



MULTIDIMENSIONAL INTEGRATED QUANTITATIVE APPROACH TO ASSESS SAFETY AND SUSTAINABILITY OF NANOMATERIALS IN REAL CASE LIFE CYCLE SCENARIOS USING NANOSPECIFIC IMPACT CATEGORIES

This project has received funding from the European Union's Horizon Europe research and innovation programme under GA No 101138414

Kick-off Meeting

23th - 24th January 2024

Minutes



Summary

The meeting has been hosted by Hotel Cavour in the meeting room “Aula Manzoni” and it has been organized by the coordinator UNIMIB.

The KOM of the project has been organized in hybrid format both in presence and online in order to allow all partners to be present and participate with their contributions.

The first day was dedicated to project introduction, partners presentation, welcome from the Project Officer and seminar on SSbD framework. An overall overview of the project was provided by Paride Mantecca from UNIMIB and Massimo Perucca from PRJ. Each partner was given 5 minutes to introduce the organization/company, the role in the project and the team that will be involved in the assigned tasks.

At the end of the day a virtual tour of Milan has been organized by UNIMIB in collaboration with a city guide.

The second day of the meeting has been dedicated to the presentation of each Work Package and related task and to the description of the planned activities for the following 6 months. A discussion on Nanoforms materials case studies has been delivered.

The agenda of the 2 days is annexed to this document.



Participants List

	Partner's company name	Surname	Name	In presence / Online	Participants day 1	Participants day 2
1	UNIMIB	Bengalli	Rossella Daniela	In presence	YES	YES
1	UNIMIB	Gualtieri	Maurizio	In presence	YES	YES
1	UNIMIB	Negrini	Beatrice	In presence	YES	YES
1	UNIMIB	Mantecca	Paride	In presence	YES	YES
1	UNIMIB	Marchetti	Sara	In presence	YES	YES
1	UNIMIB	Rostagno	Roberta	In presence	YES	YES
2	ARCHE	Eliat	Maxime	In presence	YES	YES
2	ARCHE	Koivisto	Joonas	In presence	YES	YES
3	CeNTI	Monteiro	Andreia	In presence	YES	YES
3	CeNTI	Coelho	Lorena	In presence	YES	YES
4	CNR (IAS)	Garaventa	Francesca	In presence	YES	YES
4	CNR (IAS)	Gambardella	Chiara	In presence	YES	YES
4	CNR (IAS)	Costa	Elisa	In presence	YES	YES
4	CNR (ISAC)	Nicosia	Alessia	In presence	YES	YES
4	CNR (ISAC)	Belosi	Franco	Online	YES	YES
4	CNR (ISAC)	Ravegnani	Fabrizio	Online	YES	YES
4	CNR (ISSMC)	Costa	Anna Luisa	In presence	YES	YES
4	CNR (ISSMC)	Blosi	Magda	In presence	YES	YES
4	CNR (ISSMC)	Ortelli	Simona	In presence	YES	YES
4	CNR (ISSMC)	Serantoni	Marina	In presence	YES	YES
4	CNR (ISSMC)	Zanoni	Ilaria	In presence	YES	YES
4	CNR_SCITEC	Boggioni	Laura	In presence	YES	YES

	Partner's company name	Surname	Name	In presence / Online	Participants day 1	Participants day 2
4	CNR-ISMN Palermo	Deganello	Francesca	In presence	YES	YES
4	CNR-ISMN Palermo	Liotta	Leonarda Francesca	Online	YES	YES
4	CNR-ISMN Palermo	Aliotta	Chiara	Online	YES	YES
4	CNR-ISMN Palermo	La Parola	Valeria	Online	YES	YES
4	CNR-ISMN Palermo	Testa	Maria Luisa	Online	YES	YES
5	AITEX	Blanes	Maria	In presence	YES	YES
5	AITEX	Marco	Bruno	In presence	YES	YES
5	AITEX	Pascual	Carlos	Online	NO	NO
6	BIU	Dudchenko	Natalia	In presence	YES	YES
6	BIU	Yael	Perlman	In presence	YES	YES
7	VERL	Hristova	Hristina	In presence	YES	YES
7	VERL	Tashev	Todor	In presence	YES	YES
7	VERL	El Aouad	Noureddine	In presence	YES	YES
8	UNITO	Nicola	Marco	In presence	YES	YES
8	UNITO	Garino	Claudio	In presence	YES	YES
8	UNITO	Gobetto	Roberto	In presence	YES	YES
8	UNITO	Magnacca	Giuliana	In presence	YES	NO
9	PRJ	Perucca	Massimo	In presence	YES	YES
9	PRJ	Truffa	Stefania	In presence	YES	YES
9	PRJ	Murray	Benjamin Samuel	In presence	YES	YES

	Partner's company name	Surname	Name	In presence / Online	Participants day 1	Participants day 2
9	PRJ	Stopponi	Chiara	In presence	YES	YES
10	ROV	Tonani Tomason	Ivonne	In presence	YES	YES
11	B4C	Kadrispahic	Haris	Online	YES	YES
11	B4C	Zahrtmann	Nanette	In presence	YES	YES
12	DRT	Tiemann	Janina	In presence	YES	YES
12	DRT	Michaelis	Annika	In presence	YES	YES
12	DRT	Voss	Marcel	In presence	YES	NO
13	JRC	Garmendia Aguirre	Irantzu	In presence	YES	YES

Agenda

Location	Hotel Cavour Via Fatebenefratelli, 21 20121 Milano specialevents@hotelcavour.it http://www.hotelcavour.it/
Coordinator	University of Milano-Bicocca
Participants	University of Milano-Bicocca (UNIMIB), ARCHE Consulting (ARCHE), Centre for Nanotechnology and Smart Materials (CENTI), Consiglio Nazionale delle Ricerche (CNR), Asociación de Investigación de la Industria Textil (AITEX), Bar-Ilan University (BIU), Venus Roses Lab Solutions (VERL), University of Torino (UNITO), Project HUB-360 (PRJ), Red of View (ROV), B4Ceramics (B4C), Dermatest (DRT), Joint Research Centre (JRC).

DAY #1

Tuesday 23th January 2024

Link for online participants:

<https://unimib.webex.com/unimib/j.php?MTID=m1afc551cf43fb2b0d1d507aff4b623a5>

Password: *integrano*

13:00 – 14:00	Arrival and gathering	
14:00 – 14:15	Welcome and introduction	Prof. Paride Mantecca <i>University of Milano-Bicocca</i>
14:15 – 14:30	Welcome to partners from the Project Officer	Antonios Konstantas, PhD <i>European Commission</i>
14:30 – 15:45	Project partners introduction	Order of introductions: UNIMIB ARCHE CENTI

CNR
 AITEX
 BIU
 VERL
 UNITO
 PRJ
 ROV
 B4C
 DRT

15:45 – 16:15	Coffee break	
16:15 –17:00	Seminar: The Safe and Sustainable by Design (SSbD) framework.	JRC
17:00 –17:40	Project introduction and main aims	Paride Mantecca UNIMIB, Massimo Perucca PRJ
17:40 –18:00	Milan virtual tour – Social experience	All

20:00 **Social dinner** **Rosso Brera (Trattoria Meneghina)**
[Via Marco Formentini,7 - Milano](#)

[the cost will be borne by each participant]

DAY #2

Wednesday 24th January 2024

Link for online participants:

<https://unimib.webex.com/unimib/j.php?MTID=m1afc551cf43fb2b0d1d507aff4b623a5>

Password: *integrano*

8:45 - 9:00	Arrival and gathering	
09:00 – 9:30	Welcome and introduction	Paride Mantecca UNIMIB
09:30 – 10:00	WP1: Definition of Case Studies, Data Management and Digital DST.	CNR
10:00 – 10:30	WP2: Experimental Data Generation: NMs Provision and Characterisation M-Measure	CENTI
10:30 – 11:00	Coffee break	
11:00 – 11:30	WP3: Nano Tox and Nano Eco-Tox Data Generation.	UNIMIB
11:30 – 12:00	WP4: Analysis, Assessment and Prediction Models.	ARCHE
12:00 – 12:30	WP5: NMs Integrated Impact Assessment for SSbD Based Solutions: Design and Validate.	PRJ
12:30 – 13:00	WP6: Stakeholders Engagement, Communication and Dissemination.	AITEX
13:00 – 14:30	Lunch break.	
14:30 – 14:45	WP7: Management, Coordination and Administrative issues	UNIMIB - PRJ
14:45 – 16:15	Integrano nanoforms portfolio and project roadmap: nanomaterials, applications and case studies (I/II)	Massimo Perucca PRJ and partners (materials owners)
16:15 – 16:45	Coffee break.	
16:45 – 17:30	Integrano nanoforms portfolio and project roadmap (II/II)	All
17:30	Closing remarks	

DAY #1

Tuesday 23th January 2024

Welcome and introduction

Prof. Paride Mantecca - UNIMIB

During this quick presentation the project was introduced to everybody with some summary slides on duration, consortium and key concepts.

Project partners introduction

All

All the 12 partners briefly presented their organization, their role in the project and the team involved. In comparison to the original agenda, it was decided to have partners presentation first, and then the Project Officer presentation.

Welcome to partners from the Project Officer

Antonios Konstantas, PhD - European Commission

In this presentation the Project Officer explored the following topics:

- European Health and Digital Executive Agency (HaDEA)
- HaDEA's role: managing EU programmes, feeding into the policy-making process the project's outcome & success stories, in charge of the whole project life.
- Topic and Project: call, type of action, EU funding, duration.
- Project Implementation: operational remarks, Communication – Dissemination – Visibility, Visibility – European flag and funding statement.

Seminar: The Safe and Sustainable by Design (SSbD) framework

Irantzu Garmendia Aguirre - JRC

The presentation touched the following key points:

- JRC mission
- JRC technologies for health
- SSbD framework introduction
- Safety and sustainability assessment
- SSbD framework in R&I

Project introduction and main aims

Prof. Paride Mantecca - UNIMIB; Massimo Perucca - PRJ

The presentation touched the following key points:

- Project general information
- Consortium introduction
- Project background
- KoM objectives

DAY #2

Wednesday 24th January 2024

Work Packages

The 7 WPs were presented by the WP leaders and task leaders. In comparison to the original agenda, it was decided to have the presentations on nanofoms after WP1.

WP1

Definition of case studies, data management and digital DST

Leader: CNR

WP1 Tasks

WP1			Year 1				Year 2				Year 3				Year 4			
Task	Title	Leader	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.1	Data generation and management plan for impact assessment	CNR																
1.2	Addressing case studies specific goal and scope	CNR																
1.3	Dedicated Algorithms and digital Decision Support Toolbox implementation for NMs	PRJ																

WP1 Deliverables

Del.	Title	Lead Beneficiary	Diss. Level	Due Month	Date
D1.1	First data management plan	CNR	PU	3	March 2024
D1.2	Report on the goal and scope of addressed case studies, including KDFs and KPIs definition	PRJ	SEN	18	June 2025
D1.3	Digital Decision Support Toolbox for quantitative based integrated impact assessment towards SSbD solutions	PRJ	SEN	24	December 2025
D1.4	Final data management Plan	CNR	PU	18	June 2025

Work planned for the next 6 months

- Scheduling CASE STUDIES BOARD monthly meeting.
- First update on CS.
- Prioritising the list of material ready to be delivered and the strategy (coding, central repository or not, materials owners/contacts, list of materials and of requests to be updated).

Task 1.1

Data generation and management plan for impact assessment

Leader: CNR

INTEGRANO relies on specific DATA generated within the project.

INTEGRANO data generation plan is based on obtaining the minimum and necessary amount of data per addressed case study that will enable the SSbD analysis.

Essential requirements are:

- Data quality
- Data reliability

FAIR data: Findable, including provisions and metadata <-> they will be collected in a common repository, as generated; Openly accessible <-> (as above, for internal accessibility) + clear definition of data ownership and possibility of data disclosure outside the consortium; Making data interoperable; Increase data re-use (through clarifying licenses) <-> connected to exploitation task (Data & KERs).

Task 1.2

Addressing case studies specific goal and scope

Leader: CNR

The Task will require:

- Definition of the overall case study, including final addressed application(s), intended use and NFs/NEPs life cycle
- Multilevel definition of system and system boundaries (e.g. for each LC stage), including circularity options
- Definition of technical unit(s) and functional unit(s)
- Specification of assumptions, hypothesis
- Identification and specification of proxies
- Definition of precision and accuracy levels, cut offs
- Definition of the specific addressed Key Performance Indicators associated to the Safety, Sustainability (environmental, economic and social), Functional (material, process, product functionalities) dimensions (e.g. ROS, cell viability, CFP, antibacterial, ...)
- Identification and selection of continuous or discrete Key Decision Factors (KDFs) with the support of (e.g. synthesis) process experts based on:
 - Assessed experience on expected influence extent of factors on identified performance indicators.
 - Preliminary screening campaigns for ranking KDFs influence
- Definition of the DoE matrices and the multidimensional DoE plan, including the associated VDoE for the different KPIs assessment referred to each assessment dimension (safety, environmental, costs, social, functional) for the addressed life cycle stage.

Below is a snapshot of the previously selected case studies:

CASE STUDY 1: Medical textile (CNR-ISSMC)

NMs	Synthesis/Extraction	Incorporation technology	Functionality (Abatement of biological contaminants)
Ag and TiO ₂ -based nano-composites	Sol-gel	Dip-coating / Spray-coating	Antimicrobial
CuO/ZnO	Sonochemical synthesis	Ultrasound	Antimicrobial

CS N. 1-1
CS N. 1-2

CASE STUDY 2: Water membrane (CNR-ISMN)

NMs	Synthesis/Extraction	Incorporation technology	Functionality (Abatement of contaminants of emerging concern)
Perovskite oxide (Sr/Ferrite doped) NANOTHEC-ABA, NANOPERWATER	Solution Combustion Synthesis Citrate-assisted Sol-Gel	Dip-coating (ISMN) Ultrasound (BIU)	Thermocatalysis (membrane support SIC, B4Ceramics)

CASE STUDY 3: Automotive / Elastomer (CNR_IPCB/ CNR-SCITEC)

NMs	Synthesis/Extraction	Incorporation technology	Functionality (mechanical properties)
Bio-SiO ₂ (Functionalisation, SCITEC)	Extraction from rice-husk (CENTI)	Fillers of polymers (foaming, IPCB)	Reinforcement

CASE STUDY 4: Air filters (CNR-ISAC)

NMs	Synthesis/Extraction	Incorporation technology	Functionality (Abatement of particulates, VOCs)
CaCuSi ₄ O ₁₃ / CaOCu(SiO ₂) ₄ (UNITO)	Solid State	Sintering, Electrospinning, Dip/Spray-coating, turbomixing, and turboemulsification	Antimicrobial, high-temperature resistance Photoluminescent energy
Polymer nano-fibers	Polymerisation	Electrospinning	Micro-organisms - entrapping patches

CS N. 4-1
CS N. 4-2

CASE STUDY 5: Food packaging (BIU)

NMs	Synthesis/Extraction	Incorporation technology	Functionality (Preservation)
C-dots (BIU)	Sol-gel	Ultrasound	Shell-life extension

CASE STUDY 6: Cosmetic (ROV)

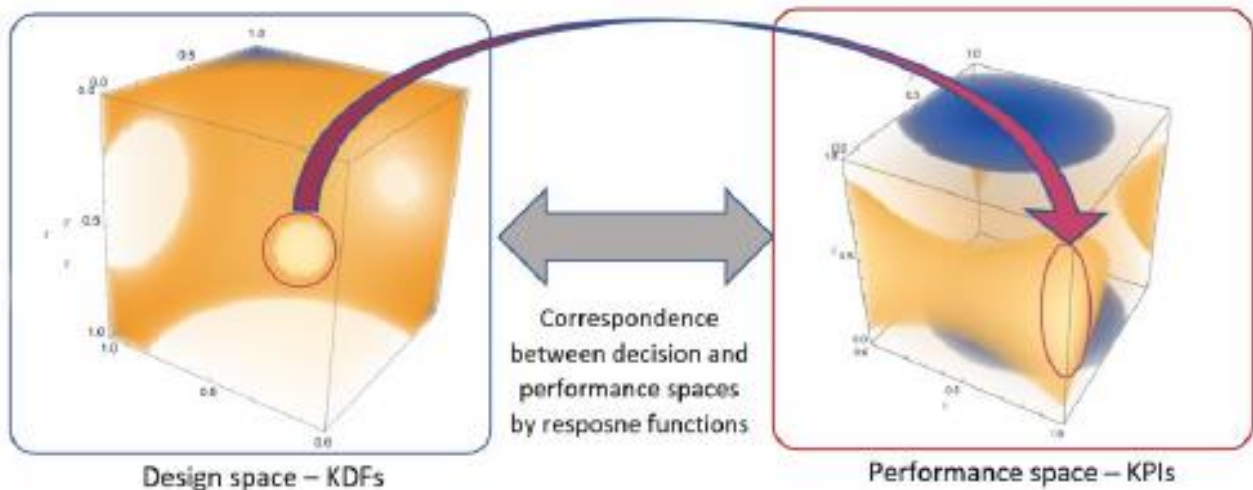
NMs	Synthesis/Extraction	Incorporation technology	Functionality (mechanical properties)
Hybrid Ag / TiO ₂ -based nano-forms, (ISSMC)	Sol-gel	Turbo-mixing (ROV) (emulsion, anhydrous products, capsules)	To be investigated
SiO ₂ -based hybrids (from rice husk ?)	Colloidal functionalisation	Turbo-mixing (ROV) (emulsion, anhydrous products, capsules)	To be investigated
C-dots	Ultrasound	Turbo-mixing (ROV) (emulsion, anhydrous products, capsules)	Lip-stick moisturising
Active capsules	Functionalised patches	Electro-spinning	To be investigated

Task 1.3

Data generation and management plan for impact assessment

Leader: PRJ

Dedicated Algorithms and digital Decision Support Toolbox will be implemented for the synthesis and incorporation of nanomaterials (NMs). PRJ will design and implement the INTEGRANO digital DST that will implement algorithms for: assessing correlation between set KDFs values in the DoE matrices and obtained KPIs values from experimental measurement and computation referred to the 5Ds for each NMs LCS; Multi-Objective Optimisation Design (MOOD) to sort among all possible design cases the multi-optimal ones, simultaneously complying with safety, sustainability and functional KPIs requirements. INTEGRANO will enable integrating the safety and nano-safety dimensions that will be computed exploiting standardized LCA and SCLA frameworks.

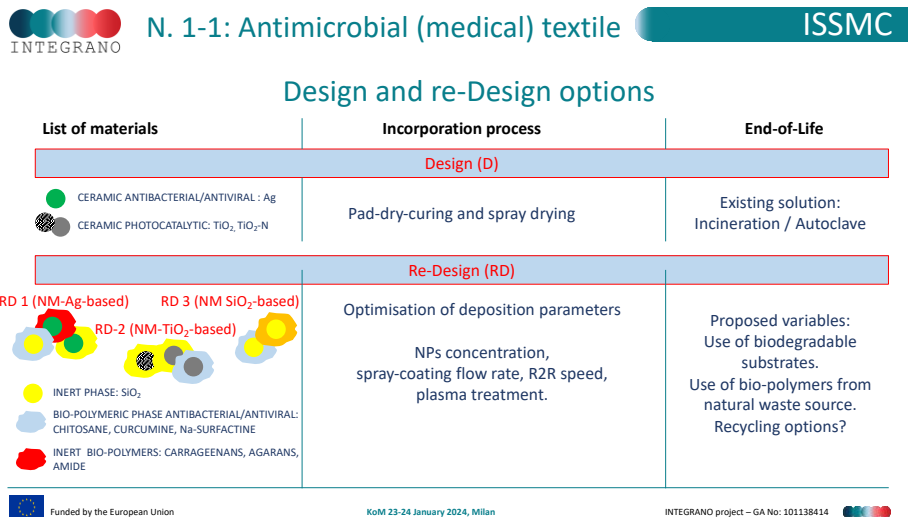


Meetings planning for the next 6 months

WHO	TOPIC	WHEN
Partners	Activities and planning	Frequency
Case studies board	Improve INTEGRANO Case Studies roadmap, prioritizing list of materials and NEPS, detailing experimental campaigns and assessment Gantt	Monthly
Anna Costa (CNR) / Massimo Perucca (PRJ)	First release of management Plan (D 1.1)	First week of March

Integrano nanoforms portfolio and project roadmap: nanomaterials, applications and case studies

Each nanoform owner provided a presentation focusing on the description of the NF. In the following schemes the list of materials, with design alternatives considered are reported, referred to each case studies.





N. 1-2: Antimicrobial (medical) textile

BIU

Design and re-Design options

List of materials	Incorporation process	End-of-Life
Design (D)		
CuO/ZnO_D	Sonication synthesis and coating	Existing solution: Waste
Re-Design (RD)		
CuO/ZnO coating_RD 1	Optimization (CuO/ZnO quantity, coating velocity, ultrasonic power, etc.)	Proposed variables: Usage of biodegradable substrates. Recycling options?
CuO/ZnO application_RD 2	Optimization (coating of various substrates with CuO/ZnO for further possible applications) <i>Process variables:</i> NMs quantity, coating velocity, ultrasonic power	



N.2: Water Membranes

CNR-ISMN

Design and re-Design options

List of materials	Incorporation process	End-of-Life
Design (D)		
Ce-doped SrFeO ₃ -SiO ₂ _D	Dip-Coating from <u>solution comb. sol on SiC scraps</u> Scale-up of the coating procedure Integration in the <u>Triple Packed Bed Reactor</u>	<u>Existing solutions:</u> waiting for the <u>final integration</u> of the system (however it produces already a very small amount of waste)
Re-Design (RD)		
Ce-doped SrFeO ₃ -SiO ₂ _RD 1 (from <u>rust waste as iron precursor</u>) Ce-doped SrFeO ₃ -SiO ₂ _RD 2 (from <u>silica obtained from rice husk as silica precursor</u>)	Optimisation of the coating procedure Optimization of the scale-up procedure <i>Process variables:</i> 1. Wt.% of coated active phase; 2. Number of SiC scraps produced in a single batch; 3. Concentration of emerging contaminants in treated water	<i>Proposed variables:</i> 1. How many times the TPBR can be used with a performance higher than 80%; 2. How much active phase or is leached from the SiC scraps in a given time



N. 3: Bio-based Composite PU foam

CNR-IPCB and SCITEC

Design and re-Design options

List of materials	Incorporation process	End-of-Life
Design (D)		
Bio-Fillers (Silica) + Bio-based Polyols (<u>Isocyanates, Additives (catalysts, surfactants, blowing agents)</u>)	Formulation of Composite Polyurethane foams	Existing solution: Chemical <u>recycling</u>
Re-Design (RD)		
Different Fillers (<u>diatomites, gas beton ultramilled, silica/diatomite, cellulose-CNC</u>) + <u>Bio-polyols</u>	<i>Process variables:</i> • increase the <u>amount</u> of additives to reduce the viscosity of the composite formulation • optimization of process parameters of pilot-plant	<i>Proposed variables:</i> To be evaluated during project activities

INTEGRANO **N 4.1: Air Filters** **CNR-ISAC**
Design and re-Design options **UNITO AITEX**
CENTI

List of materials	Incorporation process	End-of-Life
Design		
CaCuSi ₄ O ₁₀ 1) micro-powder: solid-state from SiO ₂ fumed 2) bulk: melt-flux from SiO ₂ fumed 3) nanosheets: exfoliation from micro-powder	1) micro-powder: electrospinning; 2) bulk: sintering; 3) nanosheets: electrospinning Direct integration of CaCuSi ₄ O ₁₀ sintered disc inside filtering system (2) or integration of textile supports, through electrospinning (1, 3) or dip/spray-coating	Recycling cycles through thermal or chemical treatments
Re-Design (RD)		
CaCuSi ₄ O ₁₀ 1) micro-powder: solid-state from SiO ₂ bio 2) bulk: melt-flux from SiO ₂ bio 3) nanosheets: exfoliation from micro-powder	1) micro-powder: electrospinning; 2) bulk: sintering; 3) nanosheets: electrospinning Direct integration of CaCuSi ₄ O ₁₀ sintered disc inside filtering system (2) or integration of textile supports, through electrospinning (1, 3) or dip/spray-coating	Proposed variables: Optimisation of thermal / chemical treatments for improving recyclability

INTEGRANO **N.4-2: Air Filters** **CNR-ISAC**
Design and re-Design options **AITEX**

List of materials	Incorporation process	End-of-Life
Design (D)		
PA6 (Polyamide 6) - Acetic acid - F<ormic acid PHB Polyhydroxibutirate) - Chloroform	Electrospinning - Pilot Plant at AITEX facilities	Existing solution:
Re-Design (RD)		
CA (Cellulose acetate) Green solvents: - Water - Cyrene - ...	Optimisation (Scale-up) - Mix and solvents proportion - Polymeric concentration - Electrode distance - Applied voltage - Flow rate	Proposed variables:

INTEGRANO **N.5: Food packaging** **BIU**
Design and re-Design options

List of materials	Incorporation process	End-of-Life
Design (D)		
C-dots_D	Sonication synthesis Sonication Coating	Existing solution: Waste
Re-Design (RD)		
C-dots_RD 1 (from more sustainable raw material)	Optimization (Hydrothermal synthesis)	Proposed variables: Recycling Usage of paper to produce food packaging
C-dots coating_RD 2	Optimization (CDs quantity, coating velocity, ultrasonic power, etc.)	
C-dots coating_RD 3 (paper packaging)	Optimization (coating of paper with CDs) Process variables: Green precursors, CDs quantity, coating velocity, ultrasonic power	



Case Study N.6: Cosmetic

ROV

ISSMC
VERL
BIU

NMs	Synthesis/Extraction	Incorporation technology	Functionality (mechanical properties)
Hybrid Ag / TiO ₂ -based nano-forms, (ISSMC)	Sol-gel	Turbo-mixing (ROV) (emulsion, anhydrous products, capsules)	To be investigated
SiO ₂ -based hybrids (from rice husk ?)	Colloidal functionalisation	Turbo-mixing (ROV) (emulsion, anhydrous products, capsules)	To be investigated
C-dots	Ultrasound	Turbo-mixing (ROV) (emulsion, anhydrous products, capsules)	Lip-stick moisturising
Active capsules	Functionalised patches	Electro-spinning	To be investigated

Needs information on active ingredients solubility and toxicity

WP2

Experimental Data Generation: NMs provision and characterisation M-Measure (I)

Leader: CENTI

WP2 Tasks

WP2			Year 1				Year 2				Year 3				Year 4			
Task	Title	Leader	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
2.1	Synthesis and Provision of the NM groups for targeted applications	CENTI																
2.2	Data mining	CNR																
2.3	NMs Characterisation program for selected NMs: size, morphology, p-chem properties	CNR																
2.4	Characterisation and Detection of NMs and NEPs in real-case LC scenarios	CNR																
2.5	Determination of safe condition of Use (CoU) and Risk Assessment (RA)	ARCHE																

WP2 Deliverables

Del.	Title	Lead Beneficiary	Diss. Level	Due Month	Date
D2.1	Set of NMs samples	CENTI	PU	24	December 2025
D2.2	INTEGRANO integrated database (DB) periodic release	CENTI	PU	36	December 2026
D2.3	DB on NMs detection campaigns in real and simulated environment for Fate Factors assessment	CNR	PU	42	June 2027
D2.4	Report on Conditions of Safe Use	ARCHE	PU	42	June 2027

Work planned for the next 6 months

- Definition of the NMs, synthesis processes and possible re-designs;
- Definition of the NMs amounts to be produced by each partner – in agreement with the characterization and incorporation technologies needs;
- Identification of the p-chem characterization needs and partner availability, to define the workflow;
- Definition of matrices of exposure to be characterized and exposure scenarios to be monitored.

Task 2.1

Synthesis and Provision of the NM groups for targeted applications

Leader: CENTI

The selected group of NMs will be obtained by various synthesis processes, tailoring the NMs properties for their specific application by changing the synthesis parameters. NMs functionalities and their assessment will support the comparative analysis for functional substitution of conventional chemicals either by direct substitution with NMs or by considering the addressed NMs an enabling factor for functional substitution of conventional materials with other more sustainable and safer materials.

Task 2.2

Addressing case studies specific goal and scope

Leader: CNR

Quantitative data will be searched through a data mining process through nanomaterial identification and nanomaterial information gathering. From this task will be delivered the deliverable 2.2 - INTEGRANO integrated database (DB) periodic release.

Task 2.3

NMs Characterisation program for selected NMs: size, morphology, p-chem properties

Leader: CNR

On this task was presented the available NMs characterization techniques regarding size, morphology and p-chem properties.

Task 2.4

Characterisation and Detection of NMs and NEPs in real-case LC scenarios

Leader: CNR

It is planned on this task the characterization and detection of NMs and NEPs in real-case LC scenarios. For this, dedicated field campaigns will be set up to obtain the NMs emissions into the environment by sampling process. From this task will be delivered the deliverable 2.3 - DB on NMs detection campaigns in real and simulated environment for Fate Factors assessment.

Task 2.5

Determination of safe condition of Use (CoU) and Risk Assessment (RA)

Leader: ARCHE

It is planned the setting of safe CoU according to ECHA Chapter R.14 (occupational) & R.15 (consumer) for value-chain processes and products considering nano-enabled product formulation (occupational) and use phase (consumer).

Meetings planning for the next 6 months

WHO	TOPIC	WHEN
Partners	Activities and planning	Frequency
Nanoforms owners	Definition of the NMs, synthesis processes and possible re-designs	March, 2024
All	Definition of the NMs amounts to be produced by each partner – in agreement with the characterization and incorporation technologies needs	March, 2024
All	Identification of the p-chem characterization needs and partner availability, to define the workflow	March, 2024
CNR and CeNTI	Definition of matrices of exposure to be characterized and exposure scenarios to be monitored	June, 2024

WP3

Nano Tox and nano eco-tox data generation

Leader: UNIMIB

WP3 Tasks

WP3			Year 1				Year 2				Year 3				Year 4			
Task	Title	Leader	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
3.1	Ecotoxicity: Fate and effects in biological and environmental relevant matrices	CNR																
3.2	Collecting toxicity data and filling gaps for an early identification of hazard potential. CFs for toxicological assessment by in-vitro advanced models	UNIMIB																

WP3 Deliverables

Del.	Title	Lead Beneficiary	Diss. Level	Due Month	Date
D3.1	Quantitative assessment of Ecotoxicity endpoints for indication of suitable nano-specific EE for marine and terrestrial environment eco-toxicity ICs	CNR	PU	44	August 2027
D3.2	Relevant dose-response functions for the NMs in their different LC stages, for human and environmental toxicology outcomes supporting the definition of nanospecific EE for human and environmental toxicity ICs	UNIMIB	PU	44	August 2027

Work planned for the next 6 months

WP3 will start from month 6. During the next three months preliminary activities such as collection of novel protocol, preliminary tests to set up the exposure procedure will be performed. The main activities will start, according to the submitted Gantt.

Task 3.1

Ecotoxicity: Fate and effects in biological and environmental relevant matrices

Leader: CNR

The main Task goals have been presented and their possible contribution in each Case Study has been described. The main ecotoxicological approaches that can be applied have been presented. Briefly, the ecotoxicological assessments will focus on the ecosafety assessment of the materials/products prior to their use, to prevent detrimental effects in the marine (water, sediments) and terrestrial (water, soil) environments by using standard and innovative bioassays. Batteries of bioassays available at CNR that are based on model test-species belonging to different trophic levels (Bacteria, Algae, Crustaceans, Rotifers, Echinoderms, Molluscs) have been described. Furthermore, an overview of the standard (e.g. mortality, immobility, growth inhibition) and innovative (e.g. behaviour) ecotoxicological end-points at different levels of sensitivity that can be measured has been performed.

Task 3.2

Collecting toxicity data and filling gaps for an early identification of hazard potential. CFs for toxicological assessment by in-vitro advanced models

Leader: UNIMIB

The goals of the Task 3.2 are presented in the context of WP3 and of the entire project. Subsequently, the main activities foreseen in the task to reach the proposed goals are briefly presented. In particular, the in vitro approaches, for lung and skin exposure pathway are described together with the main partners involved. Also, the Fish Embryo acute Toxicity test (FET) is presented as an alternative model to assess potential effects on human and on the environment. Finally, the interaction of WP3 with other WPs is reported together with the partners that are expected to mainly contribute to the work package activities both directly, by working on the hazard outcomes, and indirectly, by providing knowledge or material useful to fulfill the goals of WP3.

Meetings planning for the next 6 months

WHO	TOPIC	WHEN
Partners	Activities and planning	Frequency
No official meetings are foreseen during the first six months of the project.		

WP4

Analysis, Assessment and Prediction Models

Leader: ARCHE

WP4 Tasks

WP4			Year 1				Year 2				Year 3				Year 4			
Task	Title	Leader	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
4.1	Modelling of environmental NMs fate and exposure	ARCHE	a											b				
4.2	In silico-modelling: training of ML tool and response functions generation	CNR																
4.3	Modelling and Virtualisation of the synthesis and incorporation processes	PRJ																
4.4	Economic and social modelling	BIU												b				

WP4 Deliverables

Del.	Title	Lead Beneficiary	Diss. Level	Due Month	Date
D4.1	Report on the modelling of NM release and human/environmental exposure from relevant industrial case scenarios (T. 4.1)	ARCHE	PU	36	December 2026
D4.2	Integrated DB including characterisation, detection, modelling human and eco-toxicity relevant data based on FAIR principles (T.4.2)	CNR	PU	44	August 2027
D4.3	In silico modelling of response functions (T4.2)	CNR	SEN	30	June 2026
D4.4	Synthesis and incorporation models for integrated LCA, LCC and SLCA (T. 4.3)	PRJ	PU	36	December 2026
D4.5	Report on social and economic modelling and externalities optimization (T.4.4)	BIU	SEN	36	December 2026

Work planned for the next 12 months

The bulk of the work is planned to start in the second year of the project. However some preparatory work will be conducted:

Task 4.1

Establish a framework for emission and release library through nanoparticle lifecycle and update nanomaterial emission and release database.

Establish exposure response functions for general population (Tasks 4.1 and 4.2):

- Consumer exposure modeling framework for nano-enabled products
- Default exposure determinants for public/private indoor settings
- Default exposure determinants for product use

Task 4.3

External monitoring of the activities carried out by the other partners to keep track of the first operational phases of project development: planning of activities, operational choices, testing of the first processes. This approach will allow to start immediately and efficiently with the actual start of task 4.3 in month 12.

Task 4.1

Modelling of environmental NMs fate and exposure

Leader: ARCHE

Arche consulting will work on the modelling of NMs fate and exposure. Emissions will be quantified and documented in libraries that contain information about process, use, weathering, EoL, ... These libraries can then be used to feed the exposure/dispersion models like Gaussian plume models, NanoFASE and SimpleBox4nano.

Task 4.2

In silico-modelling: training of ML tool and response functions generation

Leader: CNR

Use the limited amount of sufficient project-generated data to obtain response functions associating KDFs and KPIs obtained experimental data and by deterministic-mechanistic modelling.

Use external FAIRified (big) data obtained from data mining task (Task 1.2) to train and validate ML algorithms. The project-generated data will be treated by a dedicated curation and interpolation algorithm which will capture non-linear functional dependence of KPIs on KDFs by interconnecting decision and performance spaces.

Generate response functions describing the dependence of NMs p-chem features and toxicity effects levels as a function of synthesis, incorporation parameters, use conditions and EoL options

Task 4.3

Modelling and Virtualisation of the synthesis and incorporation processes

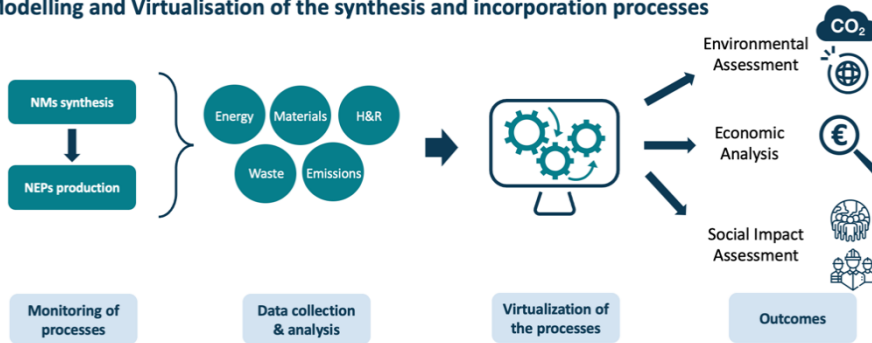
Leader: PRJ

All synthesis and incorporation processes will be analysed and duly modelled, by mapping the energy-mass balance as a function of specific values of the set processing parameters in accordance to the specified DoE matrices.

This will allow virtualising the process in such a way to obtain values for environmental, social economic, impact categories when processing set (KDFs) values are specified.

For each addressed process in the project a process specific digital module will be generated to be integrated in the DST (WP5), thus enabling the SSbD integrated assessment by performing integrated LCA, LCC, S-LCA.

Modelling and Virtualisation of the synthesis and incorporation processes



Task 4.4

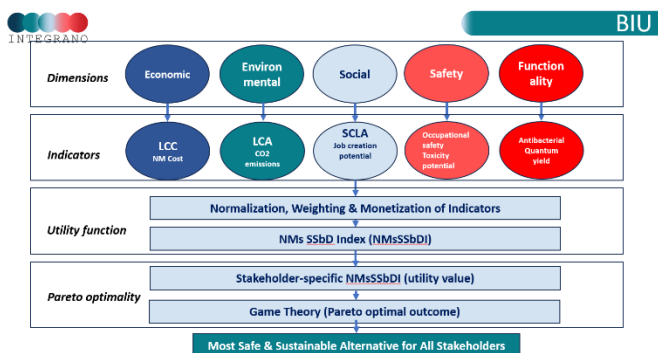
Economic and social modelling

Leader: BIU

Economic and social modelling and monetization of externalities will enable us to identify and quantify the negative externalities that can be avoided through the implementation of NMs, assessing the multiple sustainability criteria using mathematical models.

Based on the multiple sustainability criteria BIU Mgmt. will establish economic and social framework for the selection of safe and sustainable nanomaterial applications using MCDA and game theory. The model will identify the most safe and sustainable alternative for all stakeholders.

Graphical presentation:



Meetings planning for the next 6 months

No meetings planned at the moment, bulk of the work is only going to start in the second year of the project.

WP5

NMs Integrated Impact assessment for SSbD based solutions: Design and Validate

Leader: PRJ

WP5 Tasks

WP5			Year 1				Year 2				Year 3				Year 4			
Task	Title	Leader	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
5.1	Integrated safe and Sustainability assessments	UNIMIB																
5.2	Data completeness and integration	CNR																
5.3	Design Safe and Sustainable NMs	PRJ																
5.4	Verify and Validate	CNR																

WP5 Deliverables

Del.	Title	Lead Beneficiary	Diss. Level	Due Month	Date
D5.1	Report on proposed Impact model for determination of toxicity and ecotoxicity ICs scoring specifically related to NMs	UNIMIB	PU	42	June 2027
D5.2	DB of Safe and sustainability assessment data (integrated LCA, LCC, SLCA) of targeted case studies based on integrated impact model and integrated LCIA	PRJ	PU	42	June 2027
D5.3	Report on validated best SSbD solutions	CNR	PU	48	December 2027
D5.4	Report on project interlaboratory validation	CNR	PU	42	June 2027

Work planned for the next 6 months

WP starts on M18, no specific activities are planned for the next 6 months.

Task 5.1

Integrated safe and Sustainability assessments

Leader: UNIMIB

Main objective: to develop and implement a Life Cycle perspective in the design phase of the selected nanomaterials (NMs) by incorporating hazard, environmental, economic and social aspects, while exploiting existing standards.

Workflow logic and final output:

Task 5.2

Data completeness and integration

Leader: CNR

Main objective: To allow a SSbD quantitative based impact assessment, providing measurable and comparable outputs.

Examples given:

- Cultivation of skin cell/tissue cultures (or other cell culture models) exposed at the air-liquid interface (ALI)
- Measuring oxidative potential (keratinocytes)
- Measuring inflammation parameters (e.g. IL6) in cell culture supernatant

Task 5.3

Design Safe and Sustainable NMs

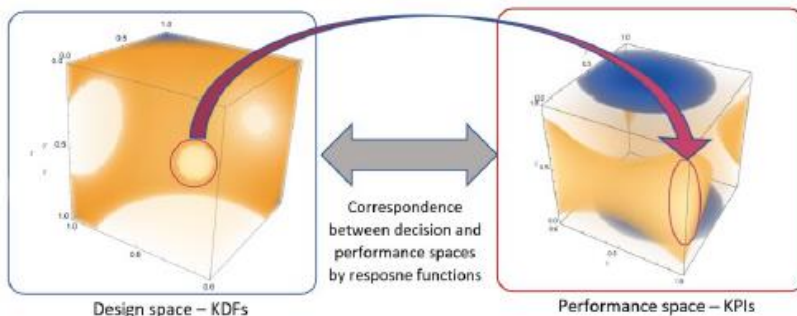
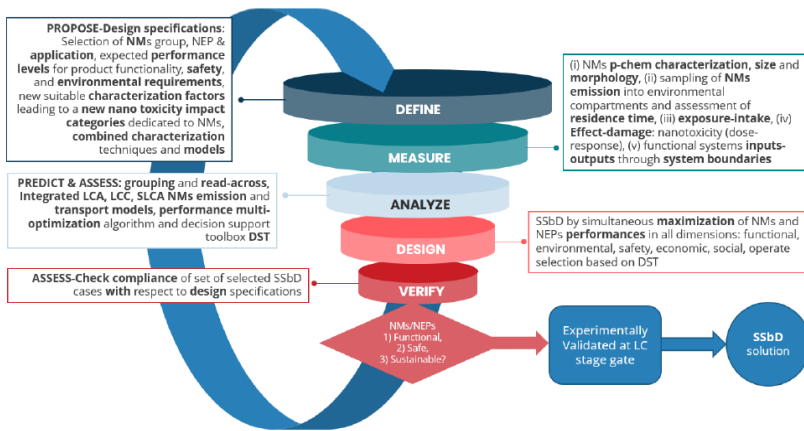
Leader: PRJ

Main objective: find functional dependence of KPIs on KDFs and to sort among all possible KDFs combinations the ones that simultaneously maximise the KPIs.

Task 5.4

Verify and Validate

Leader: CNR



Meetings planning for the next 6 months

WHO	TOPIC	WHEN
Partners	Activities and planning	Frequency
/	/	/

WP6

Stakeholders engagement, communication and dissemination

Leader: AITEX

WP6 Tasks

WP6			Year 1				Year 2				Year 3				Year 4			
Task	Title	Leader	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
6.1	Developing, updating and implementing the INTEGRANO PDER	PRJ																
6.2	Stakeholders' identification and engagement	AITEX																
6.3	Development of Guidelines for integrative impact assessment and SSbD methodology application	UNIMIB																

WP6 Deliverables

Del.	Title	Lead Beneficiary	Diss. Level	Due Month	Date
D6.1	First PDER including communication activities, and updates	PRJ	SEN	3	March 2024
D6.2	Second PDER including communication activities, and updates	PRJ	SEN	18	June 2025
D6.3	Final PDER including communication activities, and updates	PRJ	SEN	36	December 2026
D6.4	Guidelines for integrated assessment of health, social, economic, environmental sustainability	UNIMIB	PU	48	December 2027
D6.5	Project visual identity and website	PRJ	PU	3	March 2024
D6.6	First reports of stakeholder workshops and training plan	AITEX	PU	24	December 2025
D6.7	Second reports of stakeholder workshops and training plan	AITEX	PU	36	December 2026
D6.8	Final reports of stakeholder workshops and training plan	AITEX	PU	48	December 2027
D6.9	IT platform for stakeholders engagement - SSbD Think tank	PRJ	PU	8	August 2024
D6.10	First report on synergies and interaction with other EU projects and initiative	AITEX	PU	36	December 2026
D6.11	Final report on synergies and interaction with other EU projects and initiative	AITEX	PU	48	December 2027

Work planned for the next 6 months

Task 6.1 (communication activities)

- 23/01/2024: PRJ → first version of the roll-up printed
- 20/03/2024: PRJ, AITEX, UNIMIB → first review of D6.1 and D6.5
- 31/03/2024: PRJ → first version of the website available
- 31/03/2024: PRJ → first version of the brochure available (online)
- 29/04/2024: PRJ → first newsletter sent out
- 29/04/2024: PRJ → first standard presentation with project objectives and key messages available

Task 6.2 (identification and engagement activities)

Within next 6 months, a **template will be obtained and distributed through the INTEGRANO partners to identify, collect, and classify sets of stakeholders** representing largely involved sectors and authorities.

Template will include sections with information related to:

- Target group
- Communication channels
- Type of information
- Aim
- Size of audience

Task 6.3 (evaluation activities)

Start collecting relevant literature and guidelines.

Task 6.1

Developing, updating and implementing the INTEGRANO PDER

Leader: PRJ

FORESEEN OUTCOMES

Design and implementation of the following materials:

- project logo and brand identity manual
- online materials (website, Power Point template, Word template, social media posts, newsletters)
- offline materials (roll-up, brochure, poster)

Task 6.2

Stakeholders identification and engagement

Leader: AITEX

- Task 6.2.1 Stakeholders mapping and identification.
- Task 6.2.2 Stakeholders engagement and development of a shared support and agreement.
- Task 6.2.3 Synergies with other funded projects.

Stakeholder identification, such as: policymakers, public authorities, innovation hubs, incubators, NGOs. Connect key players and stakeholders in the EU's chemical and advanced materials sectors to share outcomes, gather feedback, collaborate, communicate, give access to developed tools and guidelines, and invite to join the Advisory Board.

To develop Tools and platforms to promote stakeholders' engagement, such as: communication platform, IT portal, periodic webinars, f2f workshops, general event for SSbD, training, sectorial events and EU conferences.

Task output D6.6, D6.7, D6.8 & D6.9

Actions to promote synergies between EU-funded projects, under calls: CE-NMBP-42-2020; HORIZON-CL4-2023-RESILIENCE-01-21; and HORIZON-HLTH-2022-ENVHLTH-04-01.

Task output D6.10 & D6.11

Task 6.3

Development of Guidelines for integrative impact assessment and SSbD methodology application

Leader: UNIMIB

To develop ghidelines for use of SSbD methodology:

- Analysis of needs from specific stakeholders (policy makers, standardization organizations...) and industries to tailor SSbD guidelines;
- Analysis of the feasibility to integrate into a SSbD guidance of novel technical-performances, environmental-health, social and economic data gathered and sharing of the guidance with stakeholders (ISO committes, OECD...)
- Analysis of the impact of INTEGRANO on the potential innovation of the precautionary principle (PP) also by reviewing the recent cases involving this principle in the safety domain;
- Reviewing of the literature on the application of the PP and evidence-based policies to the chemical regulation field and to the solving of social issues.

Task output D6.4

Meetings planning for the next 6 months

WHO	TOPIC	WHEN
Partners	Activities and planning	Frequency
PRJ, AITEX, UNIMIB	Communication activities check	Every 3 months

WP7

Management and Coordination

Leader: UNIMIB

WP7 Tasks

WP7			Year 1				Year 2				Year 3				Year 4			
Task	Title	Leader	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
7.1	Operational management and quality control of the project and consortium	UNIMIB																
7.2	Financial management	UNIMIB																
7.3	Internal coordination, communication and relation with the Commission	UNIMIB																

WP7 Deliverables

Del.	Title	Lead Beneficiary	Diss. Level	Due Month	Date
D7.1	Quality control plan	UNIMIB	SEN	6	June 2024
D7.2	Tools for operational, technical and contractual management periodic reporting	UNIMIB	SEN	9	September 2024

Work planned for the next 6 months

Organization of 6M General Assembly.

Task 7.1

Operational management and quality control of the project and consortium

Leader: UNIMIB

- Overview on the objectives.
- Introduction to main roles (Project coordinator – CO, Project manager – PM, Project officer – PO, Independent Experts Reviewers (Monitors)).

Task 7.2

Financial management

Leader: UNIMIB

- Overview of eligible and not eligible costs in Horizon Europe
- Personnel costs calculation in Horizon Europe
- Financial rules

Task 7.3

Internal coordination, communication and relation with the Commission

Leader: UNIMIB

- Governance structure
- Funding & Tenders Portal
- Grant Agreement
- Annotated Model Grant Agreement (AGA)
- Contacts

Meetings planning for the next 6 months

WHO	TOPIC	WHEN
Partners	Activities and planning	Frequency
All	6M General Assembly	June 2024