Overview of Bionanopolys Project

Maria Jorda

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Development of safe nano-enabled bio-based materials, bionanocomposites and materials for multifunctional and new advanced applications

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement Nº 953206.

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Innovation Services

End users

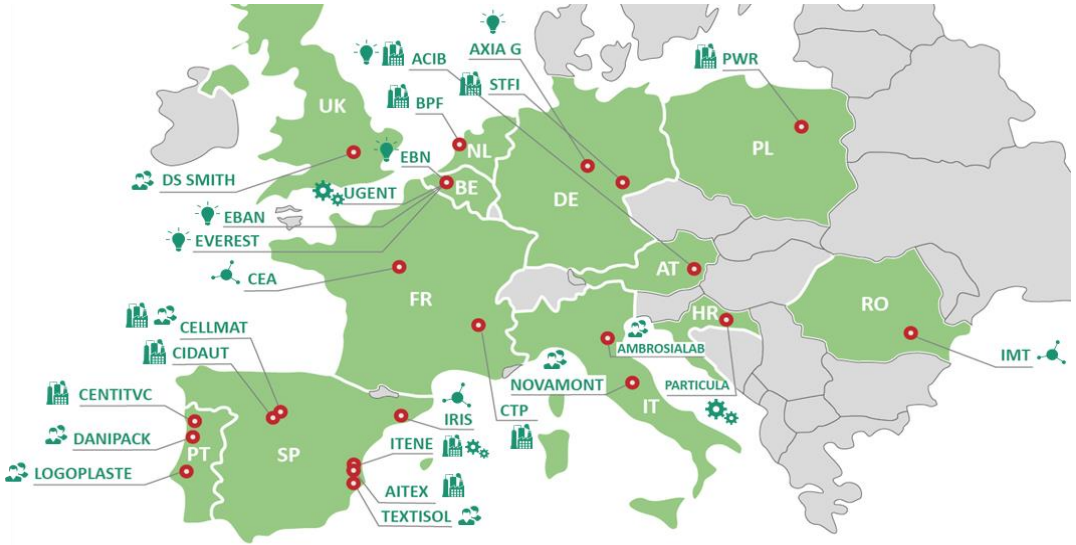
Innovation Action → TRL4 - TRL7

Starting Date → 1st January 2021

Ending Date → 31st December 2024

Total Budget→ 11,75 M€

Total Number of partners→ 27



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BioNanoPolys Project Partners

15 Technology partners

	PARTNER	ROLE	COUNTRY
1	**ITENE**	**RTO – Packaging Pilot plant**	**SP**
2	AITEX	RTO – Textile Pilot plant	SP
3	CIDAUT	RTO – Compounding, automotive	SP
4	CTP -	RTO – Paper Pilot plant	FR
5	CENTITVC	RTO – Nanoencapsulation pilot plant	PT
6	STFI	RTO – Non-woven Pilot plant	DE
7	BPF	RTO – biomass treatment	NL
8	ACIB GmbH	RTO – Enzymatic treatment	AT
9	PWR	HSE – metallic nanoparticles pilot plant	PL
10	IMT	RTO – mathematical modelling	RO
11	CEA	RTO – characterization and monitoring	FR
12	IRIS	SME – Inline monitoring	SP
13	UGENT	HSE- Biomass management	BE
14	Biotrend	SME – Bioprocesses	PT
15	PARTICULA	SME – Environmental assessment	HR

4 Innovation management services partners

16	EBAN	Non-profit. Business plans	BE
17	EBN	Non-profit. Business angel, investors	BE
18	G&S	SME law firm, IPR and legal aspects	BE
19	AXIA Innovation	SME exploitation strategy	DE

8 Industrial partners, End users

20	Ambrosialab SRL	SME cosmetics	IT
21	Hilos Técnicos San Miguel	SME producer of synthetic fibres	SP
22	TEXTISOL SL	SME Nonwoven	SP
23	NOVAMONT	LE Bioplastic producer/polymers	IT
24	DANIPACK, SA	SME Flexible packaging	PT
25	DS Smith Plc	LE cellulose-based packaging	NL
26	CELLMAT Technologies	SME Foamed tray. Pilot plant	SP
27	Logoplaste LDA	LE rigid packaging	PT

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BioNanoPolys Project Concept

PROJECT DEVELOPMENT

SINGLE ENTRY POINT (SEP)

OUTREACH AND DISSEMINATION

- Workshops
- Stakeholder web-based platform
- Pilot lines showroom
- Seminars – Webinars
- Social media dedicated campaign
- Open call tenders

USERS

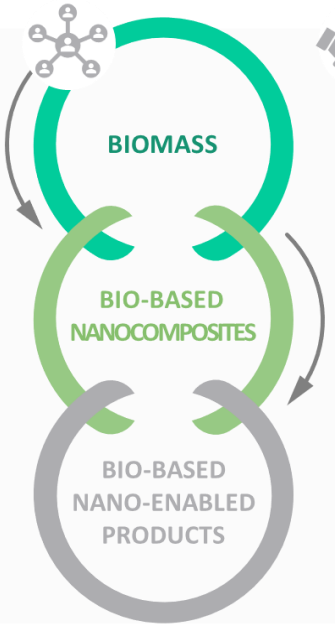
- SMEs
- Start-ups
- Spin-offs
- Industry
- RTOs
- Universities

- Investors (Business Angels Venture capitals,…)

FEASIBILITY ASSESSMENT

- Initial Technical and economic assessment
- Safety requirements definition
- Sustainability assessment
- Patent mapping
- Pilot funding financial support

OITB



MARKET READINESS

- IPR & Patenting roadmap
- Standardisations & safety requirements
- Business modelling
- Fund raising
- EoL solutions

https://www.bionanopolys.eu/

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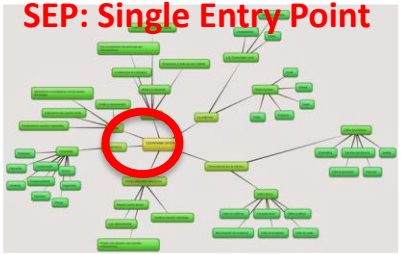
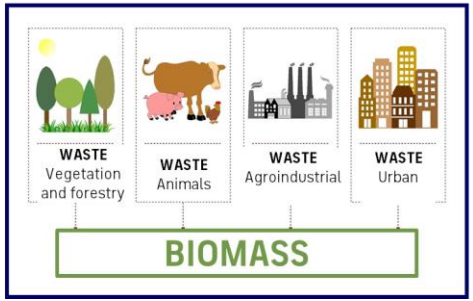
BioNanoPolys Project Concept

Creation of a network of pilot plants with its own legal entity, of an open nature that serve to promote the development of new technologies in the European business sector.



NEW TECHNOLOGIES → BUSINESS SECTOR

More specifically, **BIONANOPOLYS** aims to enhance biomass to obtain nanostructured biobased materials with multifunctional properties for application in different sectors.



→ MATERIALS AND PRODUCTS

HIGH ADDED VALUE NANOSTRUCTURED

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BioNanoPolys Objectives

Overall Objective: Create a network of pilot plant and complementary services to speed up the introduction of biobased nano-enabled materials into the market through a Single-Entry Point (SEP).

a) **Create a strong platform to support companies into overcome any type of barrier to introduce biobased nano-enabled materials into the market; technical, legal, regulatory, safety, economic and financial.**

b) **Penetrate the industrial sector reaching at least new 200 SMEs around Europe by deeply studying the requirements in each industrial sector.**

c) **Focus the technological pilot plant to market necessities and implementing the feedback from different actors.**

d) **Maximise the impact of the OITB and the excellence by cooperating with other Test Beds and European bodies.**

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BioNanoPolys Pilot Plants

Starting from BIOMASS

1. NANOADDITIVES AND RAW MATERIALS

2. BIONANOCOMPOSITES

3. NANOPRODUCTS

Packaging , textile, automotive, cosmetic, pharmacy, hygiene, food and additive manufacturing.

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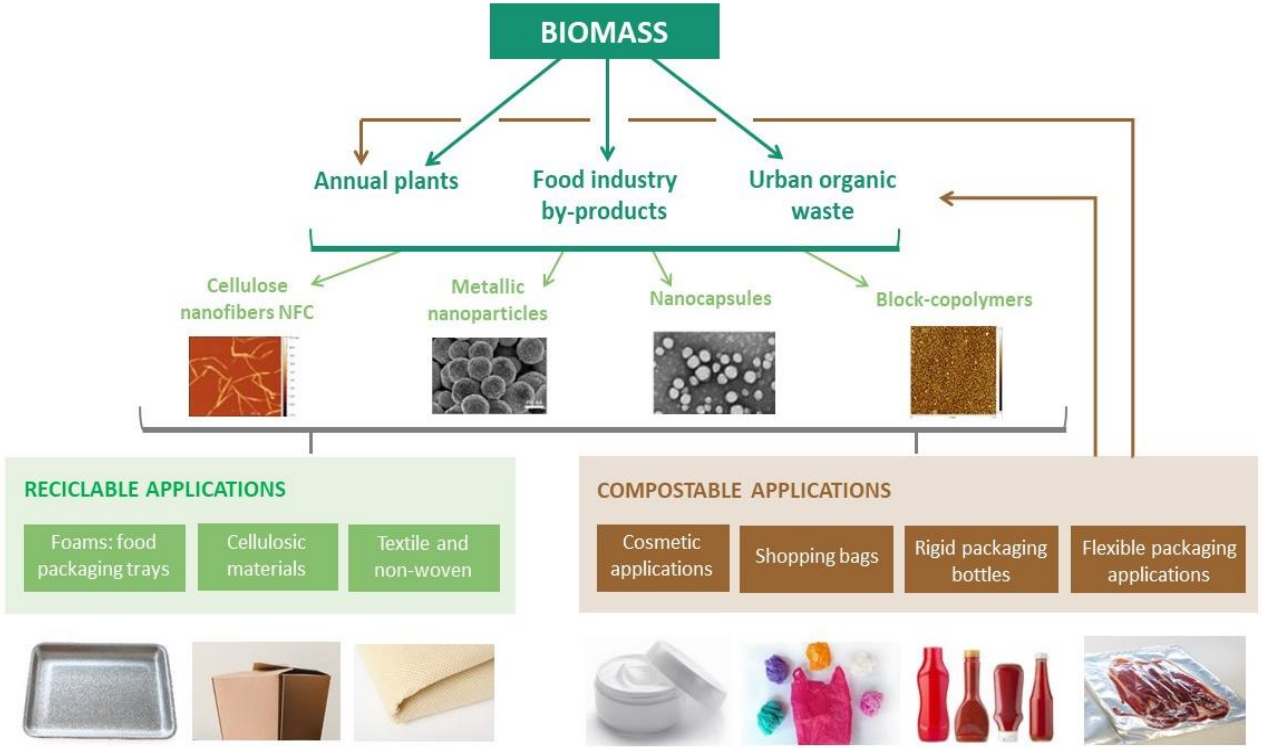
BioNanoPolys Project Products



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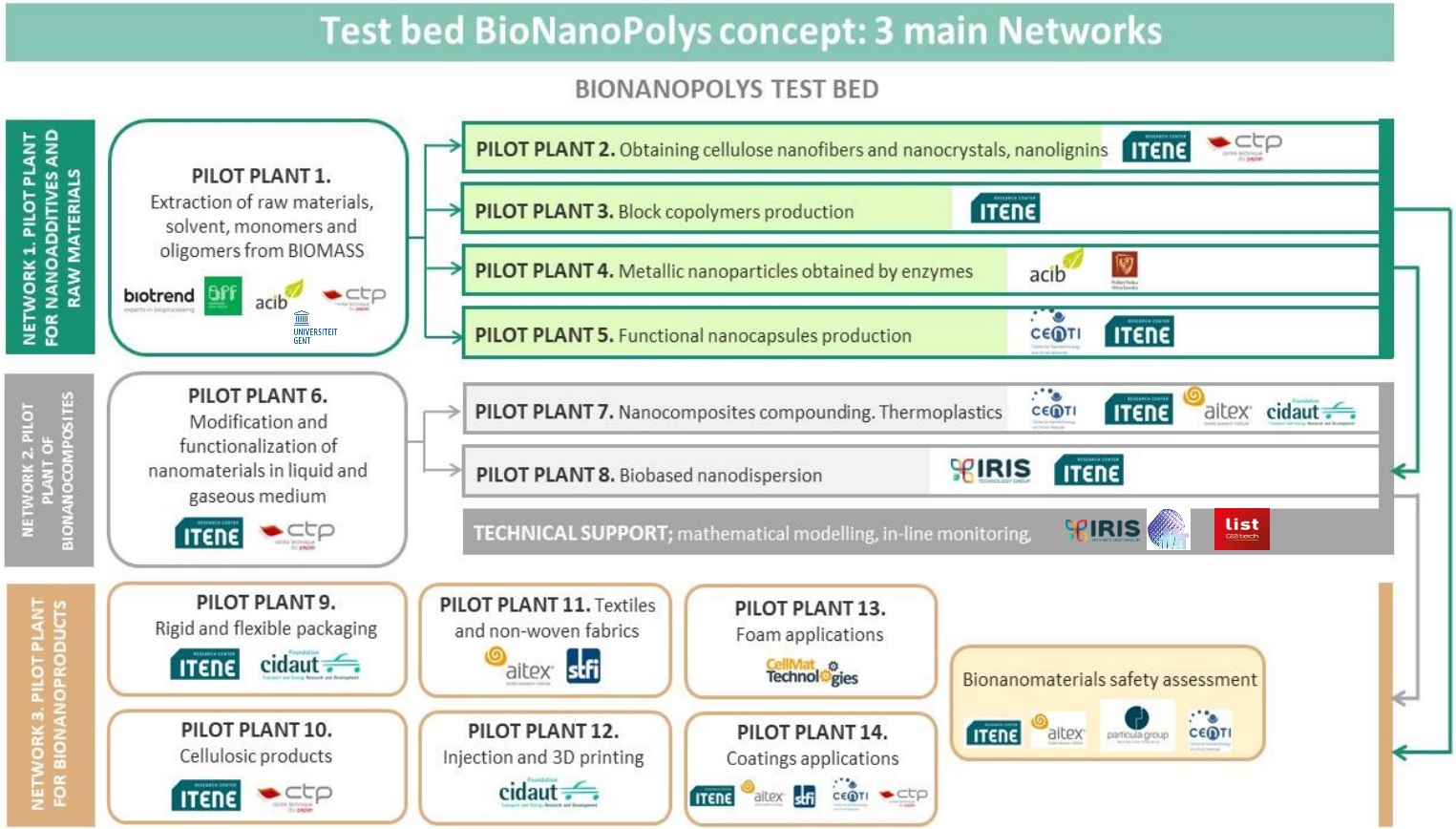
BioNanoPolys Pilot Plants



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BioNanoPolys Project Methodology

Upgrading pilot lines

2021-2023

PHASE I

Upgrading pilot lines

Business Accelerator services

OITB Exploitation plan

Legal entity/ SEP

2023-2024

PHASE II

Demonstrators

Early-adopters

Open Call

2024-2029

PHASE III

Market uptake in EU

Sustainability of BIONANOPOLYS

Bionanopolys growth and expansion

OPEN CALL 2023

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BioNanoPolys Project User Cases

Objectives, targets

- **UC1:** Block copolymers as reinforcement of biobased / compostable formulations for film packaging, injection moulded cutlery and coffee capsules, and thermoformed trays and containers.
- **UC1**: Chemically modified cellulose nanofibers will tune the of water-based dispersion to be applied as barrier coating on paper-based substrates.
- **UC3**: Nanocapsules with various functionalities, e.g. antimicrobial features resulting in extended shelf-life of packaged food and cosmetics.
- **UC4**: Modified nanoclays will reinforce the biodegradable formulations, improving mechanical and barrier properties of 100 % compostable packaging.

Bionanomaterial used / Product

PLA-PBS and PHBV-PLA block copolymers, CNF, Nanocapsules, nanoclays/ Biodegradable and/or Compostable Packaging

Pilot plants or services

- **PP1, PP2, PP3, PP5, PP6, PP7**
- **Services:** mathematical modelling, In- line monitoring.

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BioNanoPolys Project User Cases

Objectives, targets

- **UC5**: Improvement of mechanical and barrier properties of paper-based materials.
- **UC6**: Chemically modified cellulose to obtain new functionalities to the paper materials. Water and grease barrier are expected to reach.
- **UC7**: Paper with active properties (antimicrobial and antioxidant) by coating application.

Bionanomaterial used / Product

CNF, active nanocapsules.

Pilot plants or services

- **PP1, PP2, PP6, PP8, PP10, PP14.**
- **Services:** paper recyclability, in – line monitoring

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BioNanoPolys Project User Cases

textisol non woven

Objectives, targets

- **UC8**: 100% compostable non-woven textiles for personal care and cleaning wipes.
- **UC9**: Antimicrobial effect in non-woven textiles for personal.

Bionanomaterial used / Product

CNF, active nanocapsules, metallic nanoparticles

Pilot plants or services

- **PP1, PP5, PP10, PP11**
- **Services:** compostability, mathematical modelling

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BioNanoPolys Project User Cases

hilos técnicos s.m.
High Knowledge in Synthetic Fibers

Objectives, targets

- **UCM10:** synthetic fiber produced by reactive extrusion for agricultural applications.
- **UCM11:** synthetic coated with active nanocapsules including agrochemical to be released gradually.

Both 100% compostable and 80% biodegradable in soil.

Bionanomaterial used / Product

CNF, active nanocapsules, compostable synthetic fibers

Pilot plants or services

- **PP2, PP5, PP7, PP8, PP11**
- **Services:** Mathematical modelling, compostability

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BioNanoPolys Project User Cases

AMBROSIALAB
health and wellness research

Objectives, targets

- **UC12:** CNF/CNC as film forming agent in cosmetics formulations, substituting fossil-based additives.
- **UC13:** Nanocapsules as delivery systems of active agents to provide, i.e. antimicrobial, antioxidant, antiwrinkle and moisturizing properties to cosmetics formulations replacing chemically produced delivery systems.
- **UC12:** Functional food by application of active nanocapsules to different food products.

Bionanomaterial used / Product

CNF/CNC, active nanocapsules/Biobased personal care formulations

Pilot plants or services

- **PP1, PP2, PP5, PP6, PP8.**
- **Services:** evaluation of compliance to EU regulation 1223/2009 for cosmetic application

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BioNanoPolys Project User Cases

Logoplaste

Objectives, targets

- **UC15**: bottle for personal care products by injection stretch blow moulding (ISBM) reinforced with active nanocapsules with the aim of increasing the shelf life of the packaging solution.
- **UC16**: bottle for food applications (e.g. sauces) performed by co-extrusion blow moulding with biodegradable biopolymers reinforced with nanocellulose and/or modified nanoclays to improve barrier.

Both packages 100 % compostable.

Bionanomaterial used / Product

CNF, modified natural clays and active nanocapsules or metallic nanoparticles and their nanocomposites / Compostable packaging for food and personal care applications

Pilot plants or services

- **PP1, PP2, PP3, PP5, PP6, PP7, PP12.**
- **Services:** food safety and compostability tests.

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BioNanoPolys Project User Cases

Objectives, targets

Laminated film ranging from 6 to 200 µm to be thermoformed for vacuum packed applications:

- **UC 18:** recyclable solution reinforced with nanocellulose and/or nanoclays to achieve high barrier performance, (reducing the number of layers). Also, active nanocapsules will be incorporated to release active agents (antimicrobial and/or antioxidant) to increase the shelf life of food products.
- **UC19:** a compostable solution based on bionanocomposites of biodegradable polymers reinforced with nanocellulose and/or nanoclays to achieve high barrier performance and with active nanocapsules with the aim of increasing the shelf life of the packaging solution.

Bionanomaterial used / Product

Block copolymers (PLA-PBS and PHBV-PLA), CNF, active nanocapsules, modified nanoclays / Compostable and a recyclable packaging for food applications

Pilot plants or services

- **PP1, PP2, PP3, PP5, PP6, PP7, PP9.**
- **Services:** In-line monitoring, food safety, compostability tests and recyclability studies.

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BioNanoPolys Project User Cases

CellMat Technologies

Objectives, targets

- **UC19:** Thermoformed foamed trays for food packaging, with improvements of extended shelf life and mechanical properties (or weight reduction at the same mechanical performance).
- **UC20:** Foamed packaging based on bioexpanded beads, improvements in thermal resistance and mechanical performance (or weight reduction at the same mechanical performance).
- **UC21:** Complex shaped foamed parts for the automotive sector with improvements similar to previous products.

Bionanomaterial used / Product

CNF, nanolignin and nanoclays / Foamed products

Pilot plants or services

- **PP1, PP2, PP5, PP7, PP14**
- **Services:** rapid prototyping.

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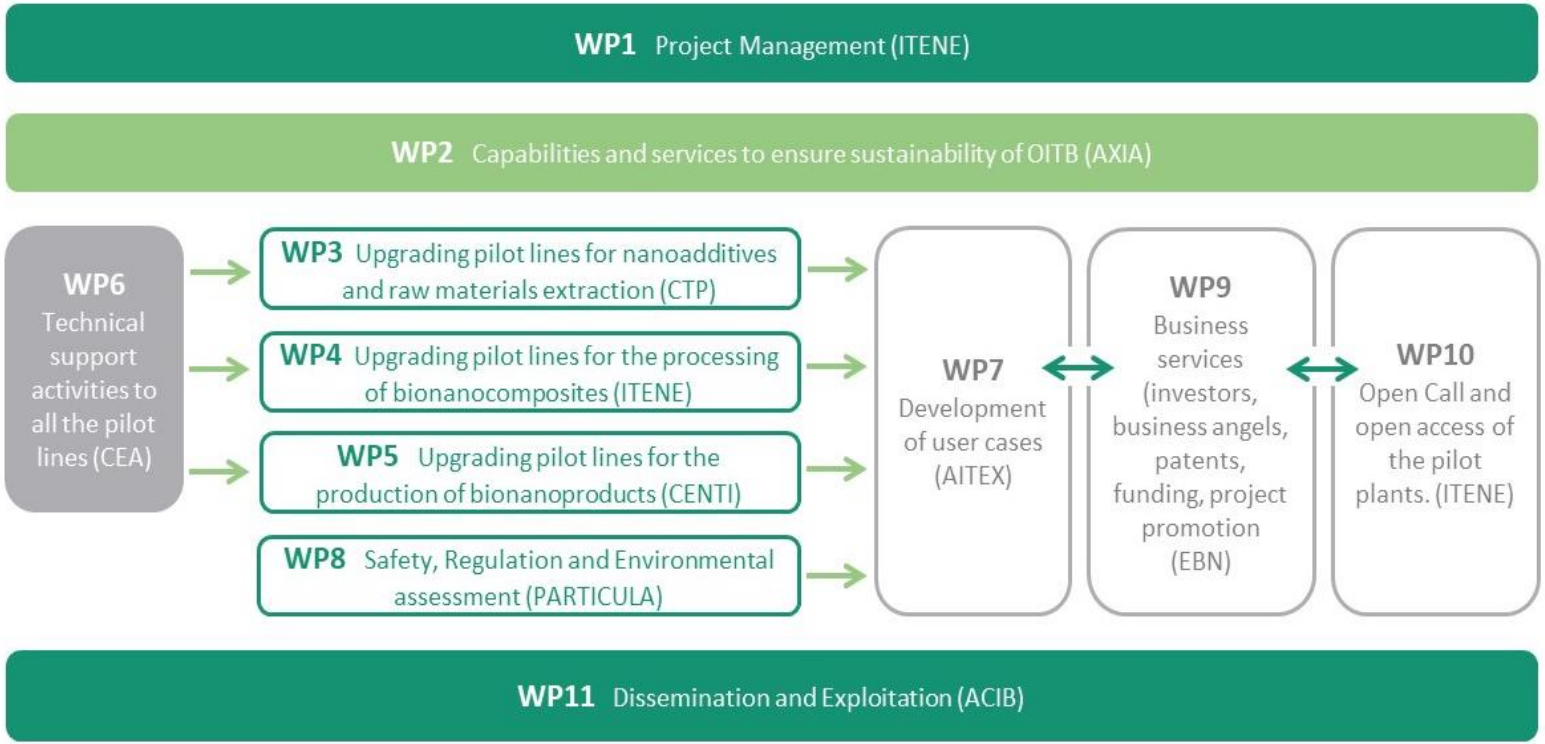
BioNanoPolys Project Implementation plan



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Bionanopolys

Maria Jorda
ITENE

mjorda@itene.com

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