

D6.4. Multi-Stakeholder Engagement and Community Building Plan



**PHYtomanagement as a sustainable feedstock
source of lignocellulosic-based high-value Bio-based
products for textile applications**

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DEVIATIONS

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EXECUTIVE SUMMARY

This document presents pHYBi “Multi-Stakeholder Engagement and Community Building Plan”. This plan outlines the ongoing and planned activities for stakeholder engagement within the pHYBi project's Work Package 6 (WP6), which focuses on Communication, Dissemination, and Exploitation. This strategic document defines methods for mapping, evaluating, and engaging relevant stakeholders to enhance awareness and facilitate their integration into the development of pHYBi solutions.

The pHYBi project aims to establish a scalable framework for sustainable industrial crop cultivation on degraded lands by integrating nanobiophytoremediation with the development of bio-based coatings and fibers from lignocellulosic biomass. This approach contributes to advancing a circular economy within the European textile industry. Active stakeholder engagement plays a crucial role in ensuring the successful adoption and dissemination of these innovative solutions.

To ensure effective stakeholder engagement, four tailored approaches will be applied based on stakeholders' levels of influence and interest:

- Communication activities
- Consultations
- Collaboration and co-creation initiatives
- Education and training efforts

Systematic documentation and monitoring of engagement activities are key to ensuring the long-term impact of stakeholder involvement beyond the project's timeframe. The project team will continuously track, analyse, and assess stakeholder participation. These insights will be incorporated into project deliverables:

- D6.5 – Intermediate Report on Communication, Dissemination, and Stakeholder/Community Engagement (M24)
- D6.6 – Final Report on Communication, Dissemination, and Stakeholder/Community Engagement (M48)

Additionally, a white paper will be developed, incorporating key stakeholder engagement outcomes to support policy discussions.

By fostering active participation and addressing the diverse needs of stakeholders, the pHYBi project aims to drive sustainable, inclusive, and demand-driven innovations in soil remediation and bio-based textile production, contributing to a circular economy model.

1. INTRODUCTION

1.1 DESCRIPTION OF THE DOCUMENT AND PURSUE

The Multi-Stakeholder Engagement and Community Building Plan for the pHYBi project provides a structured framework for effective collaboration, communication, and stakeholder participation. It ensures that stakeholders' needs, concerns, and feedback are systematically identified, addressed, and integrated throughout the project's lifecycle.

The pHYBi project aims to establish a scalable framework for sustainable industrial crop cultivation on degraded lands by integrating nanobiophytoremediation with the development of bio-based coatings and fibers from lignocellulosic biomass. This approach contributes to advancing a circular economy within the European textile industry. Active stakeholder engagement plays a crucial role in ensuring the successful adoption and dissemination of these innovative solutions.

As highlighted by Iliana Ivanova, Commissioner for Innovation, Research, Culture, Education, and Youth:

“To develop new technologies, products, and services in Europe and to ensure that innovative solutions are taken up, academia and industry must work closely together. Strong citizen engagement is key to accelerating the uptake of innovative solutions that better respond to people’s needs. These codes of practice, developed with stakeholders, will be a valuable tool for bridging the gap between the lab and the market and for boosting knowledge valorisation.”¹

To ensure broad acceptance, pHYBi implements an engagement strategy that actively engages stakeholders across the value chain. Social innovation principles like collaboration, openness, iteration, and diverse participation form the foundation of this approach. Engagement activities such as co-creation workshops, site visits, training sessions and peer-to-peer learning create a space for knowledge exchange, ensuring that stakeholders needs are met and that stakeholders support exploitation of the project outcomes.

Active stakeholder engagement throughout the project offers several key benefits:

- **Knowledge Capture:** By leveraging stakeholders’ expertise and motivation, the project ensures a holistic understanding of the challenges and opportunities at hand.
- **Understanding Stakeholders Diversity:** Different stakeholders prioritise project objectives differently. Considering pHYBi’s European-wide impact, engagement must address regional, national, and EU-level priorities to ensure adaptability.
- **Fostering Commitment and Ownership:** Active participation in co-creation processes strengthens stakeholders’ commitment, ensuring long-term acceptance and implementation of pHYBi solutions.

¹ European Commission: Directorate-General for Research and Innovation, *Valorisation policies – Code of practice on industry-academia co-creation – Commission recommendation*, Publications Office of the European Union, 2024, <https://data.europa.eu/doi/10.2777/05455>

1.2 WPS AND TASKS RELATED WITH THE DELIVERABLE

The Multi-Stakeholder Engagement and Community Building Plan is part of the Communication, Dissemination and Exploitation strategy of the project, which aims to maximise the impact of the project results and facilitate the exploitation of the project's innovative solutions.

The pHYBi project will develop and implement a strategy, plan and actions for effective multi-stakeholder engagement and community involvement across the agricultural and biorefinery value chain. This includes the involvement of stakeholders such as researchers, farmers, foresters, technology providers, end users, consumers, authorities and citizens. The aim is to promote the adoption and acceptance of pHYBi solutions by ensuring that all stakeholders along the value chain are actively involved and invested in the outcomes of the project.

Stakeholder engagement is a fundamental aspect of the pHYBi project, influencing not only the communication and dissemination efforts, but also the success and impact of all other project activities. By ensuring that stakeholders are actively involved throughout the project, pHYBi will be able to tailor its solutions more effectively to the needs and challenges of the target groups, leading to greater acceptance and adoption of the proposed innovations.

The plan is based on input from all consortium partners, which were gathered during a specific workshop.

2. STAKEHOLDER IDENTIFICATION AND MAPPING

The pHYBi consortium has conducted a comprehensive stakeholder mapping to identify key actors along the value chain impacted by the project results as well as to assess their potential role in either facilitating the adoption of or integrating the pHYBi solutions.

The stakeholder mapping followed a structured approach to ensure a targeted and effective engagement strategy:

- Identification of key target groups: A thorough analysis of the pHYBi value chain was conducted to determine relevant stakeholders from agriculture, industries, public institutions, academia, and associations.
- Stakeholder clustering: Identified stakeholders were categorized into specific groups based on their interests, influence, and role within the value chain.
- Defining engagement strategies: Based on stakeholder clusters, appropriate engagement methods and communication formats were determined to ensure meaningful interaction.
- Development of a dynamic stakeholder database: A living stakeholder map and database was created, consolidating key contacts from all consortium partners. This database will serve as a foundation for outreach efforts and engagement activities, targeting at least 300 multi-stakeholders and identifying 4-5 potential Advisory Board members.

This stakeholder mapping and evaluation is an ongoing process that will be continuously refined and expanded throughout the project's duration to adapt to evolving needs and ensure effective stakeholder participation.

2.1 KEY STAKEHOLDER GROUPS

For effective stakeholder identification, the pHYBi project conducted a comprehensive analysis of its value chain, which helped determine the primary stakeholder groups and subgroups involved in each stage of the project. This analysis, depicted in Figure 1, allows for a clear understanding of the various actors and their roles in driving the project's objectives forward.

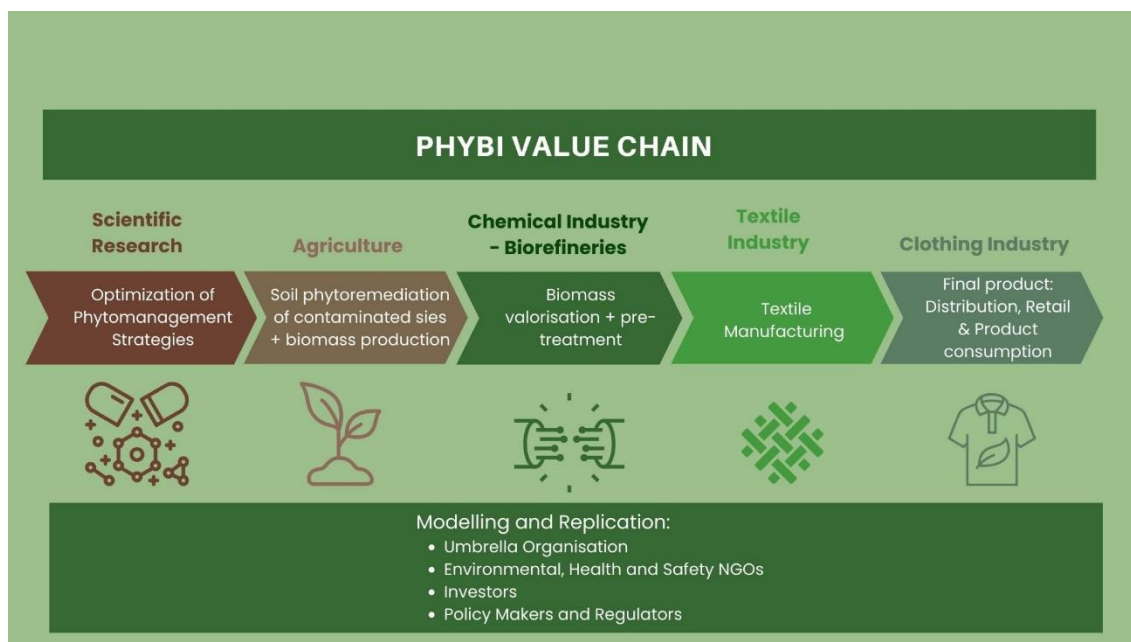


Figure 1 – Representation of the pHYBi value chain.

Scientific research institutions play a key role in the optimization of phytomanagement strategies. These institutions focus on advancing plant-based soil remediation techniques and identifying the most suitable plant species for biomass production. By refining these strategies, they significantly contribute to achieving the project’s environmental goals through increased efficiency and effectiveness.

The agricultural sector plays an important role in implementing the phytoremediation techniques on contaminated sites. This sector is responsible for restoring degraded land while also producing the biomass that will be processed in the next step. This dual role creates a critical intersection between environmental restoration and biomass production, linking farmers and landowners as primary stakeholders.

Once the biomass is harvested, it enters the biorefineries and chemical industry phase, where the extraction and refinement of lignocellulosic components—such as cellulose, lignin, and hemicellulose—occurs. At this stage, scientific research institutions and technology providers are key stakeholders, as they work to improve processing efficiency and ensure the sustainability of these methods. These actors include biorefineries, chemical companies, and technology developers, all of whom are crucial for the conversion of raw biomass into valuable, market-ready products.

In the textile manufacturing and product design phase, the focus shifts to turning the processed biomass into bio-based textiles and other materials. Here, manufacturers and researchers collaborate to develop innovative, sustainable products. Researchers play a vital role in driving innovation, while manufacturers ensure the scalability and industry integration of the new bio-based materials. These stakeholders are integral to advancing the commercialization of the project’s outputs.

The next step in the value chain involves the market introduction of the final products. At this stage, the involvement of industry players and consumers becomes critical. Companies integrating bio-based materials into their product lines are essential for driving market demand.

Additionally, consumers influence the adoption of sustainable, eco-friendly products, shaping the long-term success of the pHYBi innovations in the market.

Lastly, policymakers and regulatory authorities provide the necessary frameworks and incentives to encourage the widespread use of bio-based materials. These stakeholders play a significant role in establishing guidelines, certifications, and financial incentives, which are vital for supporting sustainable industrial practices and ensuring compliance with environmental standards.

Through this structured value chain analysis, the pHYBi project successfully identified and categorized the key stakeholder groups across different stages of the process. Each stakeholder group plays an important role in advancing the project's objectives, from scientific research and agricultural practices to biomass processing, textile manufacturing, and market integration. Table 1 outlines the identified target groups, along with their specific challenges, needs, and the benefits they derive from the pHYBi project.

Table 1 - Overview of the key target groups for the pHYBi project, involved stakeholders, challenges, needs and project benefits.

TG1: End-Users	
TG1a: End-Users of phytomanagement strategies	
Involved Stakeholders	a) farmers, foresters and other landowners
Challenges / Needs	a) Limited knowledge or awareness of sustainable farming practices, particularly for degraded or polluted land. a) Limited acceptance of new agricultural technologies or practices, such as GMOs or nanofertilisers. a) Limited expertise in modern agricultural techniques and financial constraints in implementing them. Economic feasibility of large-scale adoption of bio-based production methods.
Benefits from pHYBi	a) Access to innovative business models for cultivating high-yield industrial crops on degraded, polluted, or salt-affected land.
TG1b: End-users of lignocellulosic valorisation methodologies	
Involved Stakeholders	a) lignocellulosic biorefineries and textile industry b) additional industry sectors that could profit from new bio-based production
Challenges / Needs	- Insufficient access to reliable and high-quality biomass sources for bio-based production. - Economic feasibility of large-scale adoption of bio-based production methods. - Insufficient incentives or support for transitioning to bio-based materials.
Benefits from pHYBi	- New and reliable supply of high-yielding biomass, - Optimised valorisation processes for high-value-added applications in the textile industry

	Replicable models to improve environmental footprint and product safety.
TG2: Umbrella Organisations	
Involved Stakeholders	a) Forest/farmers organisations b) bio-based industry clusters
Challenges / Needs	- Limited exchange of knowledge and innovative techniques in nanobiophytoremediation, organosolve techniques, biomass-valorisation, and bioinformatics. - Limited exchange of knowledge for replicable models of best practices.
Benefits from pHYBi	- Access to innovative solutions and knowledge that can benefit their members. - Training, and knowledge-sharing opportunities.
TG3: Industrial solution providers	
Involved Stakeholders	a) Biotechnology Companies b) Agricultural Machinery Companies c) Textile Machinery Manufacturers
Challenges / Needs	- Adapting machinery to new sustainable agricultural practices - Developing machinery compatible with bio-based materials - Navigating complex regulations and integrating new technologies into existing systems. - Limited knowledge about valorisation techniques and products from contaminated soils. - Technological feasibility of large-scale adoption of bio-based production methods. - Limited incentives or support for transitioning to bio-based materials.
Benefits from pHYBi	- Access to innovative solutions for phytomanagement and bio-based materials, enhancing their product portfolio. - New market opportunities by being part of a sustainable and environmentally friendly value chain. - Collaboration with other stakeholders in the project to accelerate the development and adoption of biotechnological innovations.
TG4: Researchers and Academia	
Involved Stakeholders	Scientific community, particularly researchers in agronomy, phytoremediation, plant physiology, soil remediation, microbiology, bioinformatics, and environmental science
Challenges / Needs	- Limited access to research results and data about nanobiophytoremediation, bioinformatics, remote sensing techniques, organosolve techniques, and biomass-valorisation. - Limited knowledge about replicable models to improve environmental footprint and product safety.

Benefits from pHYBi	• Access to publications and data for knowledge-sharing and further research. • Basis for exploring new research directions and validating findings. • Opportunities to develop new applications based on pHYBi's results.
TG5: Environmental, Health, and Safety NGOs	
Involved Stakeholders	a) Environmental and health/safety NGOs b) initiatives targeting citizens and policymakers
Challenges / Needs	• Limited acceptance of genetically enhanced species, nano-fertilizers and potential vendor dependency. • Limited knowledge about precision farming, bioinformatics and genome scale metabolic models. • Limited knowledge about valorisation techniques and products from contaminated soil. • Limited knowledge about replicable models to improve environmental footprint and product safety.
Benefits from pHYBi	• Access to clear scientific insights and data on sustainability, public health, and safe practices. • Tools and resources to promote sustainability and agricultural best practices to influence policymakers and educate the public on sustainable development. • Increased knowledge of pHYBi's innovative methods and their benefits for sustainable clothing and environmental safety. • Economic opportunities and improved local environmental conditions. • Encouragement of public understanding and support. • Promotion of sustainable and bio-based practices and behaviours across the wider EU population.
TG6: Policy makers and Regulators	
Involved Stakeholders	a) Policy makers b) Public authorities (at regional, national and EU level)
Challenges / Needs	• Limited knowledge about precision farming, bioinformatics and genome scale metabolic models. • Limited knowledge about valorisation techniques and products from contaminated soil. • Limited knowledge about replicable models to improve environmental footprint and product safety.
Benefits from pHYBi	• Access to scientific evidence for informed policy and regulatory frameworks. • Insights into effective, safe, and lower-cost pollution management and bioremediation strategies. • Alignment with EU goals of environmental autonomy and sustainability

TG7: Investors	
Involved Stakeholders	Venture Capital Firms, private Equity Funds, Government and Public Funds, Institutional Investors, Angel Investors, Development Banks focused on sustainability, green tech, or bio-based industries.
Challenges / Needs	• Limited knowledge about soil health and nanobiophytoremediation strategies. • Limited knowledge about precision farming, bioinformatics and genome scale metabolic models. • Limited Knowledge about feedstock valorisation and products from contaminated soil.
Benefits from pHYBi	• Cost-effective pollution management solutions with commercial potential. • Investment opportunities in sustainable markets, especially textiles. • Contribution to green job creation and economic growth.
TG8: General Public	
Involved Stakeholders	Wider EU population, local communities, consumers, multipliers etc.
Challenges / Needs	• Limited knowledge about soil health and nanobiophytoremediation strategies. • Limited acceptance adopting new agricultural technologies or practices, such as genetically modified species or nano-fertilizers • Limited Knowledge about feedstock valorisation and products from contaminated soil.
Benefits from pHYBi	• Increased knowledge of pHYBi's innovative methods and their benefits for sustainable clothing and environmental safety. • Improved local environmental conditions. • Foster transparency, trust, and societal alignment with project outcomes. • Promotion of sustainable and bio-based practices and behaviours across the wider EU population.

2.2 STAKEHOLDER MAPPING

To ensure targeted and efficient communication and collaboration as well as strategic decision-making, the identified stakeholder groups have been systematically analysed using the influence-interest grid method, as illustrated in Figure 2. This well-established approach enables the categorisation of stakeholders based on two key dimensions:

- **Influence:** The stakeholders' ability to shape project decisions, outcomes, and direction. This can be based on formal authority, control over critical resources, expertise, or their ability to mobilise support or opposition.

- Interest: The stakeholders' level of engagement and concern regarding the project. This reflects how much they are affected by or invested in its success or failure. Highly interested stakeholders are more likely to participate actively, advocate for, or oppose the project.

By evaluating stakeholders against these dimensions, they are assigned to one of four categories:

- Manage Closely (High Influence, High Interest) – This group includes key decision-makers and highly engaged stakeholders who can drive project success. Regular communication, collaboration and co-creation are essential.
- Keep Satisfied (High Influence, Low Interest) – These stakeholders have significant power to impact the project but may not be deeply engaged. Proactive management is required to ensure their concerns are addressed while avoiding unnecessary over-involvement.
- Keep Informed (Low Influence, High Interest) – Although they do not directly shape project outcomes, these stakeholders have a vested interest in its success. Providing regular updates and opportunities for involvement fosters transparency and trust.
- Monitor (Low Influence, Low Interest) – These stakeholders have minimal impact on the project and limited engagement. While they require occasional updates, they do not need intensive communication.

Table 2 presents the stakeholder mapping for the identified stakeholder groups in the pHYBi project. This initial mapping provides a foundation for coordinating and collaborating with various stakeholder groups and will be continuously reassessed throughout the project as new results and insights emerge.

Based on these categories, several main engagement strategies were defined, to ensure stakeholders are effectively involved according to their influence and interest levels: Communication, Consultation, Collaboration & Co-Creation and Education & Training. These engagement strategies and related project activities are described in more detail in chapter 3.

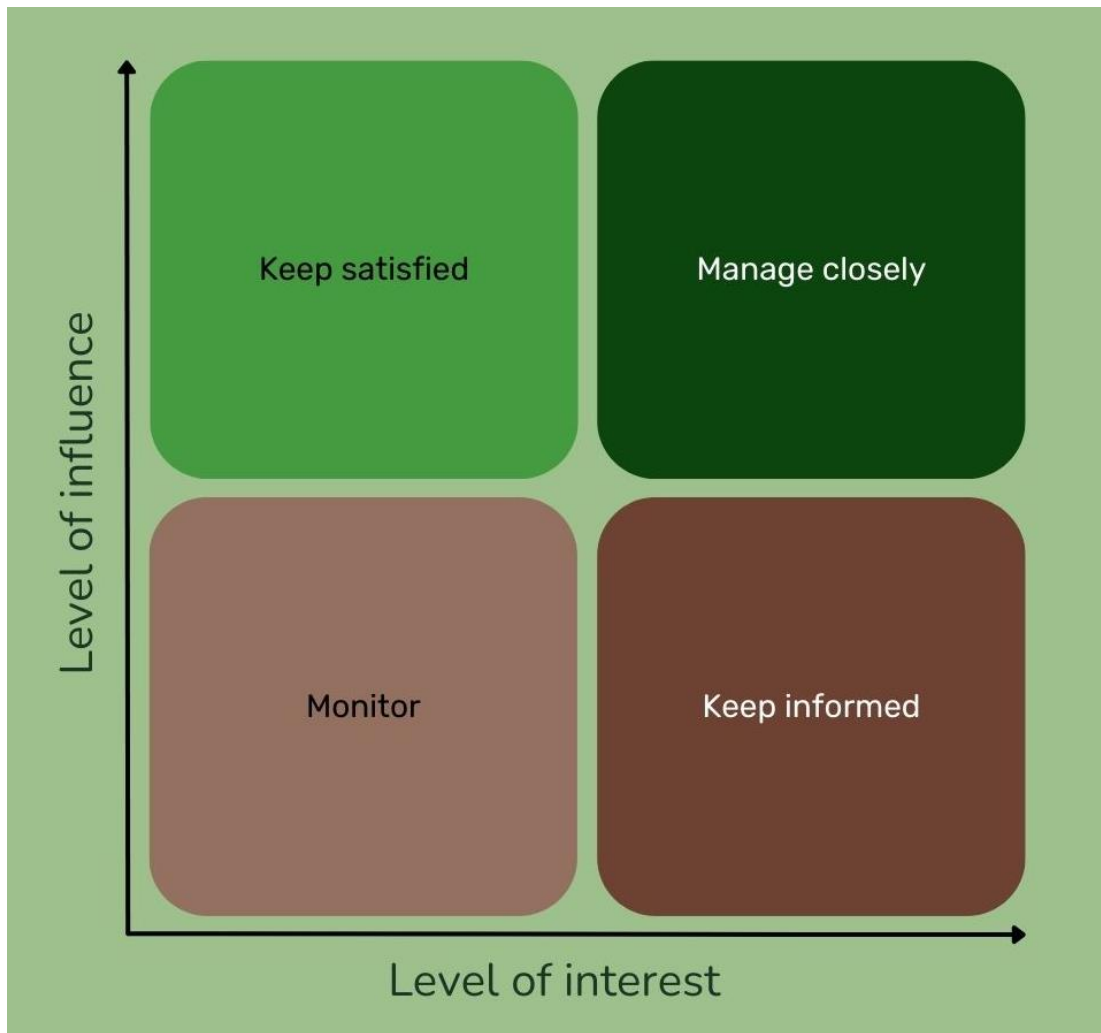


Figure 2 – Stakeholder mapping divided into four categories, based on influence and interest levels.

Table 2 – pHYBi stakeholder mapping using the influence-interest grid method.

Keep Satisfied (Low Interest, High Influence) • Umbrella Organisations: Represent multiple stakeholders (e.g., industry associations) and can influence wider adoption but may not be deeply involved in specific project activities. • Industrial Solution Providers: Providers of technology and tools, crucial to implementation but not necessarily the primary focus. Actions: • Keep informed. • Provide reports or executive summaries • Engage through networking opportunities or strategic consultations	Manage Closely (High Interest, high Influence) • Policy Makers and Regulators: Essential for creating supportive policies and enabling regulatory compliance for bio-based innovations. • Farmers, Foresters, and other Landowners: Directly impacted by and critical to implementing sustainable raw material supply. • Lignocellulosic Biorefineries and Textile Industry: Key players in adopting project outputs and scaling bio-based solutions. Actions: • Regular and direct communication • Engagement through workshops or co-development activities, feedback provision • Provide detailed, transparent progress updates to maintain trust and commitment
Monitor (Low Interest, Low Influence) • Additional Industry Sectors: May benefit indirectly from project outcomes but are not actively involved in the process. • Research and Academia: Provide foundational knowledge and innovation but may have limited influence on commercialisation or policy decisions. Actions: • Keep engagement minimal and efficient • Keep informed through general updates • Reassess status periodically in case their interest or influence changes over time	Keep informed (High Interest, Low Influence) • General Public: Beneficiaries of environmental and economic improvements but with limited direct influence. • Environmental, Health, and Safety NGOs: Advocates for sustainability, providing guidance and public credibility but not directly shaping project outcomes. • Investors: Interested in the market potential but may have less immediate decision-making power compared to policymakers or industry stakeholders. Actions: • Provide regular updates • Offer opportunities for engagement • Address concerns through accessible communication channels

2.3 LIVING STAKEHOLDER MAP

To facilitate the identification of relevant stakeholders within the pre-defined stakeholder groups, a Living Stakeholder Map has been developed. This dynamic and evolving tool will enable all project partners to use their own networks and contacts to identify and engage stakeholders at regional, national, EU and international levels. By regularly updating the stakeholders information, this map will serve as a key resource for efficiently identifying appropriate stakeholders for communication, dissemination and engagement activities, which will be further detailed in later. Collaboration with these identified stakeholders (as listed in Annex 1) will provide valuable expertise, resources and partnerships that are essential for advancing the objectives of the pHYBi project in the area of sustainable textile innovation.

The diverse expertise of the pHYBi project partners enhances the Living Stakeholder Map and allows for a comprehensive identification of stakeholders across different sectors. Each partner brings specialised knowledge that enables the project to identify and engage with a wide range of relevant stakeholders, ensuring that key players from different disciplines are involved in the stakeholder mapping process.

Expertise of project partners:

- Experts in plant and soil science (UBFC, UBU, UNIOVI, PHY)
- Chemical engineering and biorefineries (CETIM)
- Computational science (IDE)
- Textile materials and products (NTT)
- Agroindustry (MISC, PHY, DIH-LEAF)
- Market analysis, knowledge exchange and social innovation (SEZ)

In particular, DIH-LEAF will play a key role in stakeholder engagement through its extensive network of around 50 organisations from the agro-industry, research institutions and rural associations, with the aim of supporting digitalisation and technological innovation in the sector. DIH-LEAF is also linked to the European SmartAgriHubs initiative.

The Living Stakeholder Map is organised as an Excel spreadsheet with the following categories: first, the stakeholder group and subgroup, the name of the identified stakeholder and its website, a short description of the stakeholder's relevance, the country of origin and the geographical area in which the stakeholder operates, the identification of the consortium partner responsible for the stakeholder contact, and finally the stakeholder contact email. To facilitate analysis, certain parts of the table will have drop-down menus. As a dynamic tool, this list will be continuously updated by the project consortium throughout the duration of the project.

3. STAKEHOLDER ENGAGEMENT STRATEGY

Stakeholders have been categorized based on the influence-interest grid method into four distinct groups: Manage Closely (High Influence, High Interest), Keep Satisfied (High Influence, Low Interest), Keep Informed (Low Influence, High Interest), and Monitor (Low Influence, Low Interest) (see chapter 2.2).

To effectively engage these stakeholders according to their levels of influence and interest, several targeted strategies have been defined:

Communication: Effective communication is key to maintaining ongoing dialogue with stakeholders across all categories. This strategy focuses on ensuring stakeholders are consistently informed about the project's progress, objectives, and any changes that may affect them. Regular communication, whether through social media, the website and other actions helps build trust and transparency.

Consultation: Consultation involves actively seeking feedback from stakeholders to understand their concerns, expectations, and opinions on the project. Feedback sessions and surveys can provide valuable insights.

Collaboration & Co-Creation: Collaboration means working with stakeholders to achieve common goals. Workshops or regular working groups can provide opportunities for these stakeholders to influence key outcomes. Collaboration can also include partnerships in research, development or dissemination activities, ensuring that stakeholders play an active role in the achievement of project milestones.

Education & Training: Education and training initiatives aim to empower stakeholders by providing them with the necessary knowledge and skills to understand and engage with the project effectively. These initiatives can include webinars, practice abstracts and peer-to-peer learning sessions with site visits and informative resources tailored to different stakeholder needs.

These strategies are tailored to meet the specific needs of each group, ensuring the most effective approach for engagement and will be further detailed in the following sections. By applying these customized strategies, the project aims to allocate resources efficiently, focus efforts strategically, and maximize the overall outcomes of the pHYBi initiative. This targeted approach guarantees that each stakeholder group is engaged appropriately, contributing to the project's success.

Table 3 – Overview of pHYBi's stakeholder engagement strategies, key audiences and examples of actions.

Engagement Approach	Main Stakeholder Target	Examples of Actions
Communication	All	• Social Media posts • Publications on pHYBi website • Press releases • News articles • Events
Consultation	High Influence/Low Interest Low Influence/High Interest	• Advisory Board • Surveys and Interviews • Feedback sessions

Collaboration and Co-creation	High Influence/High Interest	• Co-creation workshops • Round-table sessions with similar projects • Participation to networks and clusters • Site visits
Education and Training	All	• Webinars • Peer-to-peer learning sessions • Site visits • Practice abstracts

3.2 COMMUNICATION

Communication is essential for keeping stakeholders informed and aligned with the project. It is a fundamental strategy that supports all other engagement methods and ensures stakeholders remain aware of progress, challenges, and changes.

- For Manage Closely (High Influence, High Interest): Communication should be frequent, transparent, and detailed. Regular reports and updates allow these stakeholders to stay engaged and involved at every stage.
- For Keep Satisfied (High Influence, Low Interest): Communication with this group should focus on strategic, high-level information, ensuring they are aware of the project's successes and milestones, without overwhelming them with details. This can include press releases or regular summary reports.
- For Keep Informed (Low Influence, High Interest): Frequent updates will keep these stakeholders informed on the project's progress. This helps to nurture their interest.
- For Monitor (Low Influence, Low Interest): Communication with this group should be minimal, focusing on high-level updates or brief summaries to ensure they remain aware of the project's broader outcomes, typically through annual reports or press releases.

The Communication and Dissemination Plan of the project (D6.1) outlines already the specific communication channels and strategies implemented by the pHYBi project to reach stakeholders effectively. These include updates via the project website, social media, and partners' platforms, as well as press releases to share key milestones and project achievements.

3.3 CONSULTATION

The pHYBi project will engage selected stakeholders in consultations to gather input and feedback to identify gaps, challenges, and opportunities related to the project's solutions. This approach ensures a comprehensive understanding of stakeholder needs and expectations.

- For Manage Closely (High Influence, High Interest): Regular consultations with key decision-makers to gather feedback and adjust project approaches as needed.
- For Keep Informed (Low Influence, High Interest): Offer opportunities for these stakeholders to provide feedback, ensuring their voices are heard.

- For Keep Satisfied (**High Influence, Low Interest**): Occasional consultation on issues where stakeholder influence could make a difference; engagement should be limited to specific issues rather than continuous involvement.
- For Monitor (**Low Influence, Low Interest**): Consultation for this group may not be necessary unless there is an opportunity to gather information or feedback on a non-critical aspect of the project.

Over the 48-month duration of the project, the consortium will ensure regular consultations, primarily through the establishment of an Advisory Board. This continuous engagement will enable the advisory board to provide valuable insights and guidance to the project (see section 3.3.1). Additionally, surveys and interviews may be conducted to collect further feedback if needed, particularly toward the project's conclusion concerning exploitation.

3.3.1 Advisory Board

To ensure expert input, guidance, and feedback from stakeholders across the value chain, the pHYBi project will establish an Advisory Board. This board will play a vital role in driving impactful and sustainable outcomes, particularly in soil health restoration and sustainable textile production and will contribute to the project's exploitation strategy by supporting the adoption of innovative solutions.

Roles of the advisory board:

- Assess the technical and economic feasibility of phytomanagement and sustainable textile production concepts.
- Provide expert advice on topics related to the textile industry and agriculture.
- Offer feedback on project progress to ensure continuous improvement.
- Support regulatory compliance, ensuring alignment with EU sustainability policies and standards.
- Align project outputs, such as bio-based pigments and fibres, with market needs to promote scalability and commercial viability within the circular textile economy.

The Advisory Board will consist of at least five members from diverse sectors, including: Lignocellulosic biorefineries and the textile industry, research institutions and academia, umbrella organizations, industrial solution providers. It will convene once a year to review progress and provide feedback. To protect sensitive information and facilitate open discussions, a Non-Disclosure Agreement will be developed.

3.4 COLLABORATE and CO-CREATE

Co-creation is a highly collaborative approach that actively involves stakeholders in the joint development of new knowledge, strategies, and products. This process is essential for shaping the pHYBi project's outputs by ensuring they align with stakeholder needs and expectations. Different stakeholder groups will be engaged in co-creation activities:

- **Manage Closely (High Influence, High Interest):** This group plays a central role in co-creation activities. Their expertise and influence are essential in shaping the project's direction, and they will be directly involved in decision-making and co-creation efforts.
- **Keep Satisfied (High Influence, Low Interest):** While co-creation is limited for this group, their expertise will be leveraged for specific topics. They may participate in workshops or act as advisors on key aspects where their input can have a significant impact.
- **Keep Informed (Low Influence, High Interest):** These stakeholders may not be directly involved in co-creation but will still be given opportunities to provide feedback and share insights.
- **Monitor (Low Influence, Low Interest):** Co-creation activities are generally not applicable to this group, but they may be engaged in broader consultation or information-sharing events to ensure their perspectives are considered indirectly.

The following activities will be conducted to foster collaboration and co-creation:

1. **Co-creation workshops (detailed in Section 3.4.1)**
2. **Roundtable sessions with similar projects:** To further foster knowledge exchange, the pHYBi project will hold an annual meeting with similar projects and initiatives. This platform will facilitate experience-sharing, progress updates, and feedback exchange. Relevant projects have been identified in D6.1.
3. **Participation in networks and clusters:** By actively participating in networks and clusters, the pHYBi consortium is committed to advancing collaboration with similar initiatives, co-organizing workshops, webinars, and training sessions, and strengthening synergies within the field.

Stakeholders will contribute valuable feedback and insights on different project topics, including the acceptance of crops used in phytoremediation and textile applications, sharing of decontamination strategies for soil health improvement, methods for identifying indicators of soil health and crop quality, implementation of virtual replication tools to support project objectives and the establishment of a policy co-creation forum to align project goals with regulatory needs. Additional topics will be monitored and identified as the project progresses.

3.4.1 Co-creation Workshops

The pHYBi project will organize two co-creation workshops, bringing together at least 10 diverse stakeholders to exchange perspectives and generate innovative ideas. These workshops, led by SEZ with the support of all project partners—particularly DIH-LEAF, will take place in M12 and M36. They will facilitate feedback loops across the entire value chain, incorporating insights from various sectors that operate in symbiosis with pHYBi.

Participants will engage in interactive brainstorming and ideation sessions, exploring creative approaches such as gamified exercises and prototyping to drive innovation. The workshops will be preferably conducted in person to enhance collaboration and foster synergies in soil remediation and sustainable textile production. Figure 3 shows the foreseen content and timing of the collaborative sessions.

To ensure meaningful discussions, pHYBi partners will identify key topics in advance, addressing challenges, opportunities, and technological aspects relevant to the project. These insights will be shared with stakeholders beforehand, enriching the co-creation process.

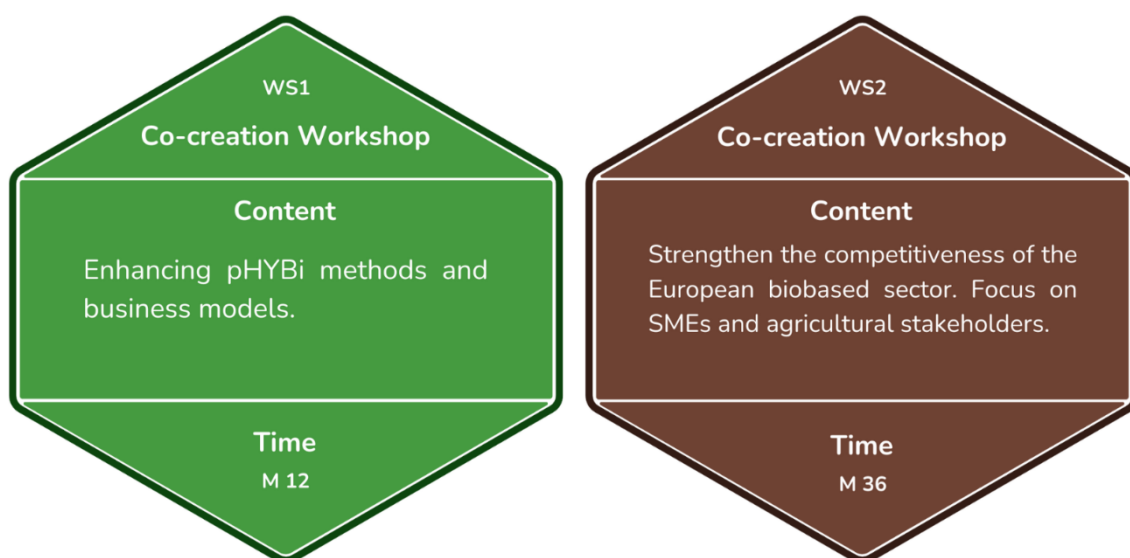


Figure 3 – Overview of the two co-creation workshops, their content and time.

The pHYBi consortium will further analyse the workshop findings, ensuring that insights are effectively incorporated into the design and development of pHYBi solutions. The outcomes will be documented in D6.5 (M24) and D6.6 (M48) and disseminated to the consortium through webinars. This structured approach guarantees that stakeholder input is systematically integrated into the project's ongoing development and final outcomes.

3.5 TRAINING and EDUCATION

Training and education initiatives are a central element of the pHYBi project, designed to provide stakeholders with the necessary knowledge and skills to understand the project results and support their implementation. These initiatives will include various learning opportunities:

- Online workshops and webinars hosted by pHYBi, potentially in collaboration with other projects, networks, and clusters.
- Dissemination of at least 10 practice abstracts showcasing pHYBi's best practices
- Peer-to-peer learning sessions and site visits (detailed in section 3.5.1)

These activities will promote practical understanding and knowledge exchange on topics such as soil remediation, feedstock valorisation, virtual replication tools, and sustainable products for the textile industry.

The training and education activities are directed to the following stakeholder groups:

1. **For Manage Closely (High Influence, High Interest):** Training and education will be a central element for this group, encouraging them to test and implement pHYBi solutions in future initiatives.

2. For Keep Satisfied (High Influence, Low Interest): Educational activities will keep this group informed, providing relevant insights and updates.
3. For Keep Informed (Low Influence, High Interest): Offering webinars or informational content that provides insight into the project's objectives, results, and impact to foster engagement.
4. For Monitor (Low Influence, Low Interest): Occasional, simplified educational content may be provided to keep this group aware of the project's general direction and results.

3.5.1 Peer-to-peer learning sessions & site visits

Four stakeholder workshops will be organized during the pHYBi project, primarily in the second half of the project, once the results are available. The workshops will include peer-to-peer learning sessions, complemented by site visits. These sessions will allow potential stakeholders from sectors such as agriculture, biorefineries, textiles, and agro-industries to learn about pHYBi's outputs, best practices, and key learning outcomes.

Preliminary topics for the workshops:

1. Biorefineries Workshop (led by CETIM).
2. Phytomanagement Workshop (organized by UBU, LMUP, and UNIOVI).
3. Digital Tools and Capacity Building Workshops (led by DIH-LEAF).

The site visits, which will take place at pHYBi case studies in Spain, France, and Croatia, as well as partner facilities, will give participants firsthand experience of the solutions in action. These visits will focus on:

- Practical applications of nanobiophytomanagement;
- Precision farming technologies;
- Digital tools, including genome scale metabolic models;
- Feedstock valorisation processes;
- Production of bio-based, circular textiles from lignocellulosic biomass;
- Innovative pigments and coatings.

The workshops will introduce future customers and stakeholders to pHYBi's innovative solutions and demonstrate real-world applications through site visits. The objective is also to build capacity within the bio-based sector, helping stakeholders adopt and implement sustainable solutions. Project partners will coordinate these site visits, ensuring alignment with stakeholder mapping results, technological advancements, and project progress. This information will be integrated into future updates of the strategy document, ensuring the activities continue to meet stakeholders' needs and reflect the latest project developments.

Table 4 – Overview of the planned stakeholder workshops, their preliminary content and potential time.

Workshop	Topic	Partner	Targeted Timeline
WS1	Phytomanagement: Focus on trees and energy crops; Applications for improving phytomanagement on different types of degraded soils	UBU, UniOvi	M33-M44

WS2	Digital Tools: Use of drones for different purposes; Precision fertilization; Soil Mapping	DIH- Leaf	M15-19
WS3	Biorefineries: Various technologies related to the biorefining of lignocellulosic materials. Outcomes of biorefining through organosolve treatment.	CETIM	M36-40
WS4	Capacity building: Circular economy; Soil health policy making; digital tools; bioremediation drivers, barriers, opportunities and risks	DIH- Leaf	M31-34

3.6 TIMELINE

This stakeholder engagement plan spans the entire duration of the project, covering all phases from initial planning and development to implementation and evaluation. Key activities include stakeholder identification, communication planning (see also D6.1: Communication and Dissemination Plan, M4), the development of engagement strategies, and ongoing monitoring and evaluation. As a dynamic and evolving framework, this plan will be continuously refined based on feedback and project developments, ensuring adaptability and responsiveness to emerging challenges and opportunities.

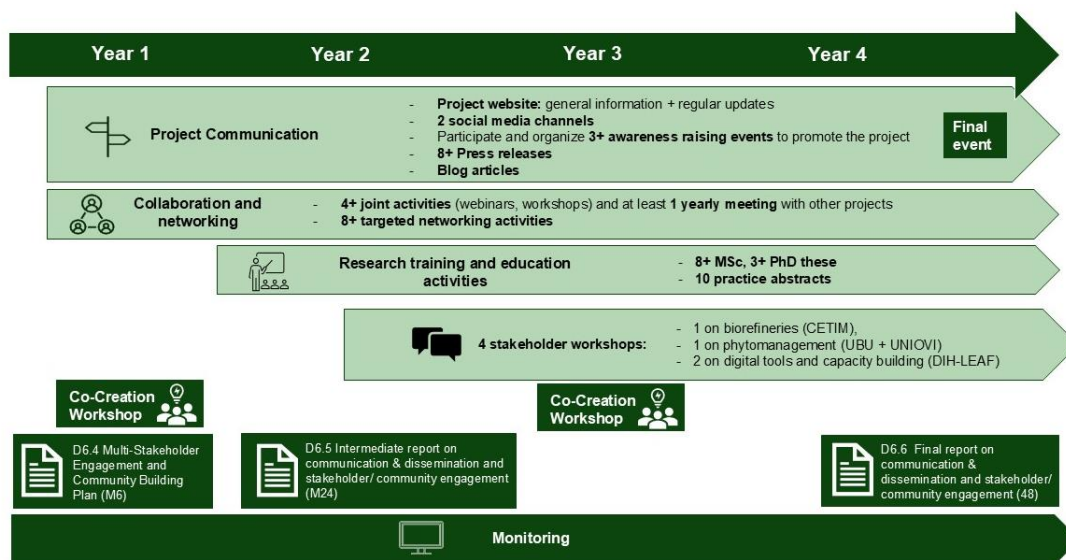


Figure 4 – Planned stakeholder engagement activities throughout the pHYBi project.

4. MONITORING AND EVALUATION OF IMPACTS

To ensure effective stakeholder engagement and integrate their feedback into decision-making, continuous documentation, monitoring, and reassessment of activities are essential throughout the project. Monitoring not only supports the long-term sustainability of project outcomes but also strengthens stakeholder relationships by maintaining a clear focus on relevant groups.

A dynamic monitoring document, hosted on the project's TEAMS platform, will facilitate this process by enabling structured documentation, analysis, and evaluation of stakeholder interactions. Regular tracking of engagement activities will help identify strengths, weaknesses, and areas for improvement. This document will assess stakeholder participation, the outcomes of engagement efforts, and their overall impact. Key details captured will include the stakeholder's identity, type of activity, key feedback points, relevant work package, feedback type, specific suggestions, and any associated measures for implementation. Comprehensive documentation of all engagement activities ensures transparency and accountability.

To complete the knowledge transfer to stakeholders, a white paper will be developed. Based on stakeholder input, this document will address regulatory barriers that hinder bioeconomy innovation and provide a framework for prioritizing coherent policies. By integrating these insights into recommendations for policymakers, the pHYBi project aims to contribute to advancing sustainable innovation in the bioeconomy sector and promoting a circular textile industry. Additionally, stakeholder engagement outcomes and activities will be captured in project deliverables D6.5, and D6.6 overing communication, dissemination, and peer-to-peer training at various project milestones.

5. CHALLENGES AND RISKS

Stakeholder engagement in the pHYBi project involves a diverse range of actors from various sectors, including soil remediation, biotechnology, and textiles. While this diversity brings valuable perspectives, it also presents several challenges and risks that need to be managed effectively. These challenges can be categorized as follows:

1. Diverging Interests and Priorities

Stakeholders represent different sectors with distinct objectives, such as environmental sustainability, technological innovation, and market-driven considerations. Aligning these interests may require balancing different priorities.

2. Communication and Knowledge Transfer

The project involves stakeholders with varying levels of expertise across specialized fields such as bioaugmentation, nano amendments, and textile manufacturing. Ensuring effective communication and knowledge transfer between these disciplines is essential to avoid misunderstandings and inefficiencies in collaboration.

3. Power Dynamics and Participation

Stakeholders differ in terms of organizational size, influence, and resources, which may impact the level of participation in engagement activities. Ensuring inclusive and balanced participation is important so that all relevant perspectives are considered and integrated into project discussions.

4. Regulatory Complexity

The project operates across multiple EU member states, each with distinct regulations governing soil remediation technologies and bio-based textile products. These regulatory variations may introduce challenges in aligning project outcomes with compliance requirements, potentially affecting implementation timelines.

5. Managing Expectations

Stakeholders may have different expectations regarding project outcomes and timelines, particularly when it comes to translating research into market applications. Clear communication of milestones, progress, and realistic timelines is essential to ensure a shared understanding of project developments.

To mitigate these challenges, the pHYBi project will:

- Establish clear communication channels to facilitate knowledge exchange.
- Provide targeted engagement strategies to address the specific needs of different stakeholder groups.
- Ensure inclusive participation by considering the perspectives of both small and large organizations.
- Monitor regulatory developments to support alignment with policy requirements.
- Manage expectations proactively through structured project planning and regular updates.

By applying these approaches, the pHYBi project aims to foster effective stakeholder engagement, contributing to its overall objectives in sustainable innovation and bio-based textile development.

6. CONCLUSION

A structured approach to multi-stakeholder engagement and community building within the pHYBi project was presented here. It outlines strategies to identify, assess, and engage stakeholders across the value chain, including soil remediation experts, textile manufacturers, and policymakers. By applying a targeted engagement framework based on stakeholders' influence and interest, the plan ensures meaningful participation in the project's development and decision-making processes.

Key methodologies, such as the influence-interest grid and systematic documentation tools, support efficient stakeholder mapping and continuous evaluation. Additionally, planned activities - including co-creation workshops and peer-to-peer learning sessions - aim to facilitate collaboration, address regulatory challenges, and promote knowledge exchange.

By integrating stakeholder feedback into sustainability assessments and project outcomes, the engagement strategy helps align the project with environmental, economic, and social objectives. Ultimately, this approach fosters acceptance and adoption of pHYBi solutions, contributing to the advancement of a circular, bio-based textile industry.

7. Annex 1: pHYBi living Stakeholder Mapping

Extract from the Living Stakeholder Map

Stakeholder	Stakeholder Subgroup	Identified Stakeholders	website	Short description	Country	geographic scope	Partner
Policy makers, public authorities	Umbrella Org.: Circularity	Cogersa	https://cogersa.es/	Waste management regional agency interested in the use of organic amendments in soil remediation (R&D department)	Spain	national	UniOvi
Policy makers, public authorities	Umbrella Org.: Circularity	Regional authorities in soil pollution	https://www.asturias.es/	Waste and Circular Economy Service, Regional Ministry for Ecological Transition (government of Asturias region)	Spain	national	UniOvi
Policy makers, public authorities	Umbrella Org.: Circularity	Ayuntamiento de Sargentos de la Lora	https://sargentosdelalora.com/	The local government of Sargentos de la Lora, responsible for municipal administration and public services in the region	Spain	national	UBU
Umbrella Organisations	Umbrella Org.: Ariculture	Bureba Ebro Sociedad Cooperativa	https://www.burebaebro.com/	An organization focused on supporting agricultural development and sustainability in the Bureba Ebro region	Spain	national	UBU
Umbrella Organisations	Umbrella Org.: Ariculture	Agrae	https://www.agrae.es/	Organization dedicated to agricultural innovation and sustainable development	Spain	national	UBU
Agricultural Machinery Companies	Umbrella Org.: Ariculture	Samca	https://gruposamca.com/	Industrial group operating in various sectors, including energy, mining, and agriculture, with a focus on technological advancement	Spain	national	UBU
Policy makers, public authorities	Public Authorities: organisations	Junta de Castilla y León	https://www.jcyl.es/web/jcyl/Portada/es/Plantilla100Directorio/1248366924958/0/1142233506275/DirectorioPadre	Regional Government: Territorial Environmental Service of Burgos.	Spain	national	UBU
Citizens and society at large	Society at large	Fundación Oxígeno	https://www.fundacionoxigeno.org/	Non-profit organisation dedicated to the conservation and enhancement of natural and rural heritage, promoting business, citizen and institutional participation.	Spain	national	UBU
Scientific community	Scientific community: Universities				France	European	UMLP
Students, early-stage researchers and new generation of workers	Students	UMLP	https://www.univ-fcomte.fr/	Training students	France	national	UMLP
Biotechnology companies	Umbrella Org.: Biotechnology	TAUW GmbH	https://www.tauw.com	Environmental Engineering Consultancy	Germany	European	UMLP
Policy makers, public authorities	Policy makers: organisations	DREAL	https://www.drieat.ile-de-france.developpement-durable.gouv.fr/	Environmental regulator	France	national	UMLP