GREEN LABS

Methodological guide

Green labs project
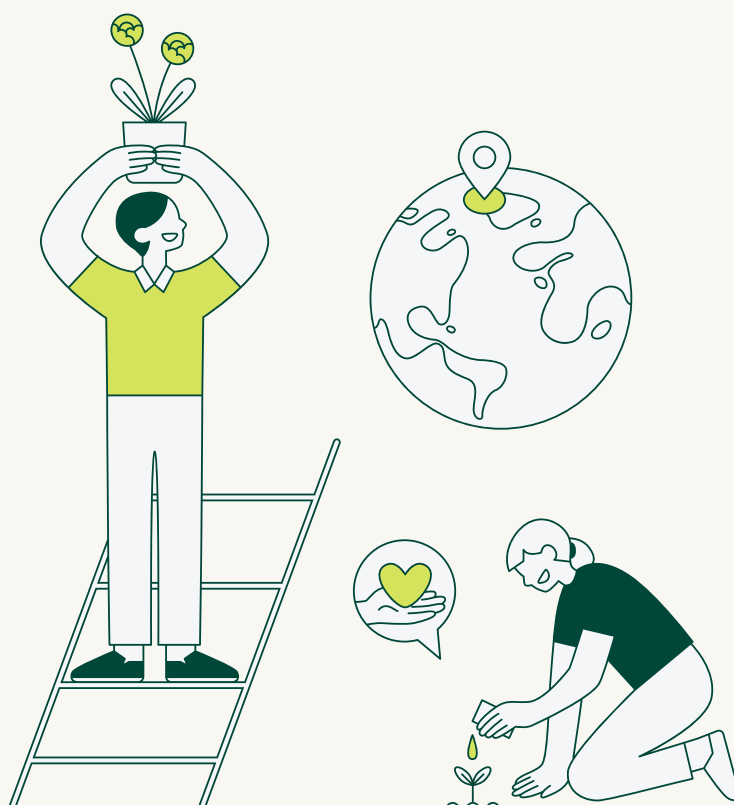
Methodological guide

Green labs

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1/ The project

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Project context

Project co-funded by the European Union under the European ERASMUS+ program in the field of vocational education and training (VET).

The GREEN LABS project aims to support and stimulate the green transition by promoting innovation and the greening of VET systems through internationalization, the exchange of practices, and knowledge sharing between partners, in line with the 2020 Osnabrück Declaration on Vocational Education and Training for Sustainable Competitiveness, Social Equity, and Resilience.

Project objectives

The project aims to promote the strengthening of a European education area, while contributing to strengthening skills for sustainable development:

- Co-creation of a European network of local laboratories (living labs) aimed at stimulating the green transition and the development of territorial initiatives and projects.
- Design and development of a new professional training program for facilitators/managers of these living labs (called "green innovation managers—GIM"), capable of acting as facilitators of the green transition.
- Steering of the living labs created, thanks to the involvement of key public and private stakeholders and the direct commitment of trained green innovation facilitators/managers.
- Implementation of a web portal for the international network of living labs, development and testing of a set of support services for stakeholders.
- Implementation of targeted, multi-channel awareness campaigns to raise awareness among all stakeholders.

Expected results

- Co-creation of a European network of local laboratories aimed at stimulating the green transition.
- Design and development of a new professional education program for green innovation managers, capable of acting as facilitators to stimulate the green transition.
- Implementation of targeted multi-channel awareness campaigns and broad multi-stakeholder awareness campaigns throughout the project and with a view to sustainability and further exploitation.

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2/ Introduction

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The GREEN LABS project is a transnational initiative co-funded by the European Union aimed at fostering eco-innovation and sustainable development through the creation of an international network of Living Labs.

These labs will operate in real-world settings across multiple partner countries, serving as participatory spaces where citizens, researchers, businesses, and public authorities collaborate to co-create solutions that promote the green transition.

Main Objectives of the Project

1/ Establish a network of local Living Labs, one in each participating country, grounded in a shared framework but adapted to local contexts.

2/ Launch the GREEN LABS Network as a system of open innovation ecosystems, supporting the design and implementation of circular economy projects and sustainable practices.

3/ Promote community engagement and co-creation processes that empower local stakeholders and enhance their capacity to lead eco-innovative initiatives.

4/ Provide a digital ecosystem to support collaboration, knowledge sharing, and the co-development of green transition strategies.

5/ Contribute to the broader EU goals for climate resilience, sustainable growth, and inclusive development, by testing models that can be replicated across Europe and beyond.

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Strategic Focus Areas

The project particularly targets key aspects of the circular economy, such as:

- Waste reduction and reuse (5Rs)
- Sustainable production and consumption
- Ecodesign and green entrepreneurship
- Community-driven green innovation

This methodological document (R1) lays the foundation for the effective design and implementation of the Living Labs. It serves as a guide for project partners, policy-makers, and practitioners by outlining essential principles, processes, and tools needed to create and manage inclusive and impact-driven Living Labs within the GREEN LABS network.

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2.1 Purpose, Scope & Objectives

The Methodological document for the design and implementation of Living Labs is a foundational guide for establishing and operating an international network of Living Labs focused on green innovation and sustainability. This document outlines the key principles, methodologies, and governance structures required to successfully design, implement, and sustain these labs as collaborative spaces for multi-stakeholder engagement.

The primary objectives of this document are:
- To define a standardized framework for designing and running Living Labs across different geographic and socio-economic contexts.
- To ensure alignment with the quintuple helix model, integrating government, academia, industry, civil society, and environmental perspectives.
- To provide clear operational guidelines on governance, co-creation methodologies, and stakeholder engagement.
- To offer tools and techniques for measuring the impact and long-term sustainability of Living Labs.
- To support replication and scalability by providing adaptable models for future Living Labs in other regions.

This methodology promotes open innovation and experimentation within communities, encouraging collaboration between different sectors and disciplines to co-create solutions for environmental challenges, by identifying the GREEN LIVING LABS as leverages of sustainable community development.

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2.2 Overview of living Labs & their applications

"The Living Lab approach is one of the most well-known and successful approaches for developing innovations. There are many aspects to consider when setting up a Living Lab in terms of organization, operations, resources, business models, users / citizens, openness and value." (European Network of Living Labs)

Living Labs are real-world innovation ecosystems that encourage participatory design and testing of solutions to complex societal challenges. They provide a structured space for iterative development, where users, researchers, businesses, and policymakers collaborate in real-life settings to design, prototype, and validate innovations before wider implementation.

The Living Labs in the GREEN LABS project will focus specifically on green ecosystems, circular economy practices, and sustainable production and consumption models. They will serve as testing grounds for new policies, business models, and technologies that promote eco-innovation and climate resilience.

2.2 Overview of living Labs & their applications

Applications of Living Labs include:

- Urban sustainability initiatives (e.g., eco-friendly city planning, renewable energy adoption, sustainable mobility solutions).
- Circular economy experiments (e.g., waste reduction, resource efficiency, sustainable product design).
- Community-driven environmental projects (e.g., green spaces, biodiversity conservation, sustainable agriculture).
- Policy co-creation spaces for public authorities to engage with citizens and businesses on climate action.
- Education and vocational training hubs, offering hands-on learning experiences for future Green Innovation Managers.

By bridging the gap between theory and practice, Living Labs enhance participatory governance and empower communities to take ownership of sustainable solutions.

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2.3 Target audience

This methodological document is intended for a broad range of stakeholders involved in the development, implementation, and sustainability of Living Labs.

The key target audiences include:
1. Policymakers & Local Authorities – Municipalities, regional governments, and EU institutions seeking to integrate Living Labs into sustainability strategies.
2. Academic & Research Institutions – Universities, think tanks, and innovation hubs aiming to harness Living Labs as collaborative research environments.
3. Businesses & Startups – Companies involved in green technology, circular economy solutions, and eco-innovation that can benefit from real-world experimentation.
4. Civil Society & Community Organizations – NGOs, grassroots movements, third-places and cooperatives working on environmental and social sustainability initiatives.
5. Funding Agencies & Investors – Entities looking to support and scale up Living Lab initiatives through public-private partnerships, grants, and crowdfunding.

By ensuring a multi-stakeholder approach, this document aims to empower different actors to engage with Living Labs to maximize their impact and sustainability and to co-create green solutions/action plans to the identified panel of local challenges.

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3/ Living Labs: Definition & Core Principles

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Living Labs are user-centered, open-innovation ecosystems where multiple stakeholders collaborate to develop, test, and refine innovative solutions in real-life environments. The approach fosters co-creation, experimentation, and participatory governance, ensuring that innovations are practical, scalable, and socially accepted.

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3.1 Definition of Living Labs

Living Labs are dynamic environments that:

- Engage users as active participants rather than passive consumers of innovation.
- Provide a real-world setting for testing new technologies, policies, and services.
- Facilitate collaboration between government, businesses, academia, and civil society.
- Encourage iterative learning through continuous feedback loops and adaptive design.

A reference definition is the one provided by the European Network of Living Labs (ENoLL):

"Living Labs are user-centered, open innovation ecosystems based on systematic user co-creation, integrating research and innovation processes in real-life settings."

In short, "Living Labs are the orchestrators of this collaboration, bringing together the different stakeholders (companies, research communities, public sector and citizens) through co-creation. Co-creation is a process of collaboration between these actors in working together towards a shared solution."[1]

In the context of the GREEN LABS project, Living Labs will focus on:

- **Sustainable development & circular economy**
- **Green transition initiatives at the local and international levels**
- **Multistakeholder engagement for eco-innovation**

[1] https://unalab.eu/

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3.2 Core Principles of Living Labs

The success of a Living Lab depends on its guiding principles, ensuring effective stakeholder engagement and practical innovation outcomes. The four key principles can be mentioned as follows:

A. User-Centric Approach
- Involves end-users (citizens, businesses, policymakers) in the innovation process.
- Ensures that solutions meet real-world needs and are socially accepted.
- Encourages active participation, rather than passive observation.

◆ Example: A green Living Lab engaging local businesses and residents in co-creating waste management solutions.

B. Open Innovation
- Promotes cross-sector knowledge exchange and joint innovation.
- Allows multiple actors to share data, insights, and best practices.
- Encourages real-time feedback and iterative improvements.

◆ Example: A Living Lab developing a community-based renewable energy system, involving policymakers, researchers, and energy providers.

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3.2 Core Principles of Living Labs

C. Co-Creation & Experimentation

- Supports real-world testing of green initiatives.
- Encourages stakeholders to collaborate on idea generation, prototyping, and piloting.
- Creates a shared sense of ownership and commitment to sustainability goals.

◆ Example: Prototyping sustainable building materials with local construction companies and urban planners.

D. Multi-Stakeholder Engagement

- Integrates government, academia, industry, civil society, and the environment (Quintuple Helix Model).
- Encourages cross-border collaboration and knowledge-sharing.
- Strengthens public-private partnerships for long-term sustainability.

◆ Example: A city-run Living Lab partnering with startups to pilot sustainable mobility solutions.

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3.3 Stakeholder Mapping & Engagement

A successful Living Lab requires a well-structured stakeholder ecosystem. The table below outlines key stakeholders and their roles in the GREEN LABS network.

Table 1: Stakeholder Roles in Living Labs

Stakeholder Group	Role in the Living Lab	Expected Contribution
Government & Municipalities	Policy development, funding, regulatory support	Provide policy frameworks, grants, and infrastructure support
Academic Institutions	Research, expertise, training	Contribute scientific knowledge, conduct impact assessment
Businesses & Startups	Solution development, piloting	Develop & test green technologies, provide funding
Civil Society & NGOs	Community engagement, advocacy	Ensure public participation, advocate for sustainability
End-Users (Citizens, Local Groups)	Testing, feedback	Provide real-life testing environments, suggest improvements

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◆ Example: A Living Lab focused on sustainable food production might involve:

- Local and urban farmers and/or associations of organic farmers, testing organic farming techniques.
- Universities conducting soil quality research or organic cultivation systems.
- Municipalities providing land and policy incentives or supporting short supply chain projects to reduce overall impacts on land and environment.

3.4 The Quintuple Helix Model in Living Labs

The Quintuple Helix Model is a framework for innovation that integrates multiple stakeholder groups to ensure sustainable and long-term impact. Within the framework of the Quintuple Helix innovation model, the natural environments of society and the economy also should be seen as drivers for knowledge production and innovation, therefore defining opportunities for the knowledge economy. The European Commission in 2009 identified the socioecological transition as a major challenge for the future roadmap of development. The Quintuple Helix supports here the formation of a win-win situation between ecology, knowledge and innovation, creating synergies between economy, society, and democracy. Global warming, for example, represents an area of ecological concern, to which the Quintuple Helix innovation model can be applied with greater potential[1].

A visual representation of the Quintuple Helix Model (see Fig. 1 below), and its application can be helpful to illustrate which key stakeholders may interact in Living Labs to solve common environmental or sustainability challenges.

Figure 1- The 5th Helix approach
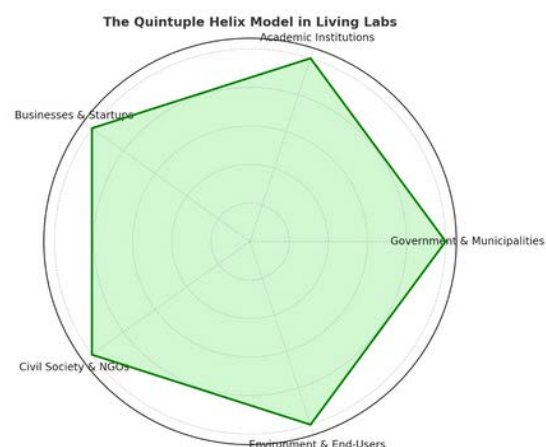
[1] Carayannis, E.G., Barth, T.D. & Campbell, D.F. The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. J Innov Entrep 1, 2 (2012). https://doi.org/10.1186/2192-5372-1-

4/ Methodology & Implementation

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4. Methodology & Implementation

This section outlines the step-by-step process for designing, implementing, and sustaining Living Labs. It follows a structured framework to ensure that each lab operates efficiently and achieves its intended impact.

The methodology is divided into three key phases:
1. Design Phase – Assessing needs, defining stakeholders, and setting objectives.
2. Implementation Phase – Prototyping, testing, and facilitating co-creation.
3. Sustainability Phase – Ensuring long-term viability through governance and funding models.

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4.1 Design Phase

The Design Phase lays the groundwork for setting up Living Labs by identifying key challenges, engaging stakeholders, and defining objectives and success metrics.

Table 1: Key Steps in the Design Phase

Step	Description	Expected Outcome
Needs Assessment	Identify environmental, social, governance and economic challenges to be addressed	A well-defined problem statement and area of focus for each Living Lab
Stakeholder Analysis	Map relevant actors (government, businesses, academia, civil society, end-users)	A structured engagement plan ensuring balanced representation
Setting Objectives & KPIs	Define clear goals, success criteria, and performance indicators	A measurable Living Lab roadmap for tracking progress
Resource & Funding Considerations	Identify necessary resources (financial, human, technological)	A funding plan incorporating local & EU-level funding sources in a perspective of sustainability
Ethical & Legal Considerations	Address data privacy, sustainability ethics, and compliance with regulations	A compliance framework for ethical operations

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4.2 Implementation Phase

The Implementation Phase focuses on bringing the Living Lab concept to life through experimentation, co-creation, and iterative development.

Key Actions in the Implementation Phase:

- **Prototyping & Experimentation**
  - Develop small-scale test projects aligned with green transition objectives.
  - Involve local communities in early-stage trials to ensure participatory approaches and engagement.
  - Iterate based on real-world feedback.

- **Co-Creation Sessions & Workshops**
  - Organize interactive design sessions with stakeholders.
  - Foster multidisciplinary collaboration between businesses, researchers, and policymakers.
  - Encourage a participatory approach in decision-making.

- **Testing & Iterative Development**
  - Pilot solutions in real-life conditions before full-scale implementation.
  - Continuously monitor and refine approaches based on stakeholder feedback.
  - Document lessons learned for broader application.

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4.2 Implementation Phase

Table 2: Tools for effective implementation

Tool/Method	Purpose	Application in Living Labs
Design Thinking	User-driven problem-solving approach	Used to identify and refine solutions through iterative feedback
Agile Prototyping	Quick experimentation cycles	Allows rapid testing of green innovations in real-world settings
Community Workshops	Engage end-users in design & testing	Facilitates local involvement and knowledge-sharing
Digital Collaboration Tools	Support virtual engagement and coordination	Enables remote co-creation & data sharing among stakeholders

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4.2 Implementation Phase

4.2.1 Recommendations for a successful implementation

Hereby it is possible to find some hand-on Tips & Tricks for the successful implementation of a living lab:

1

- **Adopt a multichannel communication flow:**

To ensure that the stakeholders are engaged, foresee clear communication flow with them. A personalized approach to engagement might be fruitful to stimulate a long-lasting collaboration as well as the use of different communication channels. Different stakeholders may use different communication channels. Some people prefer to debate, and some want to vote for stated alternatives, some will provide know-how, suggestions and advice and some will write their requests.

Give them access to many channels to choose from depending on their preferences!

2

- **Planning is crucial:**

A good planning of activities and discussion is crucial to create a collaborative environment at the living lab and to maintain a continuous multistakeholder engagement. Good planning of events is necessary also to involve many people who have other commitments, and to avoid overlapping for them. Consider that Real-time events are not easy to handle; it is difficult to engage people with short notice and without proper preparation.

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4.2 Implementation Phase

4.2.1 Recommendations for a successful implementation

(3)

- **Consider Time an ally:**

Your Living Lab is the innovation intermediary that orchestrates a multi-stakeholder ecosystem, but this is a role that requires some time to consolidate. Stakeholders need to feel engaged and take ownership of the project.

(4)

- **Adopt a data-driven approach:**

Your work should start with the user's needs. For this, a data collection process is essential: interview users and organize workshops to co-design the solution.

(5)

- **Address specific users/targets:**

Make sure your Living Lab addresses specific user groups; target groups must be well defined in order to properly address user needs[1].

(6)

- **Manage expectations carefully:**

• Understand the barriers but never make promises.
• Understand user's expectations about your innovation.

[1] Living Lab Handbook, https://unalab.eu/

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4.2 Implementation Phase

7

4.2.1 Recommendations for a successful implementation

- **The power of context:**

The Power of Context in Living Labs
A defining strength of the Living Lab model lies in its sensitivity to local context—social, cultural, environmental, and economic conditions that shape the needs, challenges, and potential of a given area. This responsiveness is what enables Living Labs to deliver relevant and impactful innovations.
In the GREEN LABS project, context is not merely a backdrop; it is an active component of the innovation process. Whether operating in rural regions of France, overseas territories such as Martinique or Guyana, or coastal and Mediterranean towns, each Living Lab is designed to reflect and respond to its unique setting.

Why Context Matters
- Social & Cultural Specificities: Community values, local traditions, and demographic characteristics influence the success of participatory initiatives.
- Geographic & Environmental Features: Coastal erosion, water scarcity, or biodiversity hotspots affect the focus and design of green initiatives.
- Economic Conditions: Access to funding, employment structures, and industrial activity shape what types of solutions are viable and scalable.

GREEN LABS

4.2 Implementation Phase

4.2.1 Recomendations for a successful implementation

(7)

- **The power of context:**

Examples of Contextualization
- A Living Lab in Martinique might prioritize climate resilience and community-based disaster response due to exposure to extreme weather.
- A rural lab in Guyana may focus on sustainable agriculture and forest conservation, adapting co-creation tools to low-tech environments.
- A Mediterranean coastal town might explore marine ecosystem restoration and sustainable tourism, linking with local fisheries and small businesses.

The "Glocal" Principle
This grounding in context embodies the "glocal" approach—combining global goals for sustainability and innovation with local relevance and ownership. Each Living Lab within the GREEN LABS network adapts shared frameworks to its own context, while contributing insights and scalable practices to the international network.

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4.3 Sustainability Phase

Ensuring the long-term success of Living Labs requires a robust governance model, financial sustainability strategy, and mechanisms for scaling and replication.

4.3.1 Governance Models

Shared Governance in Living Labs
Traditional top-down governance models often fail to address the complexity and diversity of sustainability challenges. In contrast, Living Labs thrive on shared governance, a model that actively involves all stakeholders—citizens, local authorities, businesses, civil society, and researchers—in a process of collective experimentation and decision-making.

This participatory approach reinforces the Living Lab's identity as an inclusive space where a diversity of perspectives is considered a strength. It aligns with the core principles of transparency, inclusiveness, and adaptability, ensuring that strategies and solutions are shaped by those most affected by them.

Benefits of Shared Governance
- Enhances local ownership and community engagement
- Increases the legitimacy of decisions and outcomes
- Improves the agility of the Living Lab to adapt to evolving territorial needs
- Encourages collaborative learning and sustained commitment from stakeholders

GREEN LABS

4.3 Sustainability Phase

◆ Example: In the Tiers Lab des Transitions in France, shared governance is being implemented to allow all actors to co-manage lab activities, co-define priorities, and take joint responsibility for experimentation and scaling.

Living Labs under the GREEN LABS initiative are encouraged to adopt and adapt such governance models to foster equitable participation and resilient innovation ecosystems.

Table 3: Living Lab Governance Models

Model	Key Features	Best Use Cases
Public-Private Partnership	Government-backed, industry-funded	Large-scale urban sustainability projects
Community-Led Model	Grassroots-driven, participatory decision-making	Local environmental initiatives, social innovation
University-Industry Collaboration	Academic-led innovation, industry-supported R&D	Applied research on eco-innovation

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4.3 Sustainability Phase
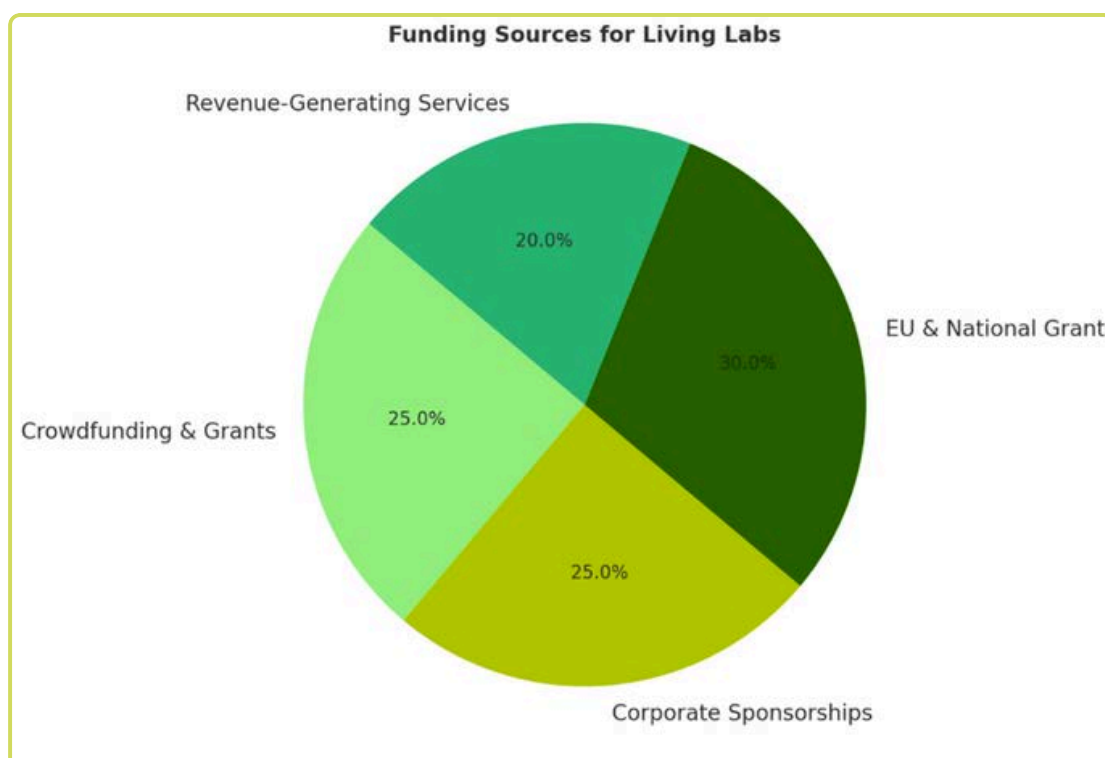
4.3.2 Funding & Financial Sustainability

Ensuring the financial sustainability of Living Labs is essential for maintaining long-term operations, stakeholder engagement, and scaling of green innovation. While many labs start with project-based or public funding, building a diversified funding strategy is critical for reducing dependency and enhancing resilience.

Funding Sources and Models

Sources	Examples & notes
Crowdfunding & Community Financing	Involving local citizens and communities as financial contributors and co-owners
Service Provision	Offering workshops, training, or consultancy to generate income (e.g., circular economy audits)
Membership Models	Fees from institutions, SMEs, or NGOs that benefit from lab activities or digital tools
Philanthropic Foundations	Environmental, innovation, or social impact foundations supporting long-term change

GREEN LABS

4.3 Sustainability Phase

Figure 2: Funding Sources for Living Labs

Funding Sources for Living Labs

- Revenue-Generating Services — 20.0%
- EU & National Grants — 30.0%
- Corporate Sponsorships — 25.0%
- Crowdfunding & Grants — 25.0%

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5/ Risk Management & Evaluation

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5. Risk management & Evaluation

This section outlines the potential risks associated with the implementation of Living Labs and presents mitigation strategies to ensure smooth operation. It also provides a structured framework for monitoring and evaluating the effectiveness of Living Labs through key performance indicators (KPIs).

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5.1 Key Risks and Mitigation Strategies

Implementing a Living Lab involves multiple stakeholders and real-world testing, which introduces various risks. These risks can be categorized into operational, financial, stakeholder-related, and technological risks.

Table 4: Key Risks and Mitigation Strategies

Risk Category	Description	Mitigation Strategy
Stakeholder Engagement Risks	Lack of participation from key stakeholders, resistance to change	Early engagement, clear communication strategies, incentives for participation
Financial Risks	Insufficient funding, delays in financial support	Diversified funding streams (grants, sponsorships, revenue models)
Operational Risks	Poor coordination between partners, delays in project execution	Strong governance model, clear roles & responsibilities, regular project reviews
Technological Risks	Lack of access to technology, technical failures	Use of open-source solutions, tech training for stakeholders
Legal & Ethical Risks	Data privacy concerns, regulatory compliance issues	Compliance checks, ethical review boards, transparent data policies

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5.2 Monitoring & Evaluation Framework

Effective Monitoring and Evaluation (M&E) in Living Labs is essential not only to measure results but to guide iterative learning, stakeholder alignment, and adaptive decision-making. A robust M&E framework should include both quantitative metrics (e.g., number of stakeholders engaged, projects launched) and qualitative indicators (e.g., quality of participation, social impact, ecosystem change).

Key Elements of the M&E Framework
- Input & Process Indicators (e.g., resources mobilized, number of workshops held)
- Output Indicators (e.g., co-created tools, prototypes, policy recommendations)
- Outcome & Impact Indicators (e.g., behavioral change, environmental improvements, increased collaboration)

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5.2 Monitoring & Evaluation Framework

Table 5: Key Performance Indicators (KPIs) for Living Labs

KPI Category	Indicator	Measurement Method
Stakeholder Engagement	Number of active participants	Attendance records, surveys
Innovation Output	Number of projects prototyped and tested	Project logs, case studies
Sustainability Impact	Reduction in carbon footprint, resource efficiency	Environmental audits, impact reports
Financial Stability	Funding secured, revenue generated	Financial reports, funding applications
Community Awareness	Public engagement in sustainability initiatives	Social media analytics, feedback surveys

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Example Methodologies Used in Living Labs

1. **Agroecosystem Living Labs: Methodological Proposal for Impact Evaluation**
Developed in the context of agro-environmental innovation, this methodology provides a multi-dimensional framework to assess environmental, economic, and social impacts in real-life settings. It emphasizes co-definition of indicators with stakeholders, longitudinal monitoring, and contextualized learning.

2. **ASIRPA Real-Time Evaluation Method (INRAe, France)**
Originally designed for public research organizations, the ASIRPA (Analyse des Impacts de la Recherche Publique Agronomique) method has been adapted for Living Labs to enable real-time learning and impact anticipation. It combines narrative analysis, qualitative scoring, and stakeholder interviews to map expected vs. observed impacts and improve Lab responsiveness.

Application in GREEN LABS

GREEN LABS partners are encouraged to combine standard project indicators (e.g., as outlined in the project's Logical Framework or Monitoring Plan) with context-specific participatory M&E methods. Where relevant, they may adapt sectoral methodologies like ASIRPA or the Agroecosystem Lab tools to their local Lab design, especially for Labs focused on environmental, agricultural, or community innovation.

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5.3 Evaluation Process

Evaluation is conducted at different project milestones to ensure continuous learning and improvement.

Figure 3: The Evaluation Cycle for Living Labs

Evaluation Cycle for Living Labs
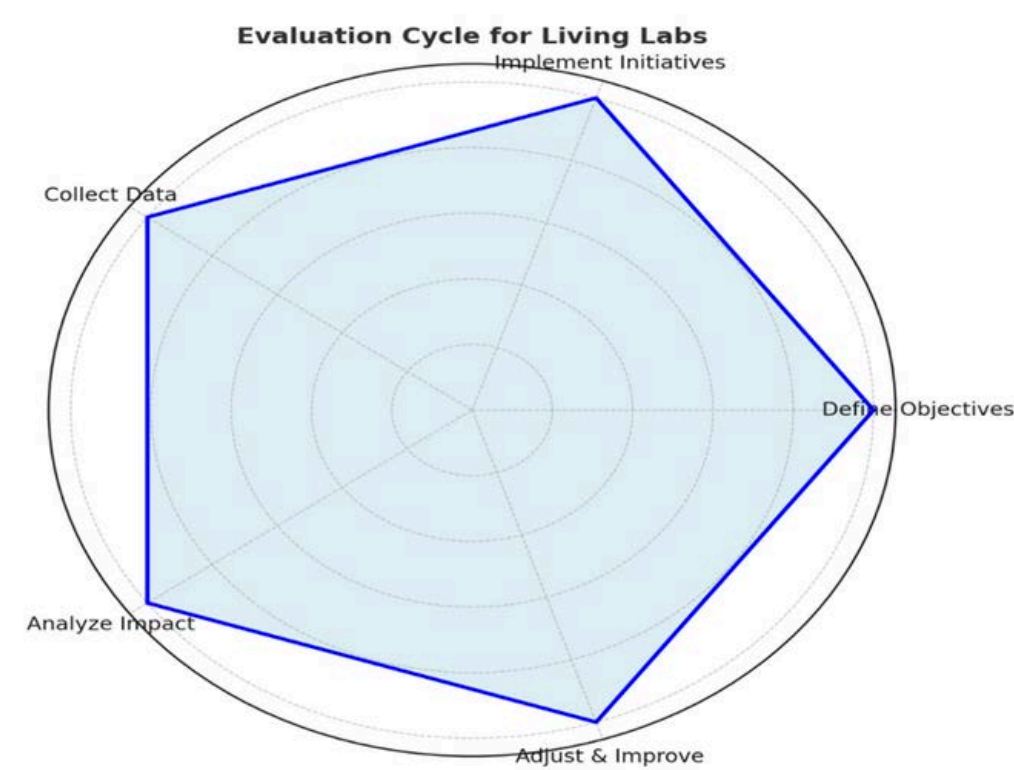
6/ Case Studies
&
Best Practices

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6.1 Examples of Best Practices

Exploring real-world applications of Living Labs provides valuable insights into their design, implementation, and impact. Case studies provide practical insights into what worked well and what lessons can be learned for future initiatives.

Below are detailed case studies from Europe, highlighting diverse approaches and achievements.

6.1.1 EfeuCampus (Bruchsal, Germany)

Overview: EfeuCampus, established in Bruchsal, Germany, is the country's first research area dedicated to urban, autonomous, and emission-free freight logistics on the last mile, known as "LastMileCityLab." Funded by the European Union and the state of Baden-Württemberg, the campus develops solutions for smart mobility in urban areas across Europe. The initiative includes autonomous delivery robots and plans for emission-free cargo drones from Volocopter to supply goods to the campus in the future.

Key Features:

- Autonomous Delivery Robots: Implementation of robots for last-mile delivery, reducing urban congestion and emissions.
- Emission-Free Cargo Drones: Future integration of drones to enhance logistics efficiency.
- Collaborative Partnerships: Involvement of multiple stakeholders, including research institutions, private companies, and government agencies.

Impact: EfeuCampus serves as a model for integrating autonomous technologies into urban logistics, aiming to create more sustainable and efficient delivery systems.

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6.1 Examples of Best Practices

6.1.2 Fab Lab Barcelona (Barcelona, Spain)

Overview: Established in 2007 by the Institute for Advanced Architecture of Catalonia (IAAC), Fab Lab Barcelona is a pioneering entity in the global Fab Labs network and the first in the European Union. Located in Barcelona's Poblenou district, it has transformed a former factory into a hub of ideas, innovation, and education, contributing significantly to the global maker culture and digital fabrication.

Key Features:

- Distributed Design Platform: A hub for the European maker movement, promoting connections between designers, makers, and markets.
- Smart Citizen Project: Initiatives like the Smart Citizen project, which won the Most Innovative Initiative prize at the Smart City Expo World Congress in 2013, focus on community-driven environmental monitoring.
- Educational Programs: Offers workshops and courses to empower individuals with digital fabrication skills.

Impact: Fab Lab Barcelona has been recognized for its innovative collaborations, including winning the STARTS Grand Prize by the European Commission in 2021 for the Remix El Barrio project. It continues to influence the global Fab Lab network and supports emerging creatives working on alternatives to mass production.

6.1 Examples of Best Practices

6.1.3 Smart Living Lab (Fribourg, Switzerland)

Overview: The Smart Living Lab is a Swiss research center focused on the built environment, established in 2014. Located in Fribourg's Bluefactory innovation district, it is affiliated with the Switzerland Innovation Park Network West EPFL. The lab focuses its research activities on human comfort and well-being in indoor spaces, environmental performance of buildings, and the digital transformation of the architecture, engineering, and construction (AEC) industry.

Key Features:

- Interdisciplinary Research: Combines expertise from EPFL, the School of Engineering and Architecture of Fribourg, and the University of Fribourg.
- Sustainable Building Initiatives: Projects like the NeighborHub solar pavilion, which won the Solar Decathlon competition in the United States, demonstrate sustainable technologies and architecture. Wikipedia
- Future-Oriented Construction: Plans for an experimental building aim to meet Switzerland's Energy Strategy 2050 goals ahead of schedule.

Impact: The Smart Living Lab contributes to advancements in sustainable construction technologies and promotes interdisciplinary approaches to improving the built environment.

6.1 Examples of Best Practices

6.1.4 Smart Gastronomy Lab (Gembloux, Belgium

Overview: The Smart Gastronomy Lab is a Belgian Living Lab located in Gembloux, inaugurated in January 2015. Its objective is to encourage gastronomic and technological experimentation. The laboratory is a partnership between Gembloux Agro-Bio Tech (University of Liège), Generation W, the KIKK Festival, and the Economic Bureau of the Province of Namur (BEP).

Key Features:
- Culinary Innovation: Focuses on integrating technology with gastronomy to create novel culinary experiences.
- 3D Food Printing: Presented a culinary 3D printer at the 2015 Milan World Expo, showcasing the intersection of food and technology.
- Collaborative Research: Engages in projects that blend culinary arts with scientific research to explore new possibilities in food preparation and presentation.

Impact: The Smart Gastronomy Lab serves as a pioneer in merging culinary arts with technological innovation, offering new perspectives on food consumption and production.

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6.1 Examples of Best Practices

6.1.5 INUO RESEARCHERS LEAD THE 'ANDALUSIAN LIVING LAB' AIMED AT IMPROVING OLIVE SOIL HEALTH - INUO

Overview: Coordinated by the University of Jaén, the Living Lab Andaluz is part of the European Living Soil program, focusing on soil health in olive cultivation. Launched in October 2024, it includes 14 prestigious Andalusian partners and 50 European companies, with a funding of 2 million euros.

Key Features:
- Soil Health Focus: Addresses issues like erosion, contamination, and drought in olive cultivation using technology for self-diagnosis and forecasting.
- Technological Transfer: Aims to transfer technology and knowledge to the olive sector in Jaén and Andalusia.
- Talent Retention: Strives to retain young talent in the region by involving them in innovative agricultural projects.

Impact: The project exemplifies collaboration between farmers, businesses, administrations, and research centers, focusing on the digitalization and sustainability of the olive sector in Andalusia.

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6.1 Examples of Best Practices

6.1.6 Urban Living Lab Center (Wuppertal Institute, Germany)

Overview: The partnership brings together transformative projects and initiatives active in the field of decarbonizing cities and sustainable urban development. The Urban Living Lab Center is co-hosted by MIT, TU Berlin, the Wuppertal Institute and UN-Habitat. Regional and thematic hubs are hosted by partner universities and network partners, Eu, Africa and Asia.

Key Features:
- Urban transformation: the hub provides a common platform for projects and initiatives for capacity building with a focus on:
  - Policy, planning, funding, and financing (public sector)
  - Green recovery, business modelling, and start-up support (private sector)
- Collaboration for green innovation: structured capacity building programme, peer-exchange, and learning concept focusing on sectoral linkages between mobility, energy, and resources as well as the socio-economic, institutional, and political aspects that affect the adoption of smart mobility solutions in cities in Europe, Asia, Africa, and Latin America.
- Technological Transfer: Aims to transfer technology and knowledge to participating stakeholders, public and private.

Impact: The projects carried out through the Living Labs network aim at support and accelerate the carbon neutrality of communities and countries, through common strategies and actions plan, involving public and private stakeholders.
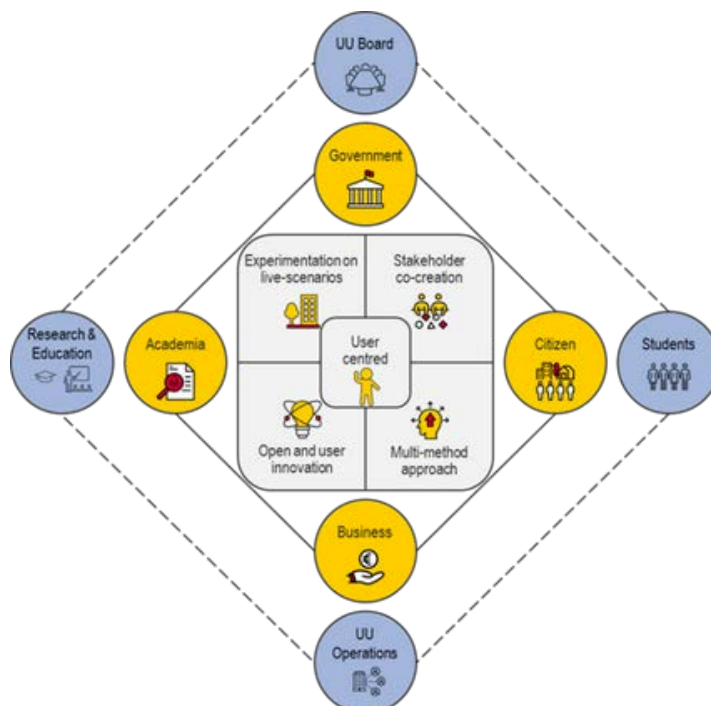
6.1 Examples of Best Practices

6.1.7 Centre for Living Labs – Utrecht University (The Netherlands)

Overview: Centre for living labs of the University (CLU) involve students, professors and public-private partnerships, (companies, citizens, local administrators, etc.) in projects aiming at finding improving solutions to common challenges, such has "Zero Waste Univrsity", PFAS Remediation interventions, etc.

CLU aims to serve as a front-office for academic-operational-societal collaboration, purposefully facilitating a transdisciplinary/action-based learning experience centered around sustainable development at the university.

The living labs are based on the core attributes model developed by Claudia Stuckrath and Jesus Rosales, showing all the components of a comprehensive living lab, both methodologically as well as the parties that need to be involved, as visualized below:

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6.1 Examples of Best Practices

Key Features:

- Greening of University spaces: the living lab aims at transforming the inner square of the university into a green oasis, where there is ample space for experimentation, innovation and cultural expression of students in the field of sustainability, biodiversity and education.
- Zero Waste: this living lab aims at contributing to UU's transformation into a zero-waste organisation by using insights from research, mainly student-led. The Centre for Living Labs guides and coordinates this living lab, matching emerging issues surrounding the road to zero waste experienced by university operations to relevant courses, research masters, internships or applied research.

Impact: The projects carried out through the University Living Labs network aims at supporting the overall innovation of the Campus, making the University an open innovation hub. This impact is possible thanks to the inspiring principles of the Centre, namely:

"Our living labs:

- are user-centered, open, transdisciplinary and real-life experiments performed by co-creating stakeholders
- bridge theory and practice for a more profound learning experience
- influence daily routines to integrate sustainability into UU's culture
- embody the sustainability ambitions and achievements of Utrecht University
- offer a global perspective contributing to the United Nations Sustainable Development Goals."

- **Living labs in France:**
  - 15Living Labs in France members of ENoLL : https://enoll.org/our-members/
- **Canada, France, Belgium, Spain**
  - PERCOLAB (company): network of living laboratories developing new ways of learning, working and governing.

6.2 Best Practices Collection Framework

To enhance the systematic collection and analysis of best practices in Living Labs, we introduce a structured framework inspired by established methodologies. Unlike case studies, best practices focus on methods and approaches that have been proven effective across multiple Living Labs. These are not tied to a single project but can be adapted and replicated in different contexts.

6.2.1 Best Practices Documentation Template

Category	Description
Title of the Best Practice	Provide a clear and concise name for the practice
Objective	Describe the key goal(s) of the best practice
Stakeholders Involved	List the key actors engaged (e.g., government, industry, academia, NGOs, citizens)
Implementation Context	Describe the geographical, social, and environmental conditions under which the best practice was implemented
Methodology Used	Explain the methods and tools applied in the practice (e.g., co-creation, participatory design, agile methodology)
Key Outcomes	Summarize the main results and impact achieved
Challenges & Mitigation Strategies	Highlight the difficulties faced and how they were overcome
Scalability & Transferability	Assess whether the practice can be replicated in different contexts
Relevant Links & References	Provide additional resources or case study documentation

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6.2 Best Practices Collection Framework

6.2.2 Concise Map for Collecting Best Practices

Before detailing best practices, an overview map is used to structure and organize key information on various cases. This preliminary mapping provides a high-level assessment before entering into detailed documentation.

Field	Description
Best Practice Name	Provide a short and descriptive title
Country/Region	Specify the geographic location where it was implemented
Main Focus	Identify the key sustainability or innovation goal
Stakeholders	List the key actors involved
Level of Maturity	Assess whether the practice is in the pilot phase, fully implemented, or scaled up
Potential for Replication	Evaluate the possibility of adapting the practice in other regions or contexts

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6.2 Best Practices Collection Framework

◆ **Example: Best Practice: Multi-Stakeholder Co-Creation in Living Labs**

Title: Effective Multi-Stakeholder Engagement for Co-Creation in Living Labs.

Objective: To ensure active participation from diverse stakeholders (government, academia, industry, civil society, and end-users) in the design, implementation, and sustainability of Living Labs.

Stakeholders Involved
- Local & Regional Governments (policy & funding).
- Universities & Research Institutes (knowledge & innovation).
- Private Sector & Startups (business solutions & technology).
- NGOs & Community Groups (social inclusion & advocacy).
- Citizens & End-Users (real-world testing & feedback).

Implementation Context
- Used in urban Living Labs focused on sustainable mobility, circular economy, and smart cities.
- Applied in EU-funded projects where co-creation is essential for innovation.

Methodology Used
- Stakeholder Mapping & Early Engagement: Identify and categorize key actors before launching the Living Lab.
- Participatory Design Workshops: Interactive sessions where stakeholders contribute ideas and co-develop solutions.
- Digital Collaboration Tools: Online platforms (e.g., Miro, Trello, Slack) used to maintain engagement and track progress.
- Living Lab Facilitators: Appoint mediators who ensure smooth communication and collaboration.
- Iterative Feedback Loops: Regular feedback collection from stakeholders to adapt and refine solutions.

6.2 Best Practices Collection Framework

Key Outcomes

- Increased stakeholders buy-in and commitment to Living Lab initiatives.
- Improved co-creation efficiency, leading to more relevant and user-centered innovations.
- Stronger cross-sector collaboration, ensuring financial and operational sustainability.

Table 6. Challenges & Mitigation Strategies

Challenge	Mitigation Strategy
Low stakeholder engagement	Offer incentives, visibility, and impact reports
Conflicting interests	Implement transparent decision-making mechanisms
Limited participation from underrepresented groups	Conduct targeted outreach and capacity-building workshops

Scalability & Transferability

- Can be replicated in various sectors (e.g., energy, health, education).
- Works in both urban and rural Living Lab contexts.
- Easily adaptable by policymakers and research organizations.

Relevant Links & References

- ENoLL (European Network of Living Labs): www.enoll.org
- Example Project: Urban Living Lab Initiative in Barcelona.

Why is this a Best Practice?

- Applicable across multiple Living Labs (not tied to a single case study).
- Replicable and adaptable to different sectors and locations.
- Provides structured guidelines for successful multi-stakeholder engagement.

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7/ Digital Tools & Collaboration

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7.1 Role of Digital Tools in Living Labs

Digital tools play a crucial role in facilitating collaboration, data sharing, and co-creation within Living Labs. These tools enhance engagement by enabling remote participation, monitoring project progress, and supporting innovation processes.

The key benefits of digital tools in Living Labs include:
- **Enhanced communication among stakeholders**
- **Real-time data collection for informed decision-making**
- **Virtual co-creation for broader participation**
- **Scalability and replication across multiple locations**

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7.2 Categories of Digital Tools

Categories of Digital Tools

The digital infrastructure supporting Living Labs plays a critical role in enabling collaboration, transparency, and innovation. A clear distinction should be made between Open Source tools—which prioritize transparency, adaptability, and shared governance—and proprietary platforms offered by GAFAM companies, which offer wide functionality but may raise concerns about data ownership, privacy, and long-term sustainability.

Open Source Tools

- **Examples:** Nextcloud (file sharing), Discourse (community forums), Jitsi (video conferencing), Mattermost (team messaging), Miro (Open Source alternatives for collaborative boards)
- **Benefits:** High customizability, community-driven development, and enhanced control over data and user experience
- **Use Case:** Suitable for public-sector-led Living Labs and those prioritizing data sovereignty

GAFAM Tools

- **Examples:** Microsoft Teams, Google Drive, Zoom, Facebook Workplace
- **Benefits:** High usability, wide adoption, integrated ecosystems
- **Risks:** Vendor lock-in, limited customizability, potential issues with data ethics and privacy

Guiding Principle

GREEN LABS partners are encouraged to prioritize Open Source solutions where possible, particularly when managing citizen data or promoting equitable access. However, in early phases or for time-sensitive collaboration, a hybrid approach using trusted proprietary tools may be appropriate.

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7.2 Categories of Digital Tools

Table 7: Types of Digital Tools & Their Applications in Living Labs

Category	Examples	Benefits
Open Source Tools	Nextcloud, Jitsi, Discourse, Mattermost	Customizable, transparent, community-driven, control over data
GAFAM Tools	Google Drive, Microsoft Teams, Zoom, Facebook Workplace	User-friendly, widely adopted, quick to deploy
Category	Examples	Benefits

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7.3 Digital Platform for the GREEN LABS Network

As part of the GREEN LABS initiative, a dedicated web-based digital platform will be developed. This platform will serve as the central hub for:

- Stakeholder collaboration across different Living Labs
- Knowledge sharing and best practices
- Digital co-creation and project development
- Monitoring and reporting sustainability impact

Key Features of the GREEN LABS Digital Platform

- User Profiles & Community Hub – Connects stakeholders and organizations.
- Open Innovation Challenges – Enables joint idea generation and problem-solving.
- Interactive Dashboards – Provides real-time updates on Living Lab activities.
- Training & Resource Center – Offers guides, webinars, and best practices

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7.4 Visualization: Digital Ecosystem in Living Labs

To illustrate how digital tools enhance collaboration in Living Labs, we can find below a diagram showing the digital ecosystem used in the GREEN LABS network.
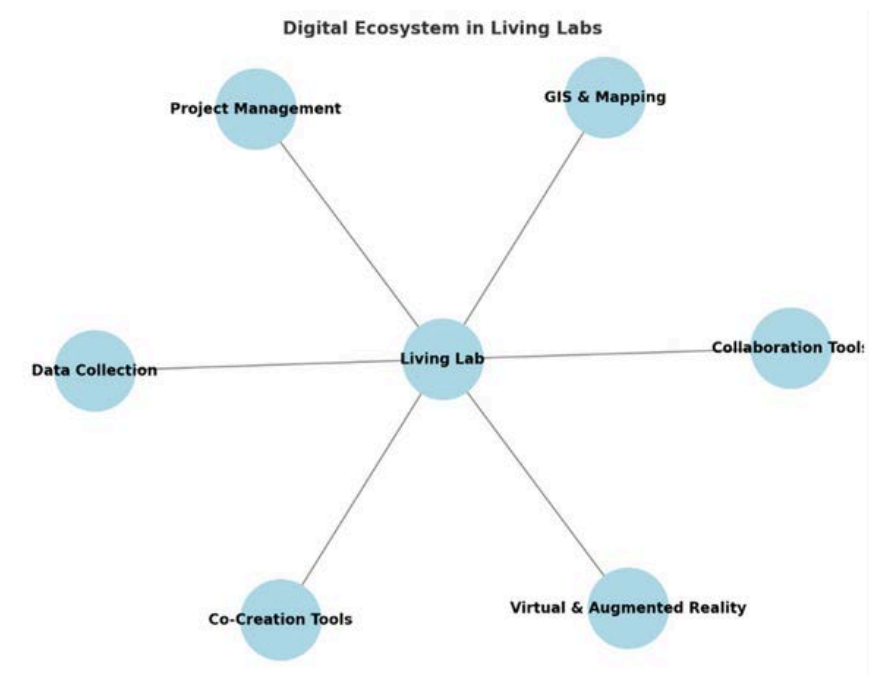
Digital Ecosystem in Living Labs, showing how different digital tools interact within the network to support collaboration and innovation.

7.5 Future Considerations for Digital Transformation in Living Labs

As Living Labs evolve, their digital infrastructure must adapt to new technological, social, and ethical challenges. The next phase of digital transformation in Living Labs should not only improve functionality and scalability but also uphold values of transparency, inclusiveness, and sustainability.

1

Ethical Use of Artificial Intelligence

AI is increasingly used for data analysis, community sensing, predictive modeling, and decision support in sustainability projects. However, the integration of AI in Living Labs must adhere to ethical standards, including:

- Transparency: Clear communication on how data is collected, processed, and interpreted
- Bias prevention: Inclusive datasets and stakeholder feedback loops
- Accountability: AI outputs must support—not replace—human decision-making

Example Use Case: AI-driven environmental monitoring systems that allow local stakeholders to assess air or water quality, with explainable outputs and community verification.

2

Preference for Open Source Digital Infrastructure

Open Source tools empower Living Labs to retain control over data, ensure long-term adaptability, and foster community-driven development. Future investments should favor platforms that are:

- Modular and interoperable
- Maintained by transparent and active communities
- Aligned with public interest missions

This approach supports digital sovereignty and aligns with the glocal values of the GREEN LABS network.

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7.5 Future Considerations for Digital Transformation in Living Labs

3

Interoperability and Data Portability

Future-ready Living Labs must build systems that can communicate across platforms and institutions, using open standards and APIs. This will:

- Facilitate regional, national, and EU-level collaboration
- Allow data to be reused for research, policy-making, and innovation
- Reduce duplication of efforts across labs and projects

4

Digital Inclusion

As digital tools expand, efforts must be made to ensure equitable access and participation, especially for:

- Non-digital native populations
- People in rural or underserved areas
- Marginalized groups with limited access to devices or connectivity

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8/ Future Trends & Innovations in Living Labs

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The landscape of Living Labs is constantly evolving with emerging technologies, societal shifts, and policy changes. This section explores the future trends and innovations that will shape the next generation of sustainable, smart, and inclusive Living Labs.

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8.1 Emerging Technologies Transforming Living Labs

Emerging technologies offer great opportunities to enhance Living Labs' capabilities, but their implementation must be evaluated carefully in terms of environmental and social impact. Below is a summary of key technologies, their applications, and the questions they raise:

Table 1: Key Technological Trends in Living Labs

Technology	Potential Application in Living Labs	Environmental & Social Impact Considerations
Artificial Intelligence (AI)	Predictive analytics, automated data collection, energy optimization	What is the energy cost of AI models? Are data sets ethically sourced? How do we prevent misuse or bias?
5G and IoT	Real-time environmental monitoring, smart city solutions	Do these require frequent hardware upgrades that generate e-waste? Can devices be reused or recycled effectively?
Blockchain	Traceability in supply chains, peer-to-peer energy transactions	What is the carbon footprint? Does the tech ensure equitable access or risk exclusion and concentration of power?
Digital Twins	Simulations for urban planning, ecosystem modeling	How inclusive is the data used? Are the models representative and respectful of community needs and privacy?
AR/VR	Immersive engagement tools for education and community dialogue	Are these tools accessible to diverse user groups? What is their environmental cost (hardware, electricity)?

8. Future Trends & Innovations in Living Labs

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8.2 Social & Policy Innovations in Living Labs

Beyond the deployment of digital tools, the future of Living Labs will be significantly shaped by social innovation and policy evolution. These dimensions reinforce the Labs' capacity to act as platforms for inclusive transformation at the intersection of society, science, and governance.

1. Citizen Science & Participatory Governance

Living Labs are increasingly embracing a shift from expert-led innovation to community-driven experimentation, empowering local communities to co-create and test solutions. This includes:

- **Citizen-generated data used in climate monitoring and smart urban planning.**
📍 Example: The city of Amsterdam's " Waag | Amsterdam Smart Citizens Lab " collects air quality and temperature data through citizen-deployed sensors, informing real-time urban responses and long-term policy design.

- **Decentralized decision-making models integrating tools like blockchain to facilitate transparent, community-led governance.**
📍 Example: The Decidim platform used in Barcelona for participatory budgeting and policy co-creation is based on open-source software and integrates user feedback loops and data transparency mechanisms.

- **Participatory Action Research (PAR) as a method to co-design sustainable practices with local actors.**
📍 Example: The REPERE method used in French viticulture facilitates knowledge exchange between winemakers, researchers, and advisors. It values experiential knowledge and collective problem-solving, contributing to agroecological transitions. [Source: INRAE, French National Research Institute for Agriculture, Food and Environment | International Commission for the Hydrology of the Rhine basin (CHR)]

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8.2 Social & Policy Innovations in Living Labs

These approaches enhance trust, legitimacy, and social ownership of Living Lab outcomes, aligning with values of social justice and environmental stewardship.

2. Circular Economy & Sustainable Living

Living Labs are increasingly becoming catalysts for circular economy models and sustainable lifestyle practices. Their local scale and participatory approach make them ideal testbeds for new behaviors and systemic change.

- **Expansion of zero-waste initiatives** within neighborhoods and public institutions through local prototyping and stakeholder co-creation.
- **Mainstreaming regenerative design** in urban planning and industrial practices, focusing on nature-based solutions and cradle-to-cradle approaches.
- **Integration of eco-labeling and sustainable product development** co-developed with communities to encourage responsible consumption.

📍 Example: In cities like Rotterdam and Ljubljana, Living Labs are pioneering urban agriculture models using hydroponics and aquaponics. These labs not only promote local food production and reduce food miles but also involve citizens in composting and reuse practices, supporting a zero-waste ecosystem.

8.2 Social & Policy Innovations in Living Labs

3. Policy & Funding Evolution

To ensure the long-term sustainability of Living Labs, there is a growing need for policy integration and diverse funding mechanisms that recognize their role in systemic innovation.

- Increased access to **EU-backed grants**, such as Horizon Europe and LIFE, with clear alignment to European Green Deal and climate goals.
- Development of **Public-Private-People Partnerships (PPPPs)** that involve citizens, businesses, public bodies, and research institutions in co-investing and co-governing labs.
- Strengthening of **local and national climate adaptation strategies** that integrate Living Labs as experimental hubs for resilient urban and rural futures.

📍 Example: The Home - NetZeroCities funded by the European Commission supports over 100 European cities in becoming climate-neutral by 2030, many of which are adopting the Living Lab model to test climate solutions, engage citizens, and scale up results.

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8.3 Visualization: The Future Living Lab Framework

The Future Living Lab Framework

The future of Living Labs lies not only in individual experimentation but in their collective capacity to form networks—locally, nationally, and internationally. These networks amplify impact, share resources, foster peer learning, and ensure sustainability beyond project cycles.

Key Dimensions of the Future Living Lab Framework
- Local Integration: Deeply rooted in community needs and territorial specificities.
- National Coordination: Structured support through federations, associations, or clusters of Living Labs.
- Transnational Collaboration: Joint EU initiatives and cross-border projects reinforcing the glocal approach.

Importance of National-Level Networks
National structures can act as scalable ecosystems that align Living Labs with policy agendas, funding frameworks, and institutional recognition. They serve as:
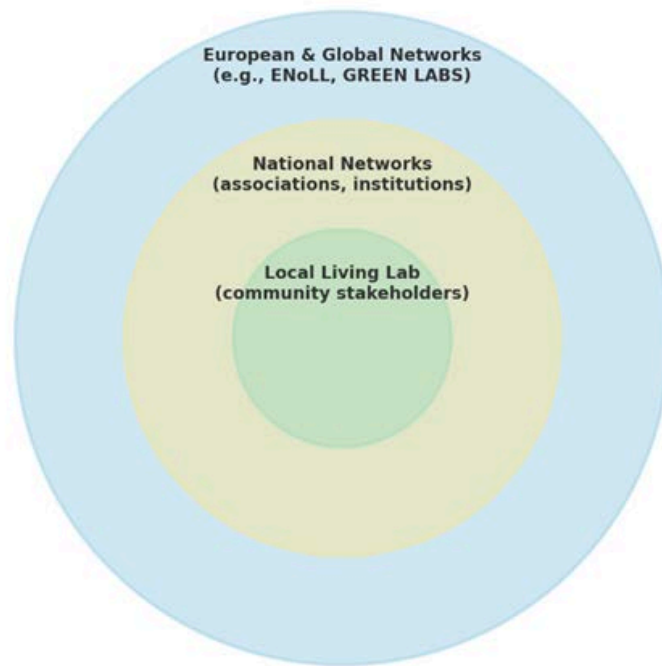- Knowledge hubs that facilitate exchange of tools, methods, and evaluation standards.
- Advocacy platforms that influence national innovation policies.
- Coordination bodies that support capacity building and the replication of successful models.

◆ Example: France – National Association of Third Places (ANCT). In France, the National Association of Third Places (Fabriques de Territoire) brings together over 2,000 third places and acts as a central relay to support and promote Living Lab-type initiatives nationwide. It fosters peer learning, connects projects with ministries and funders, and provides a recognized structure for collaboration.

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8.3 Visualization: The Future Living Lab Framework

◆ Other Examples:

- Germany: The Mittelstand-Digital Innovation Hubs support Living Labs focused on SME digitalization.
- Italy: The Cluster Nazionale Smart Communities Tech aligns regional labs with smart city strategies.

**Future Living Lab Framework
Multilevel Integration Model**

European & Global Networks
(e.g., ENoLL, GREEN LABS)

National Networks
(associations, institutions)

Local Living Lab
(community stakeholders)

8.4 Future Challenges & Opportunities

As Living Labs evolve, they must navigate key challenges while leveraging new opportunities:

Challenges:

- Data Privacy & Security – Ensuring ethical and transparent use of AI & IoT-generated data.
- Scalability & Replication – Adapting successful Living Lab models across diverse regions.
- Sustained Funding – Reducing reliance on short-term grants and ensuring long-term financial stability.

Opportunities:

- Integration with Smart Cities – Embedding Living Labs in urban planning for resilience & innovation.
- Global Collaboration Networks – Strengthening cross-border knowledge sharing & funding.
- Green Job Creation – Supporting workforce development in sustainability sectors.

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9/ Appendices

The final section of this methodological document includes a glossary of key terms, templates to support the implementation of Living Labs, and references to relevant resources and studies.

9.1 Glossary of Key Terms

Term	Definition
Living Lab	A real-world innovation environment where users, businesses, researchers, and policymakers collaborate to co-create, test, and validate new solutions.
Quintuple Helix Model	An innovation framework integrating government, academia, industry, civil society, and environmental sustainability
Circular Economy	An economic model that promotes resource efficiency, recycling, and waste minimization to achieve sustainability
Co-Creation	The process of actively involving stakeholders in the design and development of innovative solutions
Open Innovation	A collaborative approach to innovation that leverages external knowledge and partnerships
Digital Twin	A virtual model of a real-world system, enabling simulation, monitoring, and optimization
Public-Private-People Partnerships (PPPPs)	A collaboration model where government, private sector, and civil society work together on projects that benefit society
Artificial Intelligence (AI)	The use of machine learning and data analytics to automate decision-making and improve efficiency
Internet of Things (IoT)	A network of interconnected physical devices that collect and share data in real-time
Smart City	An urban area that integrates technology and data-driven solutions to improve sustainability, efficiency, and quality of life

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9.2 Templates for Living Lab Implementation

To facilitate the design and implementation of Living Labs, the following templates are provided:

1. Stakeholder Mapping Template

Living Lab Influence Mapping Template – Design Phase
Instructions: Use this table to map out items or stakeholders in your Living Lab project. Indicate their role and assign a color-coded influence level to help prioritize planning.

Influence Level Color Key

🟢Green	Low Influence – Limited or optional impact
🟠Orange	Medium Influence – Helpful but not essential
🔴Red	High Influence – Critical to success

Influence Mapping Table

Item or Stakeholder	Role / Description	Influence Level
Local Municipality	Provides permits and access	🔴High
High School	Offers space for workshops	🟠Medium
Poster Designer	Volunteer for promotional visuals	🟢Low
[Add your own]		

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9.2 Templates for Living Lab Implementation

2. Risk Assessment & Mitigation Plan

Risk Category	Potential Issues	Impact Level (High/ Medium/ Low)	Mitigation Strategy
Stakeholder Engagement	Lack of participation	High	Early involvement, clear communication, incentives
Financial	Budget constraints or lack of funding	High	Diversified funding strategy, partnerships
Operational	Project delays and lack of coordination	Medium	Clear governance structure, defined roles & timelines
Technological	Lack of access to necessary digital tools	Medium	Open-source solutions, capacity-building initiatives

9.2 Templates for Living Lab Implementation

3. Monitoring & Evaluation (M&E) Framework

Indicator	Measurement Criteria	Data Collection Method	Frequency
Stakeholder Participation	Number of engaged organizations and individuals	Event attendance, surveys	Quarterly
Innovation Impact	Number of prototypes developed & tested	Project reports, case studies	Annual
Environmental Benefits	Reduction in carbon footprint, waste reduction	Environmental audits, sustainability reports	Bi-Annual
Digital Engagement	Number of users on the Living Lab digital platform	Web analytics, platform activity logs	Monthly

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9.3 References

This section provides key references to **academic studies, reports, and policy documents** relevant to Living Labs and sustainable innovation.

Academic & Research Reports

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- Bergvall-Kåreborn, B., Eriksson, C. I., Ståhlbröst, A., & Svensson, J. (2009). A Milieu for Innovation – Defining Living Labs.
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- Smart Living Lab Fribourg. (2022). Interdisciplinary Research for Sustainable Urban Environments.

EU Policies & Guidelines

- European Commission. (2020). The European Green Deal and the Role of Living Labs.
- European Network of Living Labs (ENoLL). (2023). Best Practices in Living Labs for Sustainable Development.

Case Study Resources

- Fab Lab Barcelona. (2023). A Hub for Digital Fabrication and Circular Economy Initiatives.
- Smart Living Lab Fribourg. (2022). Interdisciplinary Research for Sustainable Urban Environments.

9. Appendices

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9. Appendices

1. Templates for Living Lab Implementation
2. Stakeholder Mapping Template
3. Risk Assessment & Mitigation Plan
4. Monitoring & Evaluation (M&E) Framework

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