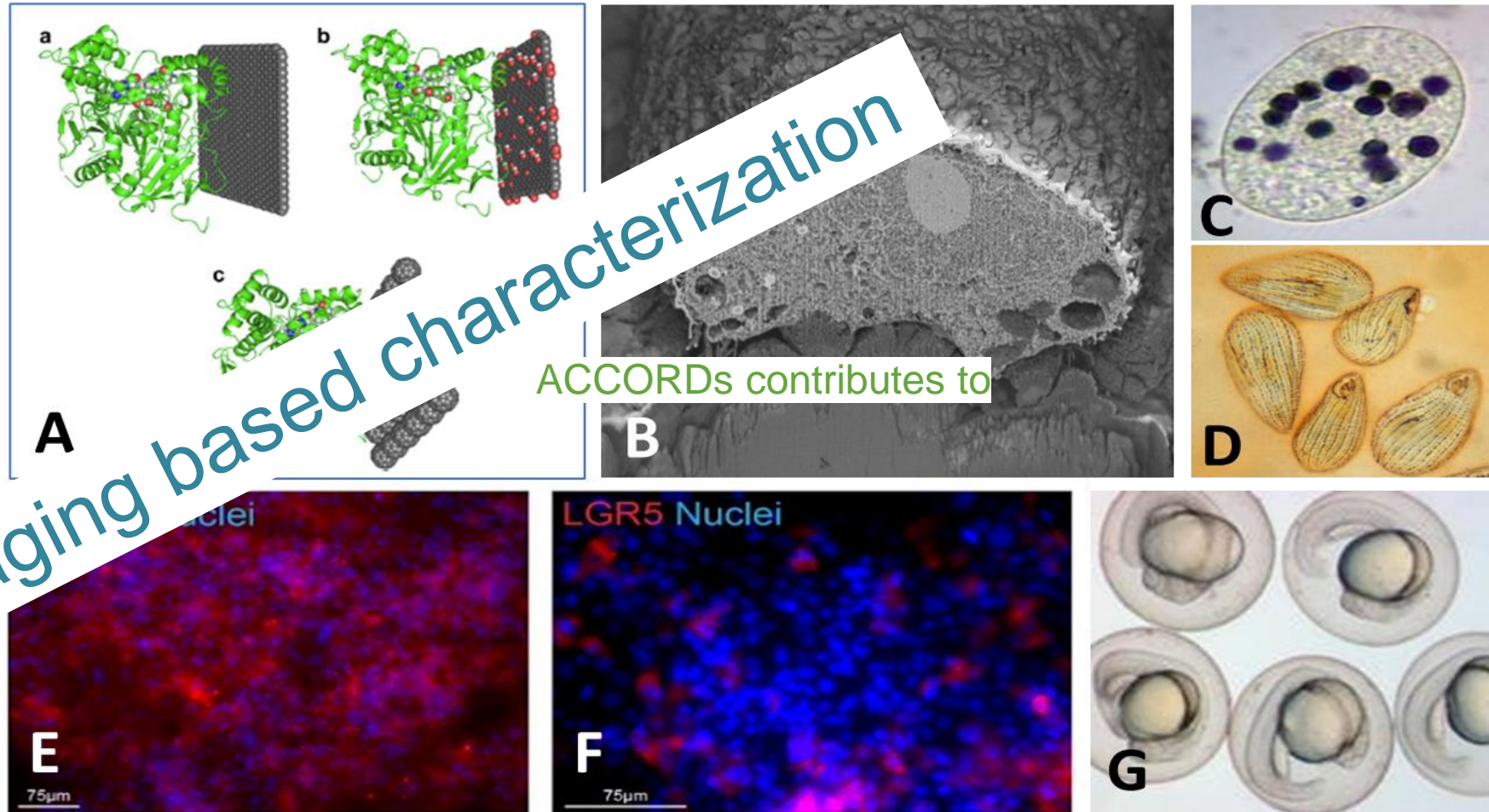
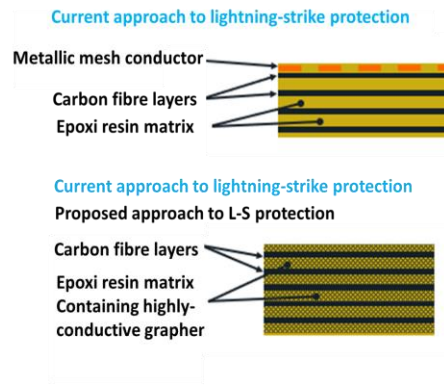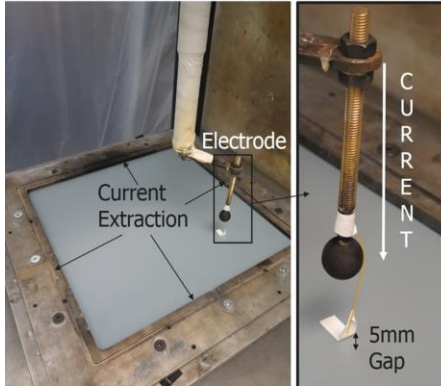# Physico-chemical characterisation methods

Physico-chemical characterisation. *Overview of selected physico-chemical methods and 2D nanomaterials (functionalized and pristine) for correlative characterization.*

Biological characterization methods

Imaging based characterization

ACCORDs contributes to

Case studies

Case study 1. *Lightning strike protection.* **Left)** *test set-up for assessing lightning strike performance of Haydale's* **graphene enhanced composite panels**. *(Led by* **Right)** *diagram demonstrating the difference between conventional and graphene enhanced lightning strike protection composites Haydale).*
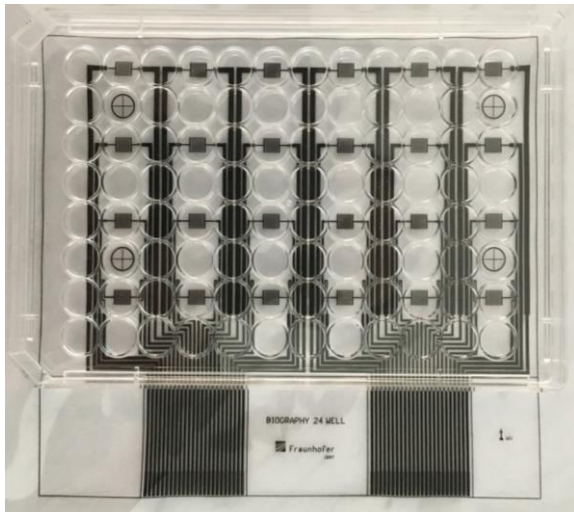
Case study 2. *Haydale graphene enhanced* **printed bio-sensor array** *developed under ERANET MERANET Biography Project (Led by Haydale).*
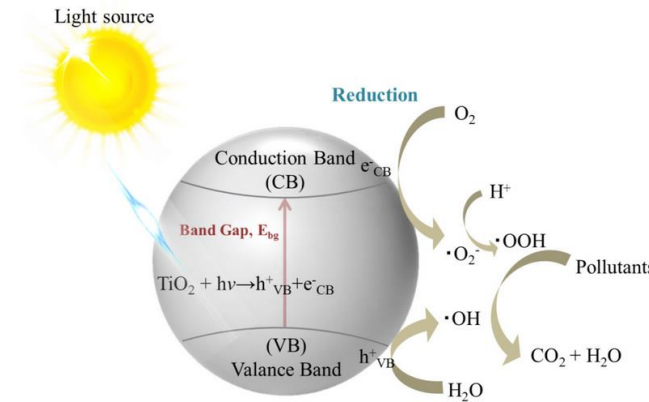
Case study 3. *Graphene used in semiconductor-graphene* **photocatalytic material** *for the abatement of pollutants and environmental applications (Led by UniTo).*

Novelty in approach

Correlative phys-chem analysis

At place

Expert lab

Competence centre

+/- **1st tier** – descriptive morpho and chemical methods

+/- **2nd tier** – advanced morpho and chemical analysis
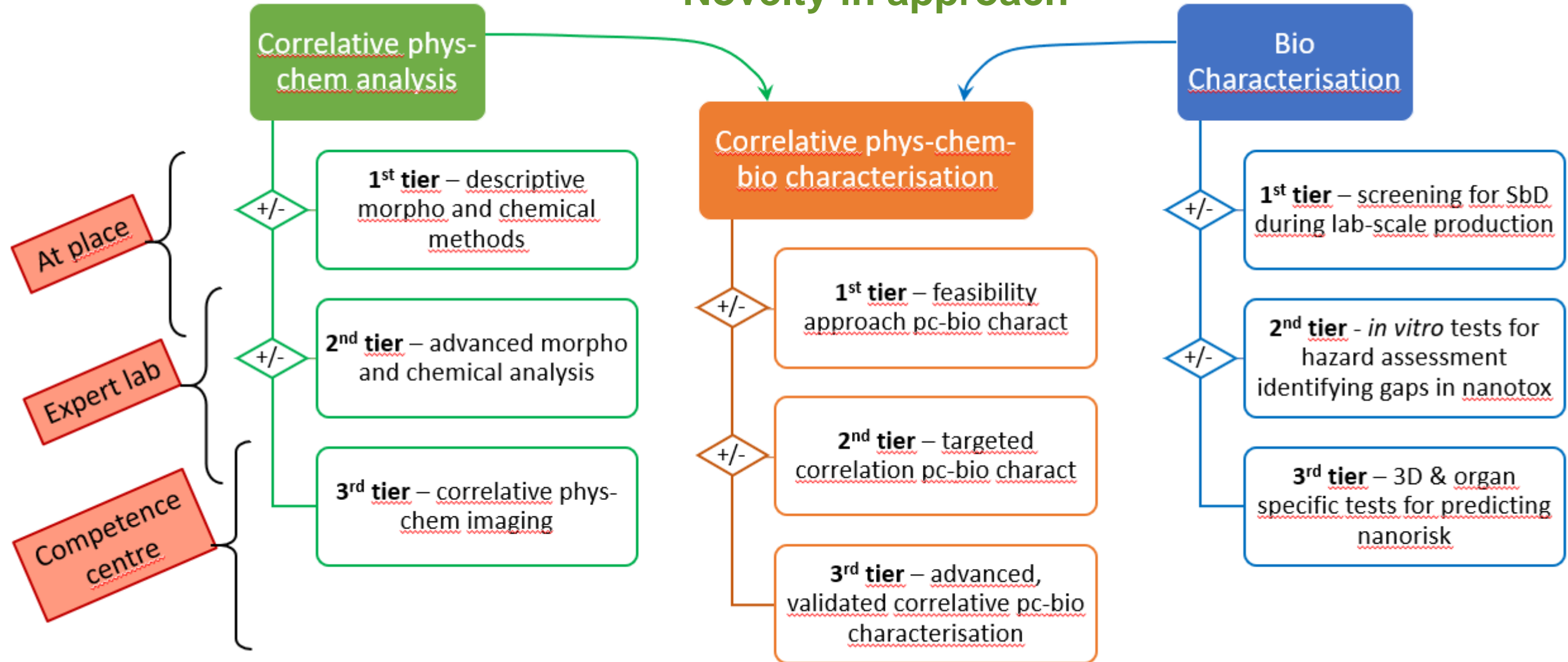
3rd tier – correlative phys-chem imaging

Correlative phys-chem-bio characterisation

+/- **1st tier** – feasibility approach pc-bio charact

+/- **2nd tier** – targeted correlation pc-bio charact

3rd tier – advanced, validated correlative pc-bio characterisation

Bio Characterisation

+/- **1st tier** – screening for SbD during lab-scale production

+/- **2nd tier** - *in vitro* tests for hazard assessment identifying gaps in nanotox

3rd tier – 3D & organ specific tests for predicting nanorisk

correlative imaging-based characterization for safety profiling

What ACCORDs will deliver:

ACCORDs will aim at the following specific objectives:

Objective O1: To develop purpose-oriented <u>correlative approaches</u> for the characterization and quantification of 2D nanomaterials as produced and in complex matrices and determination of their transformations in such environments.
Outcomes: ACCORDs will deliver a new imaging-based correlative characterisation framework including **new regulatory compliant characterization methods** (<u>5-10 **new** methods</u>)

Objective O2: To <u>increase the availability of validated</u> protocols to advance both nanosafety studies and material characterisation and deliver improved data reporting guidelines.
Outcomes: <u>Up to 10 **new** standard operating procedures (SOPs),</u> new TMDFs along with TDRFs as a basis for data/images FAIRification, and decision-making workflows, computational modelling, and grouping and read-across.

Objective O3: To ensure appropriate, realistic *in vitro* models to address current gaps in nanotoxicology.
Outcomes: New imaging-based protocols (<u>up to 5 **new** protocols</u> are expected) will be integrated with already available ones to assure a correlative and tiered approach to advance nanosafety testing.
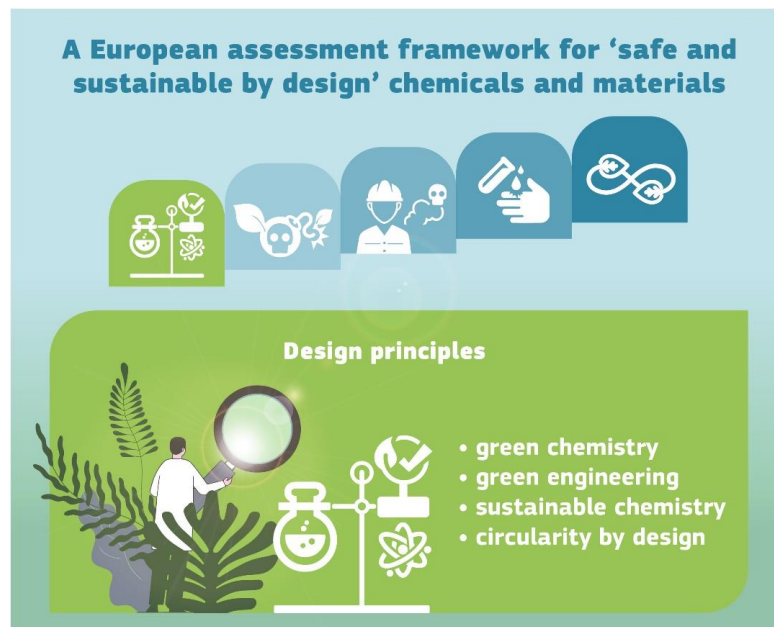
Objective O4: To deliver reliable data to support computational modelling and the development of grouping and read-across methods
Outcome: Artificial Intelligence (AI) and machine learning-based analysis of material properties will provide new models supporting product design and decision-making.

Objective O5: To develop harmonised standard operating procedures (SOPs) that can be used in a regulatory framework, including test hazard assessment, biodegradability, and sustainability for advanced 2D nanomaterials.
Outcome: Up to 5 proposals for new technical documents for standards and guidelines to international standardisation bodies.


A European assessment framework for 'safe and sustainable by design' chemicals and materials

Design principles

- green chemistry
- green engineering
- sustainable chemistry
- circularity by design

ACCORDs contributes to
Safe and sustainable by design (SSbD)

Supporting decision making

SSbD 2D material containing products

ATLAS of Images for 2D material safety diagnostics

Simple, user friendly tool for safe by design decision making during production and end of life decision making on safety

ACCORDs contributes to
Strategic R&I Plan for chemicals and materials
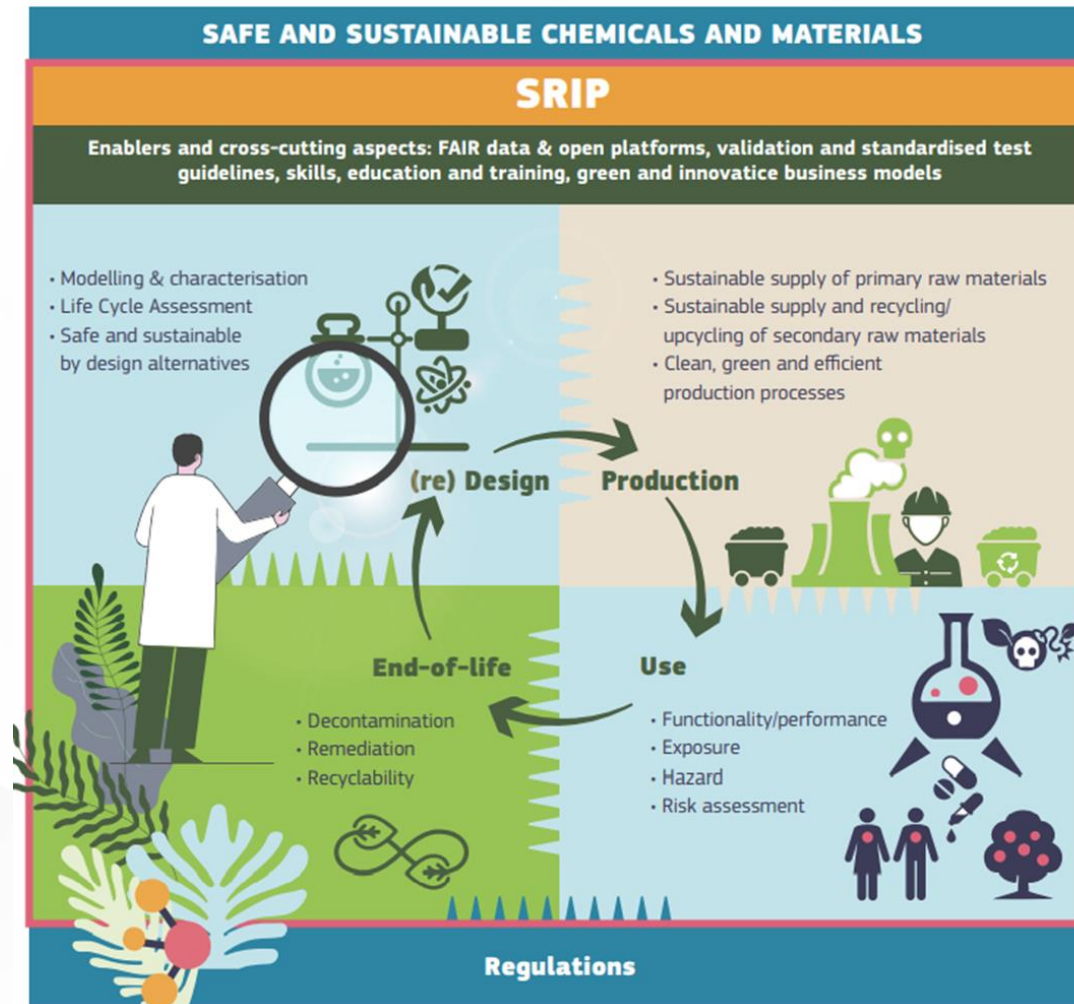
- Published in October 22: https://ec.europa.eu/assets/rtd/srip/2022/

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https://accordsproject.com/

Hvala za pozornost!