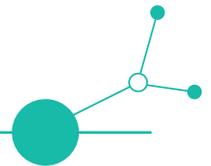


A3.3 – Deploying GREENE 4.0 innovation programs

General report



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A. Executive summary

Purpose

The purpose of the **Work package 3 - GREENE 4.0 Innovation Platform** is to accelerate the development and deployment of breakthrough technologies by providing targeted support to emerging innovations. The Innovation program, which is part of Activity 3.3, aims to guide selected technologies from identified initial practical applications (TRL 2) to a market readiness level (TRL 9) through a structured innovation process. Outlined in this deliverable is a technical document comprising the methodological steps and tools that are used for organizing and deploying the innovation programs (Proof-of-concept program, minimal viable product program, and investment & market readiness program) for each sectorial cluster by matching solutions with innovation program using TRL scale status. By leveraging the tools and resources developed under Activity 3.2, participants will be empowered to advance their technologies in a controlled, systematic manner.

This program, part of Activity 3.3, is designed to bridge the gap between theoretical research and practical application by providing comprehensive support in areas such as trainings, networking, support to find investments and test before invest. By focusing on the critical phases of technology development, we aim to facilitate the transition from early-stage research to tangible, market-ready solutions. Ultimately, the program seeks to create a robust innovation ecosystem that fosters collaboration, knowledge exchange, and investment opportunities, ensuring that promising technologies reach their full potential.

Scope and Objectives

The goal of this activity is to implement 3 innovation programs focused on piloting and testing all solutions developed within the project (Transnational Open Knowledge Box, User acceptance model, B2GreenHub platform). Participants in the Innovation Contest developed under Activity 3.2 will receive support in advancing their technologies by leveraging the tools created through this project, as well as specific services that partners can offer on their institutional level. The objective of this activity is to identify the necessary tools and activities for progressing a technology to a higher level on the TRL (Technology Readiness Level) scale. The Technology Readiness Level (TRL) scale provides a standardized framework for assessing the maturity of a given technology. While the lower TRL levels focus on scientific research, lab testing and prototype development, the upper TRL levels (7 through 9) are decisive for market entry and full-scale commercial deployment.

Expected Outcomes

This report outlines the three developed Innovation Programs that will help technologies to reach TRL 9, ensuring a structured progression. Additionally, the programs will be further enhanced by project partners, integrating additional tools, expertise, and resources to support the full innovation lifecycle. This collaborative effort will create a comprehensive framework that enables technologies to progress till TRL 9, where they are fully developed, tested, and ready for market deployment.



B. Introduction

Background information

Overview of the technology readiness level

Technology Readiness Levels (TRLs) are a standardized framework used to assess and track the maturity of a technology, from the earliest idea to full deployment. The scale is typically divided as follows:

- TRL 1–3: Early-stage development, from basic principles to proof of concept and validation in a controlled environment.
- TRL 4–6: Technology validation in relevant environments, moving toward a working prototype in operational settings.
- TRL 7–9: System demonstration, deployment, and full operational capability.

In GREENE 4.0, three Innovation Programs will be deployed to support the implementation of the solution in the industry. Through an Innovation Contest, promising technologies will be identified. Selected innovations will receive targeted support, including mentorship, technical validation, and prototype development. These Innovation Programs will be delivered by experts and facilitators, leveraging on the GREENE 4.0 developed tools and platforms and aiming at reaching specific TRLs objectives according to the technology's maturity.

The three Innovation Programs are:

1. Proof of Concept Program (TRL 2–3)

The Proof of Concept Program specifically supports early-stage technologies, guiding them through the critical first stages of development:

TRL 1: Observation of basic principles and initial scientific research – not involved in Greene 4.0 project.

TRL 2: Formulation of technology concepts and potential applications.

TRL 3: Experimental proof of concept — development of a functional prototype tested in a controlled environment.

2. Minimal Viable Product Program (TRL 4–6)

The Minimal Viable Product Program specifically supports the verification that a technology works as intended in a controlled or simulated environment and the proof of technology's effectiveness under realistic conditions:

TRL 4: Validation of the technology in laboratory environment.

TRL 5: Validation of the technology in industrially relevant environment.

TRL 6: Demonstration of the technology in industrially relevant environment.

3. Investment and Market Readiness Program (TRL 7–9)

The Innovation and Market Readiness Program supports products and technologies which have already reached the latter stages of the TRL scale, guiding them through the final stages of development:

TRL 7: Demonstrate a prototype in an operational environment



TRL 8: Finalize the system and validate it through rigorous testing

TRL 9: Deploy the proven system in real-world operations

Goal of the program

These innovation programs are designed to support innovators and startups selected through an innovation competition. The goal is to provide a comprehensive framework of tailored services, expert guidance, and validation tools to elevate these technologies to TRL9 — the level where the systems are fully validated and proven in operational environments.

The programs have a specific focus according to the related TRL, from reducing risk and validating early hypotheses, to validate the developed solution till supporting final system integration. They provide the teams with the methodologies, tools and networks necessary for successful real-world implementation and scaling.



C. Methodology

The Innovation programs are grounded to best practices for innovation management and to TRL development models, in order to ensure a successful deployment. Each program started from an analysis of TRL prerequisites in terms of general activities and outputs and identified the related services that GREENE 4.0 could offer to reach those targets. Moreover, each program is associated with a list of available tools that could be used to support the technology providers in this journey.

The methodology and the contents of the Innovation Programs have been discussed and validated by GREENE 4.0 partners through a series of periodic meetings.

Selection and Onboarding

Each Innovation Program will start with a preliminary step, where technologies are evaluated to confirm their TRL status (the minimum is TRL2) and strategic fit with the competition's focus areas (e.g., green tech, digital solutions, health innovation). Selected participants are then onboarded through a structured bootcamp covering:

- Introduction to TRL methodology and progression criteria
- Orientation on program structure, timeline, and deliverables
- Introduction on supporting tools and mentoring resources

The onboarding will be performed organizing knowledge-sharing sessions with industry experts and facilitators and engaging in online discussions and expert Q&A to validate the starting point. This is fundamental to have a clear understanding of the basic principles behind the technology and the identification of key knowledge gaps.

TRL-Based Progression Model

Each activity within the program is mapped against the TRL framework to ensure that all work contributes meaningfully to the TRL advancement. Specific indicators for each level include:

- TRL2: Formulation of concept and potential applications
- TRL3: Proof-of-concept through analytical and/or experimental evidence
- TRL4: Documented description of performed tests in laboratory environment
- TRL5: Documented description of performed tests in industrially relevant environment
- TRL6: Documented demonstration that the technology is working in realistic operative conditions
- TRL 7: Successful demonstration of a prototype in a real-world environment
- TRL 8: Developmental finalization and validation of the system
- TRL 9: First successful deployment of the system



Mentorship-Driven Learning

Every team is paired with at least one technical and/or business mentor. Mentorship activities include:

- Assessment of the state-of-the-art
- Milestone planning and delivery review
- Cross-team feedback and peer learning activities

Mentors are selected from academic, industry, and entrepreneurial backgrounds, ensuring that scientific, technical, and commercial aspects are addressed.

Monitoring and Evaluation

Throughout the program, each technical mentor will guide the team to ensure quality progress. During regular checkpoints, the TRL progression will be evaluated based on agreed indicators, tracking risks, bottlenecks, and capacity gaps. At the end of each Innovation Program the team will prepare for final TRL assessment and presentation, validating the achieved outcomes and eventually defining a clear roadmap for further refinement and scalability.

The Innovation Programs Implementation Procedure

According to what has been previously described, a procedure for the implementation of these Innovation Programs has been set up.

At the start of the development process, a **kick-off Meeting** will be scheduled, where the GREENE 4.0 facilitator brings together the solution provider and the solution seeker. During this session, the facilitator will introduce the methodology and structure of the Innovation Programs, outlining how GREENE 4.0 will support the technological maturation journey through the delivery of tailored services. These services are organized across the three Innovation Programs, each designed to progressively increase the solution's TRL.

During the progress of the activities, an **interim check** will be done to assess ongoing technology maturity and make adjustments if necessary. At the end, this stage will be concluded by a final evaluation to determine the TRL achieved (with TRL 7 as the minimum expected outcome).

According to this structure, participants will be expected to **deliver key outputs** at the end of each program phase, serving as formal documentation of their progress and achievements. These deliverables will allow to proceed with the following Innovation Program or to marked as concluded the activity:

- Proof-of-Concept Program (TRL 2–3): a PoC Report describing the developed proof of concept, including the technological assumptions, system architecture, and early validation results.
- Minimal Viable Product Program (TRL 4–6): a validated prototype, tested under realistic conditions, accompanied by a technical report detailing experimental methodologies, test protocols, and performance metrics.
- Investment and Market Readiness Program (TRL 7–9): an Operational Validation Report compiling results from field trials, integration with existing systems, and compliance with relevant standards and regulations. Additionally, a Final Pitch Deck to present the solution to potential investors and stakeholders.

A scheme of the procedure is reported in Figure 2.



THE PROCEDURE

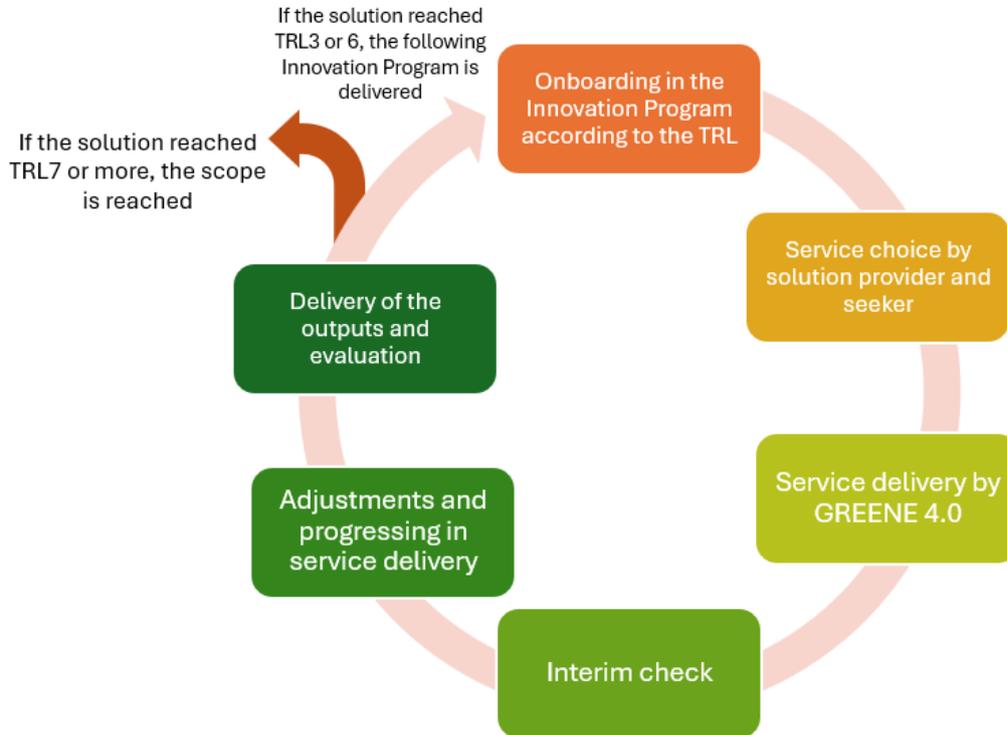


Figure 1: applied procedure for the delivery of GREENE 4.0 Innovation Programs.

As example, consider a **start-up developing a smart sensor for industrial air quality monitoring that begins its journey at TRL 2**. During the initial kick-off Meeting, the GREENE 4.0 facilitator assesses the start-up's needs and helps define a tailored roadmap. Recognizing the need to validate the core technological assumptions, the start-up is supported in identifying and engaging with a research institution capable of performing the required early-stage validations.

As a result, the start-up successfully develops a functional Proof of Concept (PoC) and compiles a comprehensive PoC Report outlining the concept, assumptions, and initial test outcomes. The GREENE 4.0 facilitator reviews the deliverable and formally confirms the transition to TRL 3, allowing the start-up to proceed to the next phase of the Innovation Program.

In the Minimal Viable Product Program (TRL 4–6), the start-up leverages the "Connection with companies" service via the B2GreenHub platform. This enables two key actions:

- Gaining access to industrial environments suitable for experimental validation.
- Engaging with relevant industrial stakeholders open to hosting demonstration activities.

Thanks to this support, the start-up builds and tests a working prototype in a real industrial setting. It documents the test results and methodology in a technical report, demonstrating the maturity of the solution and enabling a confirmed progression to TRL 6.

Finally, during the Investment and Market Readiness Program (TRL 7–9), the start-up is supported in conducting critical compliance assessments, including:

- Safety evaluations
- Regulatory alignment (e.g., CE marking, GDPR compliance, and medical device regulations)
- Environmental compliance checks



These activities ensure that the solution meets both operational and market-entry standards. Upon reviewing the final deliverables, the GREENE 4.0 facilitator confirms that the solution has successfully reached TRL 7, meeting the program's minimum expected outcome.

An even easier journey is represented by a more mature solution advancing from TRL 6 to TRL 9. As example consider a **scale-up company that has developed a cloud-based predictive maintenance platform for industrial machinery and enters the GREENE 4.0 program at TRL 6**, having already tested a stable prototype in controlled environments.

During the kick-off meeting, the facilitator identifies that the company qualifies for the Investment and Market Readiness Program, the third phase of the Innovation Programs, as it already meets the criteria to transition into TRL 7.

To ensure the advancement towards TRL 9, GREENE 4.0 offers a tailored service package. The company choose to be supported in the definition of KPIs and impact measurement, to monitor system performance and demonstrate concrete value to stakeholders, and in the mentoring for internationalisation, facilitating the entry into new EU markets with tailored commercial approaches.

By the final review in October, the platform demonstrates:

- Proven functionality in multiple operational environments.
- Scalable architecture and support systems.
- Verified market interest and early funding commitments.

The facilitator formally validates the solution's achievement of TRL 9, confirming its readiness for full commercial deployment and international scaling.



D. The deployment of Proof-of-Concept

Transition Plan from TRL 2 to TRL 3

Technology Maturation Phase

Proof Strategy and Experimental Validation (TRL2 to TRL3)

This phase moves participants from theoretical understanding to early experimental validation. Emphasis is placed on demonstrating that the scientific principle works in practice, even in simplified or simulated conditions. In general, this stage includes this type of actions:

- Experimental design planning
- Identification of performance metrics and test criteria
- Access to labs or sandbox environments
- Collection of stakeholder feedback (if applicable)

Once the scientific basis is established, the next step is to develop a structured technology concept, to define potential applications, and to outline early feasibility assessments.

According to this and to support the technologies' progression in this stage, GREENE 4.0 Proof of Concept Innovation Program identified a list of possible services to offer. Specific support provided may vary depending on the partner country. The overall framework and approach remain consistent. The technology provider, according to its own specific needs, will choose one of the following services.

Services Offered:

- 1:1 Technical mentorship and prototyping support
- Partner lab access for experimental validation
- Matchmaking with industry experts, investors, and research institutions for knowledge exchange
- Defining use cases and assessing the technology's real-world applicability
- PoC micro-grants and material support
- User/stakeholder feedback sessions
- Engaging in MOOCs and expert-led workshops to refine prototypes and business models

The outcome of this Innovation Program will be a structured technology concept with defined applications, initial feasibility studies, and identified innovation assets for future prototyping.



E. The deployment of Minimal Viable Product program

Transition Plan from TRL 4 to TRL 6

Stage 1: Validation of the proposed technology

Phase 1: Validation of the technology in laboratory environment (TRL3 to TRL4)

Supporting the transition of selected technologies from TRL 3 (Proof of Concept) to TRL 4 (Technology Validation in Lab) means helping them go from the knowledge of the principle to the testing under controlled conditions to prove it works. It is essential that these test results are thoroughly documented, providing a solid foundation for further development. This is a critical phase where the core technical feasibility is proven through lab-scale experiments, prototypes, and analysis. Possible activities include:

- *Technical Support*
 - Lab testing support
 - Simulation & modelling tools
- *Training & Mentoring*
 - Guidance on design of experiments (DOE)
 - Access to technology mentors
- *Funding & Resources*
 - Small grants for prototyping and materials
 - Vouchers for lab services
- *Partnerships*
 - Connect with research centres or universities
 - Facilitate collaboration with early adopters
- *IP & Regulatory Guidance*
 - Patentability assessments
 - Early regulatory landscape mapping
- *Validation Frameworks*
 - Help define performance metrics
 - Create test protocols and validation plans

According to this and to support the technologies' progression in this stage, GREENE 4.0 Minimal Viable Product Innovation Program identified a list of possible services to offer. Specific support provided may vary depending on the partner country. The overall framework and approach remain consistent. The technology provider, according to its own specific needs, will choose one of the following services.

Services Provided:

- Connection with experts/facilitators through the B2GreenHub platform, to be guided in defining the experimental activities, the related KPIs, etc.



- Connection with research centres, laboratories and universities through the B2GreenHub platform to access testing facilities and equipment and to create physical prototype, when needed.
- 1:1 technical mentoring sessions
- Analysis of available funding opportunities for the prototyping phase (European Open calls, vouchers, etc.).
- Regulatory and patentability assessments according to market needs and requirements.

The outcome of this Innovation Program will be a validated laboratory-scale prototype that demonstrates the proper functioning of the key technological components.

Phase 2: Validation of the technology in industrially relevant environment (TRL4 to TRL5)

Moving from TRL 4 to TRL 5 means helping enterprises evolve from a validated lab prototype to a validated system in a relevant (but still controlled) environment. This is a pivotal phase where the technology begins to interact with real-world constraints. The prototype of the technology should evolve beyond the lab to a complete and more robust version, capable of operating in realistic scenarios.

Below some possible activities:

- *Pilot Testing Support*
 - Set up or access relevant test environments
 - Support for semi-operational trials
- *Engineering & Design*
 - Refine prototype for environment-specific constraints
 - Integrate additional subsystems
- *Validation & Data Collection*
 - Define KPIs and operational metrics
 - Collect performance data in relevant settings
- *Stakeholder Engagement*
 - Involve target users or customers in pilot testing
 - Gather usability and adoption feedback
- *Regulatory & Standards Mapping*
 - Preliminary compliance assessments
 - Gap analysis against industry norms
- *Business Alignment:* connect tech performance with potential market or operational use cases

According to this and to support the technologies' progression in this stage, GREENE 4.0 Minimal Viable Product Innovation Program identified a list of possible services to offer. Specific support provided may vary depending on the partner country. The overall framework and approach remain consistent. The technology provider, according to its own specific needs, will choose one of the following services.

Services Provided:



- Connection with companies through the B2GreenHub platform, to have access for experimental validation.
- Connection with experts/facilitators through the B2GreenHub platform, to be guided in defining the relevant trials, the related KPIs, etc.
- Organization of user/stakeholder feedback sessions.
- Normative and compliance gap analysis.

The outcome of this Innovation Program will be a tested technology in a relevant environment, that mimics real-world conditions that uncovered integration, performance, and usability issues. Quantitative performance data will be collected, to be used to validate the technology's potential in practical applications.

Stage 2: Demonstration

Demonstration of the technology in industrially relevant environment (TRL5 to TRL6)

The transition from TRL 5 to TRL 6 represents a further step toward technology maturity, moving from a system validated in a relevant environment to a demonstration in a real operational environment, although still at a limited scale. This however will provide crucial insights into usability, maintenance, and integration. Performance data will validate the technology's readiness for larger-scale deployment and the business case will begin to take shape. The possible key activities of this stage are:

- *Field Trials & Deployment*
 - Implement pilot projects in real operational environments
 - Monitor long-term system behaviour
- *Support & Monitoring*
 - Provide technical support during field tests
 - Set up performance monitoring tools
- *Human Factors & UX*
 - Evaluate user interaction and collect qualitative feedback
 - Adapt UI/UX as needed
- *Business Validation*
 - Conduct early cost-benefit or ROI analyses
 - Define potential use cases and business models
- *Compliance & Certification*
 - Start formal certification or pre-certification processes
 - Address safety and legal barriers
- *Stakeholder Reporting*: prepare technical validation reports for investors, partners, or regulators.

According to this and to support the technologies' progression in this stage, GREENE 4.0 Minimal Viable Product Innovation Program identified a list of possible services to offer. Specific support provided may



vary depending on the partner country. The overall framework and approach remain consistent. The technology provider, according to its own specific needs, will choose one of the following services

Services Provided:

- Connection with companies through the B2GreenHub platform, to facilitate the involvement of industrial stakeholders available to perform the demonstration.
- Connection with experts/facilitators through the B2GreenHub platform, to define the field tests to be performed.
- Connection with technology providers through the B2GreenHub platform, if needed, to optimize the technology user interface.
- Identification of performance monitoring tools.
- Organization of user/stakeholder feedback sessions.
- Economic assessment through the ROI analysis.
- Business model validation according to the obtained results.
- Support for the identification of certification needs and competent bodies and authorities.
- Support for the preparation of technical validation reports.

The outcome of this Innovation Program will be a demonstrated technology in an industrially relevant environment, tested by real users or operators. A roadmap to engage with certification bodies or regulatory authorities to prepare for commercialization could be also considered.



F. The deployment of the Investment and Market Readiness Program

Transition Plan from TRL 7 to TRL 9

Stage 1: Operational Validation

Demonstration of the prototype in operational environment (TRL6 to TRL7)

At this stage, the objective is to complete the development of the system prototype, ensuring it is fully functional and reflects the intended design specifications. It involves testing in real-world environments to assess performance, reliability and usability under actual operating conditions and resolving any technical or operational issues to ensure the solution is ready for pre-commercial deployment. The possible key activities of this stage include:

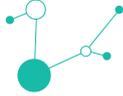
- Demonstration of an integrated system or pilot plant
- Testing under actual operational conditions (e.g., industrial environment, relevant timescales)
- Addressing remaining engineering and manufacturing risks
- Collecting feedback from end-users or partners

According to this and to support the technologies' progression in this stage, GREENE 4.0 Investment and Market Readiness Program Innovation Program identified a list of possible services to offer. Specific support provided may vary depending on the partner country. The overall framework and approach remain consistent. The technology provider, according to its own specific needs, will choose one of the following services.

Services offered:

- Support of pilot testing in realistic operational environments with actual users, providing access to testbeds and pilot environments (e.g., hospitals, factories, smart cities)
- Partnership facilitation with end-users or early adopters for co-development and feedback
- Collection of performance data under various conditions (technical, environmental, user behaviour) for a preliminary technical validation.
- Conducting safety, regulatory (e.g., CE marking, GDPR compliance, medical device regulations) and environmental compliance assessments
- Refining the user interface, system integration and automation based on pilot feedback

The outcome of this Innovation Program will be a verified and refined full-scale prototype, with a number of validated performance metrics. A risk assessment and a corresponding mitigation plan could be also included in the report.



Stage 2: Pre-Commercial Development

Finalize the system and validate it through rigorous testing (TRL7 to TRL8)

The transition between TRL7 and TRL8 will produce a validated prototype into a fully integrated, production-ready version suitable for broader deployment. This involves refining the design for manufacturability or scalability, establishing necessary operational processes and securing compliance with relevant regulations and standards. The goal is to prepare the solution for limited market entry while building the infrastructure and partnerships needed for full commercialization. At TRL 8, in fact, the technology is considered to be completed and qualified through rigorous testing and demonstration. This stage includes different possible activities:

- Completion of pre-commercial demonstration
- Full-scale system tested in near-market conditions
- Final performance validation against user needs and regulatory standards
- Refinement of manufacturing processes and cost models

TRL 8 typically coincides with the first phase of limited commercial trials or pilot customers. Any remaining gaps between the prototype and the commercial version must be resolved and certification or accreditation processes (if applicable) should be finalized at this stage. According to this and to support the technologies' progression in this stage, GREENE 4.0 Investment and Market Readiness Program Innovation Program identified a list of possible services to offer. Specific support provided may vary depending on the partner country. The overall framework and approach remain consistent. The technology provider, according to its own specific needs, will choose one of the following services.

Services offered:

- Access to manufacturing facilities or partners for small-scale manufacturing and industrialisation support
- System integration services (ensuring interoperability with existing platforms)
- Development support for a manufacturing or deployment strategy (e.g., cloud scaling for digital, supply chain readiness for hardware)
- Support with formal certification processes (e.g., ISO, CE, FDA, etc.)
- Performance extended trials or limited market releases ("beta" phase for digital solutions)
- Support for robustness, reliability, and security testing
- Advisory on pricing, value proposition, and go-to-market strategies
- Intellectual property protection (patent strategy, NDAs, copyrights)
- Scalability planning and roadmap development

The outcome of this Innovation Program will be a fully integrated, production-ready system, which has been validated by both users and (if applicable) other relevant stakeholders. A deployment and support infrastructure will be in place to support the full commercial roll-out.



Stage 3: Full Rollout

Deploy the proven system in real-world operations (TRL8 to TRL9)

This stage focuses on validating the system's ability to operate consistently in diverse conditions while meeting user needs and business goals. It also involves gathering long-term performance data and stakeholder feedback to support full commercialization and future scaling opportunities. It represents the final stage of solution development and corresponds with the achievement of TRL 9. Reaching TRL 9, in fact, means that the technology has been fully deployed in the target market and is operating successfully under the full range of conditions. The system has passed all validation, certification and performance milestones and now supports routine operations. Key aspects of TRL 9 include:

- Full commercial deployment
- Real-time operations with end-users or clients
- Monitoring, quality assurance and process control in place
- Scalable manufacturing or deployment capabilities

For many technologies, TRL 9 is associated with 24/7 production or service delivery, robust supply chain integration and ongoing performance optimization. According to this and to support the technologies' progression in this stage, GREENE 4.0 Investment and Market Readiness Program Innovation Program identified a list of possible services to offer. Specific support provided may vary depending on the partner country. The overall framework and approach remain consistent. The technology provider, according to its own specific needs, will choose one of the following services

Services offered:

- Monitor system reliability, scalability and performance over time, through KPI definition and impact measurement to demonstrate value to stakeholders
- Optimize support systems, including customer service, maintenance and upgrades
- Collect data to inform business model refinement and potential scale-up or investment
- Funding access for early market deployment (pre-commercial funding, innovation loans)
- Mentoring for internationalisation and scaling-up
- **Marketing and communication strategy support including pitching**
- Investor readiness and fundraising advisory

The outcome of this Innovation Program will be a commercially deployed solution in an operational setting. It has been proven to be robust and fully meet client requirements. Any lessons learned from developing this solution are ready to be applied to future development.



G. Tools and Resources

Innovation requires access to the right resources at each stage of development. To support innovators in advancing their technologies through the Technology Readiness Levels (TRLs), we provide a set of specialized tools designed to facilitate prototyping, simulation, and testing. These tools are integrated within the B2GreenHub platform and other supporting frameworks, ensuring that innovators have access to expert knowledge, collaboration opportunities, infrastructure, and financial resources necessary to bring their ideas to life.

1. B2GreenHub Expert Forum

The B2GreenHub Expert Forum is an interactive platform designed to foster knowledge exchange and collaboration in the different stages of technological development. It accelerates the development of innovative technologies by supporting innovators through every stage of the Technology Readiness Level (TRL) spectrum—from early theoretical exploration (TRL 2) to full commercial deployment (TRL 9). In fact, it serves as a meeting ground for experts, researchers, and professionals, enabling discussions that help users explore and understand the fundamental scientific principles behind emerging technologies, and can also support innovators in their process of understanding how, where and with whom they can test their technology to validate and demonstrate it.

At TRL 2, identifying and validating the scientific principles behind a technology is essential. The B2GreenHub Expert Forum provides a space for:

- Knowledge exchange and structured discussion among researchers, scientists, and experts.
- Exploration of fundamental mechanisms behind emerging technologies.
- Interdisciplinary collaboration to spark new ideas and refine theoretical foundations.

By enabling early dialogue and critical analysis, the forum helps innovators determine the feasibility and scientific soundness of their ideas—laying the groundwork for further development.

As concepts evolve into experimental proofs and early prototypes, the Expert Forum continues to offer critical value by:

- Supporting discussions on technology integration, design validation, and material selection.
- Helping identify use cases, market needs, and regulatory considerations.
- Providing a venue to gather feedback for iterative development.
- Case studies and lessons learned from similar technologies.

Reaching TRL 6–7 involves significant challenges, such as demonstrating full system integration, ensuring reliability under operational conditions, and aligning with real user needs. The B2GreenHub Expert Forum helps address these challenges through the expert advisory sessions focused on engineering, integration, and performance optimization. This service help innovators transition from a validated prototype to a demonstrated system ready for pre-commercial use.

Moreover, at final TRL stages, the Expert Forum support technologies to prove their reliability, to secure certifications, and to prepare for market deployment. In fact, it allows to connect innovators with certification bodies and compliance experts and to enable dialogue with early customers, buyers, and investors. Through community-driven validation, strategic networking, and expert guidance, the



B2GreenHub Expert Forum empowers innovators to successfully move from a tested system (TRL 8) to a fully operational, commercialised solution (TRL 9).

2. Open Innovation Maps

The B2GreenHub Open Innovation Map is a strategic tool that supports innovators throughout the full lifecycle of technology development. By mapping key innovation assets—such as laboratories, testbeds, demo centers, companies, and expert networks—it enables technology developers to find the right infrastructure, partners, and use cases to advance their solutions from early concept (TRL 2) to market-ready deployment (TRL 9).

At TRL 2, technologies are still at the conceptual stage, requiring refinement of core ideas and identification of critical functions. The Open Innovation Map supports this phase by:

- Mapping relevant research facilities and laboratories for early experimentation.
- Enabling innovators to locate nearby demo centers and testbeds to explore functionality.
- Offering access to simulation environments and expert support for refining technological concepts.

At TRL 3, when developers begin validating key components and testing technical assumptions, the platform helps innovators to connect with specialized labs and equipment for early prototyping and find collaborators (researchers, technical experts, industrial mentors) to guide experimentation.

As technologies progress to lab-validated prototypes (TRL 4) and operational testing in relevant environments (TRL 5), the Open Innovation Map becomes a gateway to:

- Testbeds and pilot infrastructures relevant to the application domain (e.g., energy, waste, mobility).
- Expert networks and industrial mentors who can offer feedback and guide development.
- Matchmaking with research and technology centers for joint validation activities.
- Funding opportunities and collaborative R&D programmes, helping innovators build strong multi-stakeholder consortia.

These resources enable structured testing and multidisciplinary evaluation—key to developing robust, scalable solutions.

At TRL 6 and 7, innovators face the challenge of demonstrating integrated systems in real-world conditions. The Open Innovation Map supports this phase by:

- Mapping industrial facilities and pilot sites for demonstration projects.
- Enabling connections with small, medium, and large companies classified by sector and geography.
- Facilitating involvement of target users, customers, and integrators for pilot testing.
- Supporting feedback collection and design of field trials (DoE – Design of Experiment) to optimize time, cost, and performance evaluation.

Furthermore, the platform enables connections with technology providers to improve UI/UX and address technical bottlenecks during system integration.



Finally, as technologies reach TRL 8 and prepare for market launch (TRL 9), the Open Innovation Map provides access to:

- Pre-commercial demonstration environments and certified testing labs.
- Certification bodies for regulatory compliance (e.g. CE, ISO).
- Industrial partners to support scaling, manufacturing, and distribution.
- Infrastructure for extended field trials or limited market releases, bridging the gap to full commercialization.

By identifying the right ecosystem actors and infrastructure, the Open Innovation Map ensures innovators can complete performance validation under expected operational conditions, align with market requirements and certification protocols and secure early customers and deploy their technology at scale.

3. Private equity investment tool

The B2GreenHub Private Equity Investment Tool empowers innovators to navigate the funding landscape, align technical development with market expectations, and build compelling business cases throughout the technology lifecycle. Designed to support financial and strategic preparedness, this tool helps innovators transform promising ideas into investment-ready solutions by the time they reach market deployment (TRL 9).

At the earliest stages of innovation (TRL 2–4), researchers and entrepreneurs often struggle to align technical ambition with commercial potential. The Private Equity Investment Tool addresses this by:

- Introducing the Investment Readiness Playbook, a structured guide that builds foundational knowledge of business and investor dynamics.
- Helping innovators formulate early value propositions, identify high-level market opportunities, and consider potential risks.
- Offering templates and self-assessment checklists to analyse the feasibility of turning early concepts into investable propositions.

This early exposure to financial thinking ensures innovators begin developing the mindset needed to translate scientific promise into economic value.

As solutions reach the demonstration phase (TRL 5–7), developers must begin preparing for investor engagement and due diligence. The Private Equity Investment Tool supports this phase by offering:

- Modules for refined financial modelling, cost analysis, and revenue forecasting.
- Templates for investment pitches, one-pagers, and traction summaries.
- Checklists to track regulatory compliance, IP strategy, and certification milestones.
- Guidance on how to structure a proof-of-business alongside the proof-of-technology.

These features allow innovators to de-risk their proposition and present a balanced view of both technical validation and business readiness—key to attracting private capital at this stage.

At the final stages of technology development, securing funding for scaling and commercialization becomes critical. The Private Equity Investment Tool supports this with:



- Investor-ready templates for commercialization planning, cost structure optimization, and long-term revenue modelling.
- Executive pitch builders and storytelling tools to communicate impact, scalability, and differentiation.
- Legal and compliance checklists covering certifications, licensing, and IP protection.
- Support in connecting with strategic partners, investors, and public buyers.

This ensures innovators can translate technical success into a clear, credible, and compelling business case, increasing their chances of raising capital for scaling and market deployment.

The B2GreenHub Private Equity Investment Tool, in fact, is more than a set of templates: it's a comprehensive roadmap for investment readiness. By introducing financial planning and strategic thinking at the earliest stages and progressively deepening those capabilities across TRLs, the tool enables a confident engagement with investors and a stronger business cases grounded in technical reality, supporting innovators to turn ideas into investable ventures.

4. B2GreenHub Business Model Generator

As innovations move from technical validation (TRL 5) to system demonstration (TRL 6) and eventually toward market deployment (TRL 9), aligning the technology with a sound and scalable business model becomes essential. The B2GreenHub Business Model Generator supports this process by helping innovators integrate economic viability into their development path, ensuring their solutions are not only functional but also commercially attractive.

At TRL 5 and 7, innovators must begin framing their technical solution within a broader economic and strategic context. The Business Model Generator supports this transition by offering:

- Preliminary ROI Analysis, helping innovators estimate the Return on Investment in industrial settings, quantifying value creation, cost drivers, and payback periods. This early economic evaluation is key to engaging potential investors and industrial partners.
- Business Model Canvas Development, enabling users to map out and iterate on customer segments and needs, and revenue streams and cost structures.
- Market Feedback Integration, supporting real-time refinement of the business model based on demonstration results, allowing innovators to validate assumptions with operational data from pilot deployments.

By linking technical outcomes to financial viability, the tool helps innovators strengthen their business case and ensure the demonstration phase aligns with future commercialization goals.

At final stages, the Business Model Generator plays a final, strategic role in preparing for commercial deployment and growth. It supports the translation of the validated business model into a professional plan for engaging private equity investors, public buyers, and strategic partners, and the short- and long-term planning for production scale-up, service delivery, and market expansion.

By integrating these aspects, the Business Model Generator ensures that the innovation is not only technically sound, but financially compelling and commercially viable, ready to scale across markets.

5. Open Knowledge Training Tool



The B2GreenHub Open Knowledge Training Tool—part of the Transnational Open Knowledge Box—provides innovators with targeted training, methodologies, and strategic guidance to navigate each phase of technology development. Through structured modules, expert input, and hands-on learning, the tool supports the transition from conceptual ideas to fully market-ready solutions.

At the early stages, innovators must explore the fundamental principles behind their ideas and begin outlining the path toward feasibility. The Open Knowledge Training Tool provides structured Training Modules on Smart manufacturing, Sustainable production, Circular economy principles, Digital business models and Private equity investment basics.

Massive Open Online Courses (MOOCs), in fact, offer flexible, self-paced learning tailored to scientific and business-oriented aspects of technology development, giving participants hands-on opportunities to apply theoretical knowledge in a real-world context. These resources guide innovators in understanding the technical, economic, and environmental feasibility of their ideas, setting a strong foundation for early-stage prototyping (TRL 3).

As technologies evolve toward MVP and demonstration phases, innovators require more focused support on both technical validation and strategic development. The Open Knowledge Training Tool supports this with Module 5, focused on Finance and Investment Readiness, which introduces key concepts, such as Funding gap analysis, Stakeholder mapping, Investor expectations and Value proposition articulation. This integrated approach ensures technologies are validated not only technically, but also from a market and investment readiness standpoint.

6. B2GreenHub One-on-One Sessions with Facilitators

As emerging technologies progress, personalized support becomes critical to align technical, strategic, and regulatory dimensions. The One-to-One Sessions with B2GreenHub Facilitators provide tailored mentoring that empowers innovators to structure, validate, and demonstrate their solutions effectively within industrial environments.

In the early stages till TRL5, innovations are typically transitioning from controlled lab testing toward validation in relevant environments. Facilitators play a central role in guiding this transition through:

- Experimental Plan Definition, assisting in the design of tailored Design of Experiments (DoE), definition of relevant KPIs, selection of performance metrics, and scheduling of test phases.
- Custom Mentorship, adapting the support to the specific needs of each innovation, ensuring the right tools, approaches, and validation frameworks are applied.
- Funding Guidance, helping identify and analyse suitable funding opportunities, matching the financial requirements of laboratory testing and early piloting with available regional, national, or EU programs.

When transitioning to industrial-scale testing (TRL6-7), facilitators continue to provide hands-on guidance tailored to operational environments:

- Pilot Design and Execution Support, Co-developing structured pilot plans, helping define testing conditions, monitoring protocols, and feedback collection mechanisms.
- Technology Compliance & Gap Analysis, Supporting regulatory diagnostics and identifying areas requiring improvement before industrial adoption.
- Performance Monitoring Strategy, Guiding the selection of monitoring tools, metrics, and data collection techniques that align with expected outcomes and stakeholder requirements.



- Stakeholder Engagement, Organizing and structuring user feedback sessions, supporting usability assessment and market alignment through direct interaction with potential adopters.

Facilitators act as bridges between innovators and the industrial environment, ensuring that testing activities meet real-world standards and expectations.

Finally, as innovations approach full deployment, facilitators provide the strategic oversight and documentation support needed to ensure market readiness:

- Certification & Regulatory Navigation, helping innovators understand and meet sector-specific certification requirements, identifying competent bodies and guiding conformity assessments.
- Technical Validation Reporting, supporting the drafting of comprehensive technical validation reports, aligned with industrial norms and investor expectations.
- Demonstration Impact Communication, helping summarize pilot outcomes and quantify benefits in terms that resonate with potential customers, investors, and public buyers.

This strategic mentorship approach ensures that innovators are not alone during their journey, and have access to the right knowledge, at the right time, to move confidently from concept to commercialization.



H. Expected Outcomes

Participating in an Innovation Program that supports the journey from early-stage research to full market deployment enables a wide range of strategic and measurable outcomes for innovators and their technologies.

At the early stages (TRL 2–3), the program **enhances the scientific and entrepreneurial capacity of participants**. Through structured training, expert mentoring, and access to tailored tools, innovators develop not only their technical concepts but also the strategic mindset needed to transform ideas into viable solutions.

As concepts mature, the program helps position promising innovations to enter prototype development tracks, guiding them through critical stages such as feasibility assessment, early prototyping, and functional validation. This lays the foundation for building strong business cases and investment-readiness.

High-potential projects benefit from increased **visibility to incubators, accelerators, and investors**, expanding their access to resources, funding, and strategic partnerships. With the support of the program, innovators advance to validation and demonstration phases, where prototypes are tested in controlled environments and later in real industrial settings.

One of the key outcomes is the **activation of new collaborations with relevant stakeholders**, such as research centers, corporates, and potential end users, which helps strengthen the solution and explore new industrial use-cases, increasing both the depth and breadth of impact.

As the technologies progress, participants experience a significant boost in their **technical, operational, and commercial capabilities**. The program supports them in navigating the complexities of market entry, regulatory frameworks, and customer engagement.

Within the GREENE 4.0 project, the minimum TRL to be reached by the selected solution is TRL7.

However, if there is time and the technology providers agree, further steps can be done. By the time technologies approach TRL 8–9, they should demonstrate a high level of **market readiness**, backed by improved regulatory compliance and a more robust intellectual property (IP) portfolio. At this stage, the solutions are prepared for adoption by either private or public sector stakeholders, or for scaling via licensing, partnerships, or direct commercialization.

Finally, the program ensures **high-visibility exposure** for mature solutions by connecting innovators with corporate partners, strategic investors, and public buyers. This visibility not only accelerates potential adoption but also validates the innovation's relevance and readiness in real-world contexts.

Key Deliverables

According to this structure, participants will be expected to deliver key outputs at the end of each phase of the Innovation Program, serving as formal documentation of their progress and achievements:

- Proof-of-Concept Program (TRL 2-3)

A report outlining the developed proof of concept (PoC), including the technological concept, functional assumptions, and preliminary validations. This document will demonstrate the feasibility of the core idea.



- Minimal Viable Product Program (TRL4-6)

A validated prototype capable of operating in realistic conditions, accompanied by a report summarizing the tests carried out, methodologies used (e.g., DOE), and key performance results. This deliverable highlights the technical maturity and application potential of the solution.

- Investment and Market Readiness Program (TRL7-9)

An Operational Validation Report that documents real-world performance data, integration outcomes, and regulatory compliance from field trials. In addition, a Final Pitch Deck will be prepared for presentation to stakeholders, showcasing both the technological capabilities and commercial value proposition of the solution.

Timeline

The selected solutions will be developed over a four-month period, with a final deadline set for October 31st. Each solution will progress from its initial Technology Readiness Level (TRL) to **at least TRL 7**. If time permits and depending on the specific development path, the technologies may also advance to TRL 9. The journey will be tailored to the individual needs of each technology developer and the final objectives required.

Following the matching phase, a **Kick-off Meeting** will be scheduled. During this meeting, GREENE 4.0 facilitators will introduce both solution providers and seekers to the structure and workflow of the Innovation Programs. This onboarding session will outline the applied methodology, clarify any doubts, and explain how beneficiaries can take full advantage of the three Innovation Programs according to their TRL stage. It will also serve to schedule the most suitable service package and related activities.

From July to October, **services will be delivered** accordingly. Solutions beginning from TRL 2 will follow the full pathway through the three Innovation Programs:

- Proof of Concept (TRL 3-6)
- Minimal Viable Product (TRL 4-6)
- Investment and Market Readiness Program (TRL 7-9)

More mature solutions will only participate in the programs relevant to their current TRL. Regular check-ins and progress assessments will be conducted throughout the process.

The **final evaluation** of the achieved TRL will take place on October 31st, marking the official conclusion of the development phase.

A scheme of the process is reported in Figure 2.



THE TIMELINE

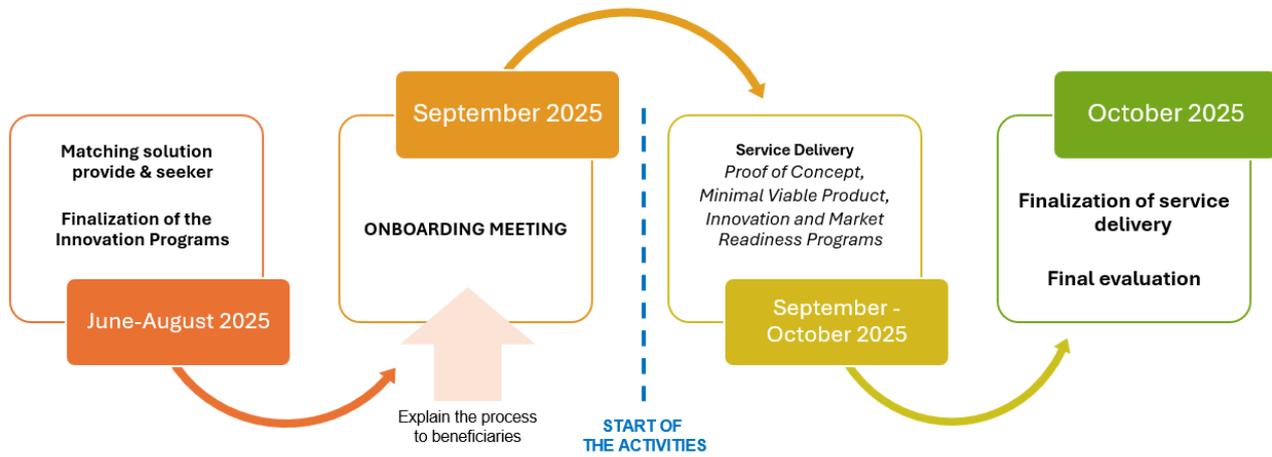


Figure 2: timeline of the Innovation Programs delivered by GREENE 4.0 partners.



Conclusion

The deployment of the GREENE 4.0 Innovation Programs provides a clear and structured pathway for technologies to progress from TRL 2 to TRL 9. Through three Innovation Programs, selected innovations receive targeted support to validate core principles, build initial prototypes, demonstrate the solution in industrially relevant environment, optimize system integration, and prove commercial viability in real-world environments.

The program is based on proven methods, combining agile development, scientific validation, and practical mentoring to ensure measurable TRL advancement. Tools and resources developed within the project directly support each step, from concept formulation to full scale roll-out.

The methodology ensures that only technologies with demonstrated operational success and market readiness move forward, reducing risks and maximizing the effectiveness of investment and deployment efforts.