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D2.2.1 Methodology for testing: Living labs

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Abstract

This methodology supports the creation of Living Labs to co-design, test, and scale data-driven tourism solutions across diverse European territories. Integrated with a Destination Management Support System (DMSS), the approach combines local engagement, real-world experimentation, and behavioral nudging strategies. It offers a roadmap to guide innovation in both inland and coastal tourism contexts. The following document will guide Libeccio partners in setting up the testing activities and serve as a flexible baseline, adaptable to the unique characteristics of each location, including local context, governance structures, and stakeholder composition.

EXECUTIVE SUMMARY

The **D2.2.1 Methodology for testing: Living labs** presents an updated methodology for establishing and managing **Living Labs** as collaborative spaces for data-driven innovation in tourism governance. Designed within the LIBECCIO framework, the methodology supports the **customization and validation of the Destination Management Support System (DMSS)** across diverse territorial contexts. The document outlines how **multi-level stakeholders**—including public authorities, businesses, academia, and local communities—are actively engaged in **co-creation processes**, ensuring that solutions are both user-centric and locally relevant. A structured **governance model** is described, consisting of institutional and operational task forces, along with localized Living Lab teams that manage experimentation on the ground.

With the establishment of **two Task Forces**—*one for institutional partners* (coordinated by the Western Greece Region) and another *for operational partners* (except Athena, coordinated by CNA Abruzzo), the coordinated activities can be ensured and synchronized.

The methodology introduces **physical Living Labs** to accommodate **context-specific challenges** both in inland and coastal territories. Each lab is embedded within a **phased roadmap**—from local context analysis to solution scaling—and is tightly integrated with the central DMSS platform to support **data-driven decision-making**, behavioral insights, and real-time performance monitoring.

Key innovations include the use of **"nudging" techniques** to encourage user adoption, stakeholder collaboration, and sustainable practices without imposing restrictive measures. These behavioral tools, integrated into the Living Lab activities, reinforce participation and long-term impact. This **behavioral method** will be applied **in stakeholder meetings** to help them better comprehend the use and implementation of the raw data-offered DMSS and the ETP platform.

To ensure consistent monitoring and cross-territory comparability, a set of **Key Performance Indicators (KPIs)** is proposed *through a number of workshops*, covering stakeholder engagement, co-creation, data readiness, solution adoption, and replicability. The methodology also emphasizes **data management principles** (e.g., privacy, interoperability, feedback loops) and provides guidance for building a **transnational community of practice**.

In sum, this report equips stakeholders with a **modular, scalable, and participatory framework** for implementing Living Labs as a tool for testing the DMSS, thus transforming tourism data into strategic, inclusive, and sustainable innovation.

I. INTRODUCTION & CORE PRINCIPLES OF DATA-DRIVEN LIVING LABS

Living Labs are open innovation ecosystems where public and private actors—including citizens, tourism businesses, researchers, and local authorities—collaborate to **co-create, test, and validate solutions in real-world settings** both in physical and virtual environments (Leminen et al, 2012). Within the LIBECCIO project, Living Labs are instrumental in testing, adapting and deploying the **Destination Management Support System (DMSS)** at local level, transforming data into strategic action for sustainable tourism.

This methodology enables not only experimentation, but also the **integration of innovation practices** in destination governance, providing an iterative cycle of activities, including needs identification, co-design, prototyping, testing, implementation, and monitoring. (Ballon et al., 2018). Living Labs act as both **testing grounds and learning hubs**, where insights are exchanged across regions, and solutions evolve through continuous feedback.

Core Principles

Five fundamental principles are outlined in the Methodology Guideline: 1) a focus **on the value** that innovation provides; 2) **sustainability** of the living lab activities and proposed innovations through their alignment with sustainable development goals and longevity of the ideas beyond the project; 3) **acknowledgement of individual actors' influence** on living lab outcomes and subsequent efforts to engage those actors in the co-creation process; 4) **realism of the tested solutions and the real-life experimentation** context; and 5) **openness of the living lab** to multiple actor (Ståhlbröst ,2012) .

The above-mentioned principles guide the design and implementation of each Living Lab through:

1. User-Centered Co-Creation

Users—citizens, tourists, and local operators—are directly involved in defining problems and shaping solutions. Their feedback ensures relevance and usability.

2. Real-World Experimentation and Iteration

Living Labs operate in physical and virtual tourism environments (e.g., historical towns, beaches, protected areas), enabling live testing and continuous improvement of services.

3. Multi-Stakeholder Engagement

Engagement spans across public institutions, SMEs, academia, and civil society. This inclusive governance fosters shared ownership, ethical data use, and trust.

4. Data-Driven Decision Making

Living Labs leverages big data, IoT, open data, and AI to inform decisions. The DMSS acts as a shared infrastructure for real-time monitoring, forecasting, and strategic planning.

5. Sustainability, Scalability & Knowledge Transfer

Solutions are designed to be environmentally and socially sustainable, easily replicated, and supported by **capacity-building activities** and interregional exchange.

6. Behavioral Innovation through Nudging tools

Living Labs apply "nudging" as a tool—providing subtle prompts that support the local Focus Groups (*Policy and Business decision makers)* in freely choosing how to collect and utilize diverse data sources related to sustainable tourism. These cues, especially during meetings in the Ideation and Experimentation phases, help encourage more conscious, collaborative, and responsible decision-making without restricting autonomy.

What is the mission of the data-driven living labs?

The methodology identifies the Living Labs to address diverse territorial needs which have been developed and identified through interviews **in D1.3.1**. Each Living Lab is aligned with the DMSS architecture and connected to a **community of practice**, enabling scalability and cross-border learning, as well as awareness raising thanks to the instrumental role ensured by the networking environment characterizing Living Lab experiences.

II. GOALS FOR DATA-DRIVEN TOURISM PROJECTS

2.1. Why has a Living Lab approach been a choice for Sustainable Tourism?

The goal is to enhance **competitiveness, sustainability, and innovation** in destinations by leveraging the **power of data**. With a **Living Lab approach**, tourism destinations **transform data into strategy, innovation, and sustainable growth**. The adoption of data-driven **Living Labs** in tourism aims to empower destinations to evolve from **data users into data-driven innovators**.

Through localized **co-creation and interactions in real-time experimentation** by the involvement of targeted institutions, Living Labs facilitate the transformation of tourism governance by enabling the **adaptation and integration of the Destination Management Support System (DMSS)**.

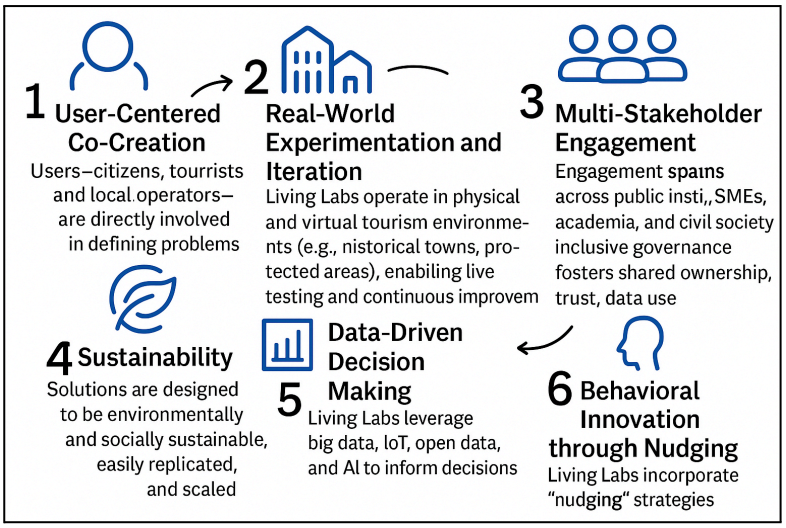

Fig 1. Iterative process in data-driven Living Labs in 6 steps

Whether in **inland** or **coastal** contexts, **the goal is to make tourism ecosystems smarter, more inclusive, and more sustainable** by activating innovation processes rooted in real needs and measurable outcomes.

The Living Lab therefore is a tool for managing **cross-stakeholder issues in DMSS** by bringing all kinds of stakeholders, even institutions, who are not typically in direct connection with all kinds of target groups to discuss concrete development issues in a flexible and innovative setting. The Living Lab therefore functions as a medium for self-organization in knowledge conversion and innovation. (*Hannes et al, 2020)*.

2.2. Key Strategic Objectives

2.2.1. Empowering Destinations Through Data

From Data Consumers to Data Leaders:

Living Labs foster a culture of data use at the local level. Public authorities, tourism operators, and citizens gain the capacity to collect, understand, and use data for strategic decision-making.

- Promote data literacy and cross-sector data sharing
- Integrate local datasets into centralized platforms like DMSS
- Support self-assessment and evidence-based policy

2.2.2. Boosting Tourism Competitiveness

Smart Decisions, Better Experiences:

Data analytics allows destinations to improve competitiveness through better resource allocation, smarter marketing, and tailored visitor experiences.

- Optimize pricing, seasonality, and capacity management
- Enable predictive analytics and behavioral insights
- Create AI-powered solutions for itinerary planning, service design, and event scheduling

2.2.3. Promoting Sustainability and Social Inclusion

Balancing Growth with Responsibility:

Living Labs support the alignment of tourism growth with environmental protection, heritage conservation, and social equity.

- Monitor tourism impacts and carry out corrective actions
- Prevent overcrowding and environmental degradation
- Encourage inclusive and accessible tourism models

2.2.4. Building a Shared Knowledge Base

Connecting Insights, Driving Impact:

By fostering collaboration across regions, the methodology aims to build a **community of practice** supported by shared tools (DMSS), joint learning, and open innovation.

- Share best practices through the ETIP platform
- Facilitate cross-Lab exchange of methodologies and nudging strategies
- Document replicable solutions through toolkits and guides.

2.3. Implementing DMSS Services Using the Living Lab Methodology

On the path for **structuring and adapting the Living Lab methodology** within the **LIBECCIO** project, it is mandatory to emphasize **the need for a unified approach rather than differentiating between inland and coastal sites**. Below is a **structured response** integrating key observations while reinforcing the strategic direction. At the heart of this process lies the integration of **Decision-Making Support Services (DMSS)** with the principles of **open innovation** and **big data ecosystems**, empowering stakeholders to co-create data-informed strategies that directly address local and regional challenges in sustainable tourism.

Open innovation ensures that knowledge exchange remains bidirectional: stakeholders not only consume insights but actively shape the data landscape by contributing local expertise, needs, and feedback. This **co-creative structure strengthens the sense of ownership among all participants,** from *focus groups to local authorities, and accelerates the acceptance and impact of pilot solutions.* Rather than designing separate methodologies for different territories, the Living Lab approach should foster **shared tools, adaptable modules**, and **transversal knowledge frameworks** that can be calibrated to reflect local realities. This unified, data-driven innovation process positions the LIBECCIO project as a catalyst for **more transparent, evidence-based, and community-anchored decision-making in tourism governance.**

Key elements and features of DMSS

- **DMSS infrastructure** includes a distributed data warehouse, input and scraping modules, and an analytics engine that feeds the **Interactive Graphical Dashboard**.
- **Living Labs act as testing and co-creation environments**, where selected DMSS services and indicators are validated under real-world conditions.
- **Pilot projects populate the system with real-use data**, helping shape dashboard content and usability.
- A **bidirectional flow** ensures that local stakeholder feedback and testing outcomes inform platform evolution and training.
- The **Tourism Innovation Platform (ETIP)** supports knowledge sharing and horizontal transfer of methods and use cases.

Unified Living Lab Approach for Tourism Sustainability

Rather than separating **Coastal vs. Inland Living Labs**, the **core objective** remains consistent: A) **Fighting seasonality & over-concentration** in tourism across partner territories. B) **Providing stakeholders with evidence-based decision-making tools** via DMSS. C) Ensuring that **tourism capacity, infrastructure, and sustainability practices** are analyzed consistently, regardless of geographic characteristics.

Outcome: Instead of focusing on territorial differences, the **Living Lab pilots and exercises will prioritize usability testing, stakeholder evaluation, and adaptation of DMSS functions** (e.g., visitor segmentation analysis, UI design, indicator accuracy).

Stakeholder Motivation & Co-Creation Priorities

Since **user requirements for DMSS are already defined**, the **Living Lab methodology will be used as a tool to test the DMSS** by: **Policy Makers** → Prioritizing sustainability indicators, climate adaptation measures, and evidence-based policy insights. **Business Decision Makers** → Enhancing visitor flow predictions, sentiment analysis, and market-driven insights for commercial applications.

Co-Creation Objective: Rather than re-evaluating service needs, the emphasis should shift toward **ensuring stakeholders can effectively interpret and utilize DMSS outputs**, particularly in how **data visualization, accessibility, and decision-support functionalities** are structured.

Methodological Refinements: Shifting Focus on the Evaluation & Feedback Loop

A collaborative and iterative approach offers a real-world testbed through the data-driven Living Labs in **LIBECCIO** for developing a sustainable tourism platform (ETP) through an inclusive, **step-by-step process**. By engaging diverse stakeholders—from citizens to policymakers—they co-create, test, and refine solutions based on actual needs and behaviors.

The **Living Lab framework** should assess:

- **Usability & User Interface testing** → Ensuring DMSS is intuitive **for different stakeholder groups.**
- **Indicator Validation & Customization** → Verifying the relevance of analytics across various decision-making contexts.
- **Adaptability for Different Tourism Policies** → Ensuring flexibility in integrating new insights into stakeholder workflows.

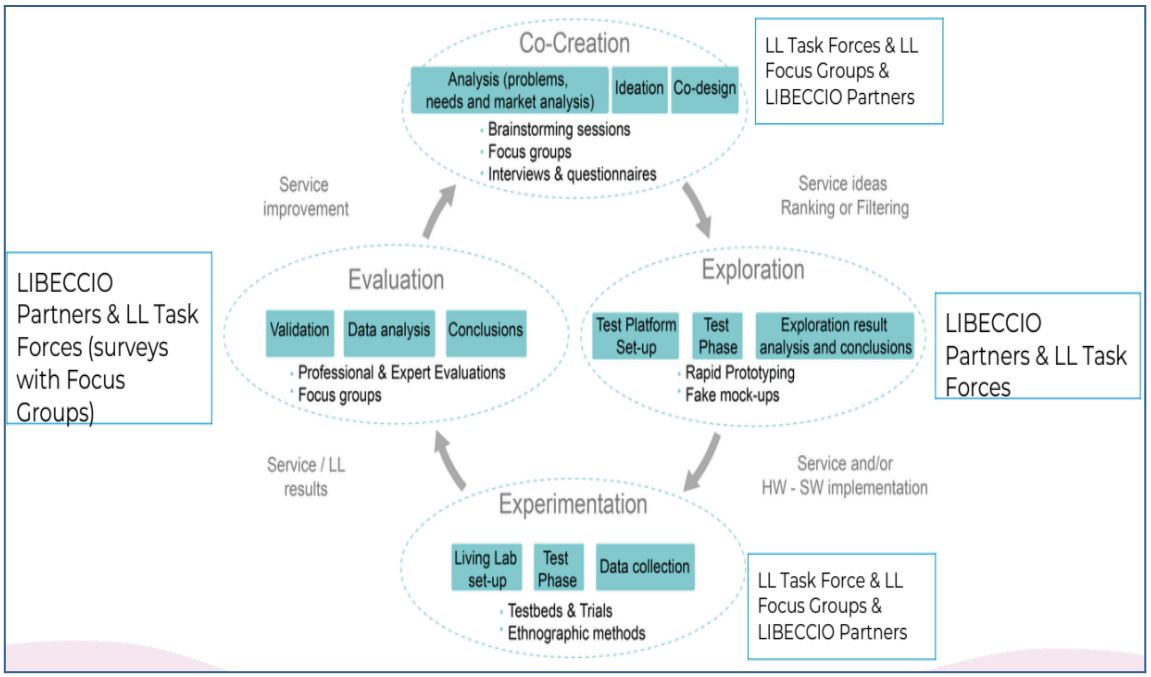

Fig 2. The Living Lab process scheme

This dynamic cycle of the Living Lab process **(Fig 2)** fosters innovation, builds trust, and ensures long-term adoption.

The process unfolds through six key phases.

Let's walk through the full process and how each phase supports adoption and implementation:

1. Ideation

This is where stakeholders—tourism operators, local authorities, researchers, and citizens—co-create ideas based on real-world challenges. Involving users from the start ensures the platform addresses actual needs, which boosts buy-in and long-term relevance.

2. Co-Design & Prototyping

Living labs emphasize participatory design. Here, mock-ups or early versions of the data-driven platform are tested with users. This phase helps identify usability issues, refine features, and build trust—especially important when dealing with behavioral nudges or sustainability metrics.

3. Data Collection & Integration

Sensors, apps, surveys, and other tools gather data on tourist flows, environmental impact, or user preferences. Because this happens in real-world settings, the data is richer and more actionable than in lab-only environments.

4. Data Analysis & Visualization

This is where the magic happens. Insights are extracted and visualized in ways that are accessible to all stakeholders—not just data scientists. Dashboards, maps, or storyboards can help local businesses or policymakers understand trends and make informed decisions.

5. Decision-Making & Implementation

With evidence in hand, stakeholders can co-decide on interventions—like adjusting visitor flows, promoting eco-friendly routes, or launching targeted nudges. Because the process has been collaborative from the start, implementation is smoother and more widely accepted.

6. Evaluation & Iteration

Living labs are iterative by nature. After implementation, the impact is monitored, and the cycle begins again refining the platform and strategies based on what works.

This full-cycle approach not only builds better tools but also cultivates a culture of "shared ownership", which is key to sustainable adoption.

2.4. Multilevel Stakeholders involvement

Multiple stakeholders are involved in **the Living Labs**, based on their roles and contributions:

- **Policy Makers** – Local, regional, and national administrators.

- **Tourist Destination Decision-Makers** – Business owners, environmental managers, researchers, and operators.

New Key Services for Policy Makers and Business Decision makers through a large data sources and datasets

In accordance with the approach and interview's results with stakeholders summarized in **D1.3.1. Up-scaled DMSS functional and technical requirements report** , the enhanced **Decision-Making Support System (DMSS)** harnesses large-scale data sources and diverse datasets to provide policy makers and business decision makers with **actionable insights.** By integrating **real-time monitoring, historical trends, and predictive analytics**, the **DMSS platform enables informed, strategic decisions** that enhance tourism sustainability and efficiency. For **policy makers**, this approach ensures data-driven governance, allowing them to track environmental, economic, and social sustainability indicators more effectively. Meanwhile, **business decision makers** benefit from advanced visitor flow predictions, sentiment analysis, and personalized tourism service recommendations, ensuring they stay ahead of changing demands. *(Table 1).*

Through **big data analytics, machine learning, and interregional benchmarking**, these services foster more adaptive, resilient, and sustainable tourism strategies.

	Stakeholders	New Key Services
1.	**Policy Makers**	**Monitoring Accessibility:** Evaluates public transport and walking access to tourist areas. **Supporting Sustainable Mobility:** Tracks cycling and pedestrian infrastructure for eco-friendly transport. **Assessing Social Sustainability:** Reviews accessibility for disabled persons and families. **Energy & Water Consumption Monitoring:** Establishes benchmarks for conservation policies. **Waste Management Optimization:** Assesses separation and recycling practices. **Managing Blue & Green Economies:** Evaluates marine and mountain resources for preservation. **Tourist Flow Analysis:** Prevents overcrowding and resource depletion. **Measuring Tourist Satisfaction:** Tracks sentiment on environmental sustainability efforts. **Interregional Benchmarking:** Compares sustainability metrics to enhance tourism strategies. **Economic Impact Assessment:** Quantifies tourism's contribution to GDP and employment.
2.	**Business Decision-makers**	**Visitor Arrival Predictions:** Forecasts short-, medium-, and long-term visitor trends. **Visitor Segmentation Analysis:** Identifies visitor demographics, preferences, and behaviors. **Visitor Feedback & Reviews:** Provides real-time insights for service improvement. **Destination Feedback & Sentiment Analysis:** Balances visitor experience with resident perspectives.

Table 1. List of identified key services by the 2 main stakeholders' groups

3. TYPOLOGY OF LIVING LABS

To respond effectively to the diversity of tourism destinations across Europe, the LIBECCIO methodology identifies each data-driven Living Lab by the main specific **environmental, cultural, and infrastructural characteristics** of each region. Following the same Living Lab principles and methodology, yet differing in **focus areas**, **stakeholder composition**, and **types of data and challenges** addressed. **The flexibility of the model allows each Living Lab to tailor its actions while remaining interoperable** with the **central DMSS platform** and aligned with common objectives.
The involved, newly established Living Labs are geographically located in various territories.

Example Locations	Inland area	Coastal area
	Terrassa(ES), Sarajevo (BA) Green Karst (SLO)	Emilia-Romagna(IT), Abruzzo (IT) Kotor (MNE), Western Greece (GR), Burgas (BG)

Each Living Lab contributes to the co-development of a shared knowledge base, while demonstrating how the same methodology can be adapted to very different tourism realities. This dual typology fosters innovation through both localization and transnational learning. Furthermore, in areas where the destination extends across inland and coastal areas, the Living Lab methodology allows to highlight common strategies for a better integration of sustainable responses.

Typology Matrix: LIBECCIO Living Labs

Dimension	Inland Areas	Coastal & Inland areas
Geographic Focus	Urban, rural, and natural inland areas (e.g. towns, forests, mountains)	Coastal areas, islands, harbors, and marine environments
Primary Challenges	Seasonality, depopulation, heritage preservation, inclusive growth	Climate change, coastal erosion, mass tourism, marine biodiversity
Key Stakeholders	Cultural institutions, SMEs, municipalities, rural communities	Coastal authorities, marine parks, tour operators, port agencies
Main Tourism Themes	Cultural tourism, eco-tourism, local crafts, inland mobility	Beach tourism, cruise management, eco-maritime tourism, island resilience
Data Sources	Event calendars, bookings, citizen feedback, local businesses	Sensor data, weather/ocean data, real-time occupancy, cruise schedules
Typical Nudging Applications	Promote off-season visits, respect heritage, encourage eco-activities	Guide eco-friendly marine behavior, reduce littering, manage crowd flows
Tech & Tools	AR for storytelling, digital itineraries, co-creation apps	IoT for environmental monitoring, digital signage, green infrastructure pilots

Dimension	Inland Areas	Coastal & Inland areas
Co-Creation Focus	Inclusive tourism offers, heritage valorization, rural innovation	Low-impact infrastructure, nature conservation, smart coastal services
Integration with DMSS	Visitor segmentation, event-based analytics, social feedback	Real-time impact dashboards, environmental KPIs, resilience indicators
Scalability Potential	Transferable to other inland rural or peri-urban areas	Replicable in similar coastal and island territories across the Mediterranean

Table 2-3: Typology matrix of Living Labs

4. ROADMAP TO ACTION: KEY STEPS TO LAUNCH & MANAGE DATA-DRIVEN LIVING LABS

This framework outlines the **step-by-step methodology** for managing **Living Labs for data-driven tourism**, ensuring effective integration with the **centralized data warehouse platform**. Each step aligns **Living Lab activities** with **data collection, analysis, and decision-making** to foster **sustainable tourism innovation**.

Step 1: Establishing Living Labs (Physical Setup)

Living Lab Actions:

- **Appoint a Living Lab Manager** to oversee operations and establish a physical environment for the operation.
- Practical Guide will help on how-to-setup a Living Lab and to identify the **role and activities of the Living Lab Manager and staff (if any) .**
- Utilize the **Living Lab Guide** for practical guidance at each site.
- Map of the main 2 types of stakeholders in each territory

Output: Fully operational Living Labs with established stakeholder networks.

Step 2: Access to data sources and technological Infrastructure

Living Lab Actions

- Establish an Operational Task Force (composed of Living Lab Managers and Tech experts of ISI).
- Select the most suitable **tourism challenges and opportunities** (from the List of Key new services)
- First meetings with the selected stakeholders in each territory
- Assess available **data sources** and **technological infrastructure**.

Integration with Data Warehouse

In line with A2.8, to connect existing **local datasets** (tourist flows, event calendars, booking trends)

to the data warehouse. Identify **missing data sources** to be integrated via API, manual input, or web scraping.
Output: Document defining objectives, stakeholder map, key datasets and data audit.

Step 3: Building the Partnership & Governance Model

Living Lab Actions

- Define **roles and responsibilities** (Living Lab managers, data and technical experts, policy makers, business decision makers, Task Force). The data and technical experts should know the platform and how it works.
- Establish a **multistakeholder governance model** and a **coordination group** activities and roadmap
- Create **2 Focus Groups**: **Focus Group #No1. Policy makers**. **Focus Group #No2. Business decision makers,** who collaborate with each other and with other Living Labs in LIBECCIO.
- Focus Group **purpose:** Facilitates **discussion & stakeholder insights** through structured conversations. **Best for:** Understanding **user needs, preferences, and feedback** on pilot services. **Outcome:** Generates **qualitative data** through moderated discussions, helping refine the data-driven approach before full implementation. **Use in Living Labs:** Policy makers & business decision makers participate in two distinct **Focus Groups** to evaluate DMSS usability.
- **Nudging opportunity**: Introduce soft prompts to ensure participation in governance processes

Integration with Data Warehouse

-Assign **data access levels** to different users through the **Users Authenticator** module.
-Define **protocols for secure data exchange** between the Living Labs and the central system.
Output: Partnership agreement and operational governance plan

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Step 4: Creating a Hub for a unified Data Ecosystem

Living Lab Actions

- Identify **data sources** (big data, open data, social media, business insights).
- Standardize **data formats** to ensure interoperability.
- Ensure **GDPR** compliance and data quality.

Integration with Data Warehouse:

-Set up **automated harvesting** (APIs, scraping) to collect and integrate real-time data from external sources (e.g., tourist boards, transport systems).
-Configure **Web Data Scraping** to extract valuable insights from travel platforms, review sites, and local blogs.
-Set up **Manual Data Entry** for SMEs or small-scale operators.

- **Focus on:** tourism businesses, cultural calendars, community-generated data, sensors, marine data, real-time environmental indicators etc.

Output: Data integration plan and interoperability checklist.

Step 5: Co-Creation & Solution Development based on the selected Key Services aligned with the Local Needs

Living Lab Actions

- Organize **co-design workshops** with stakeholders to define **priority solutions** (e.g., AI-driven itineraries, predictive tourism analytics).
- Select and **prototype priority solutions** based on real user needs.
- Define **KPIs** to measure solution effectiveness and nudging strategies

Integration with Data Warehouse

-Utilize the **Data Analyzer module** to apply statistical and AI-driven models (e.g., visitor segmentation, predictive demand analytics).

-Store results in **Analyzed Data** to provide insights through dashboards.

-Incorporate **nudging elements in UI/UX** (e.g., default paths, behavior prompts)

Output: Pilot projects template canvas (or similar) with solutions integrated with the analytical tools and KPI dashboard drafts

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Step 6: Real-World Experimentation & Iteration

Living Lab Actions

- Deploy **pilot solutions** in each selected area.
- Find methods and tools to monitor effectiveness using **real-time analytics, and visitor feedback tools** (through surveys, metrics or live interactions)
- Iterate based on **user feedback and performance metrics**.

Integration with Data Warehouse

-Implement **real-time feedback loops** in the **Data Presenter** dashboard for interactive monitoring.

-Embed nudges in physical spaces (e.g., signs, AR, incentives)

-Use visual and digital cues for eco-responsible behavior

Output: Field-testing report with lessons learned with key insights

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Step 7: Evaluation & Scalability

Living Lab Actions

- Analyze **data-driven impact metrics** (visitor satisfaction, economic impact, sustainability performance).
- Identify **critical success factors** and areas for improvement.
- Develop a **scalability model** to expand solutions to other regions.

Integration with Data Warehouse

Generate a dashboard or **automated reports** using **Grafana UI** to visualize performance indicators.

Output: Dashboard or evaluation report, best practice case studies.

Step 8: Long-Term Sustainability & Expansion

Living Lab Actions

- Integrate solutions into **public policies and tourism strategies**.

Integration with Data Warehouse

Define **long-term data-sharing agreements** to manage the pilot projects identified and updated datasets maintenance and analytics modules

Output: Sustainability plan and policy integration strategy

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5. BEHAVIORAL INNOVATION: INTEGRATING LIBECCIO-NUDGES (Optional, highly recommended)

To further enhance participation, adoption, and sustainability within Living Labs, the methodology introduces the use of **behavioral nudges**. Nudging is a technique based on **behavioral economics** (Thaler, 2015), which gently steers individuals toward beneficial decisions **without limiting freedom of choice**. Integrated into the **Living Lab activities**, nudges increase the impact of solutions while promoting active engagement and sustainable behaviors. (Nudge My Tour- The Basic Toolkit, 2019).

5.1. What Are Libeccio-Nudges?

Libeccio-Nudges are soft behavioral prompts—visual, contextual, digital, or social—that influence how users interact with information, tools, and services within the Living Labs. Nudges are not mandates; rather, they simplify decisions and highlight preferable options, aligned with public interest and project goals.

Key benefits:

- Promote sustainable choices without coercion
- Enhance digital tool adoption (e.g., DMSS modules, dashboards)
- Encourage continuous stakeholder participation
- Support climate-responsible and culturally respectful tourism

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5.2. Nudge tools in DMSS & data-driven Living Labs

Do we need to integrate nudges in a sustainable tourism related data-driven platform (ETP) in the living lab to facilitate the interactions with the users?

Nudges can play a pivotal role in a sustainable tourism platform within a living lab setting. The real strength of this combination lies in changing behaviors without overt enforcement, which is often critical in encouraging **sustainable choices among decision makers, business support organizations, travelers and locals alike.**

What makes the living lab unique is its focus on experimentation and co-creation with real users in real-world settings. So, *the Living labs with end users could continuously test and iterate different nudging strategies to see which ones resonate and drive sustainable outcomes.*

Goal	Example Nudge Strategy
Encourage participation	Friendly reminders for workshops or feedback loops; social proof from other territories
Promote tool adoption	Default configurations that suggest eco-smart or inclusive options
Foster sustainable behaviors	Visual prompts (e.g., green icons) encouraging low-impact activities or off-peak visits
Increase collaboration	Gamified elements or visible recognition for active contributors
Simplify complexity	Step-by-step guidance in dashboards or decision support tools

Table 4 Example nudge strategy to foster sustainable behaviors

Application tip: Nudges should be used in the **physical environments** (signage, labels, routes) used mainly in the local workshops.

5.3. Contextual Nudging by Living Lab typologies

Inland	Coastal
Highlight lesser-known attractions	Encourage eco-certified marine tours
Suggest off-season visits to reduce crowding	Promote waste separation through signage
Encourage cultural respect via AR storytelling	Use icons to guide swimmers toward safe areas
Promote hiking or slow tourism options	Discourage plastic use with visual prompts
Encouraging Sustainable Mobility Choices	Protecting Beach & Seaside Wildlife

Table 5 Contextual nudging based on LL typologies

5.4. Internet of Behavior (IoB) as a new approach in data-driven living labs

Nudging techniques in data-driven living labs for Decision-Making Support Systems (DMSS) tourism are gaining traction as a way to subtly influence tourist behavior while promoting sustainable and personalized experiences.

How Data-driven Nudging Works in Tourism DMSS ?

a) **Personalized Recommendations: Data-driven nudging** uses behavioral data to suggest activities, accommodations, and routes tailored to tourists' preferences. A. Kwok study[1] highlight the implications of the **Internet of Behaviors (IoB)** for tourism stakeholders in a hyper-connected and data-driven world.
b) **Sustainability Nudges**: Encouraging eco-friendly choices, such as selecting green transportation or reducing waste, by leveraging behavioral insights.
c) **Social Influence & Engagement**: Nudging tourists to share experiences, leave positive reviews, and interact with local businesses.
d) **Ethical Considerations**: While nudging can enhance user experience, concerns about privacy, autonomy, and manipulation remain.

5.5. How Nudges Enhance Data Collection in Living Lab Interactions?

In data-driven Living Labs, nudging tools play a subtle but powerful role in encouraging richer and more diverse data contributions. By embedding behavioral cues into collaborative sessions, stakeholders and LIBECCIO project partners with local Task forces are gently guided to share insights from underutilized sources, engage with sustainability metrics, and explore alternative perspectives—without ever feeling pressured. This approach turns data collection into a more intuitive, inclusive, and participatory process.

5.5.1. Examples of digital nudging in data-driven Living Labs, specialized for sustainable tourism, during meetings or brainstorming with stakeholders:

1. Frictionless Onboarding Nudges: At the start of workshops or co-creation meetings

- Use digital **pre-session prompts** (e.g. emails or app pop-ups) nudging participants to log into the DMSS platform and sync accounts connected to platforms like TripAdvisor or local tourism boards.
- Provide **"why it matters" visual nudges**—brief infographics showing how their data contributions from various platforms shape local sustainability strategies.

2. Smart Templates with Pre-Filled Data Suggestions :During brainstorming sessions

- Present **default fields** or **pre-filled sample entries** in collaborative tools (like shared dashboards or whiteboards) pulled from platforms such as **AirBnB** or **Tourinform**, nudging participants to validate, adjust, or expand them).
- Use **tag-based prompts** (like "***Local mobility trend?***" or "***Peak-time visitor behavior from AirBnB stays?"***) to frame data requests in ways that feel natural and help participants think in terms of cross-platform sources.

[1] Andrei O.J.Kwok: The next frontier of the Internet of Behaviors: data-driven nudging in smart tourism, Journal of Tourism Futures, 2023.
https://www.emerald.com/insight/content/doi/10.1108/jtf-11-2022-0288/full/html

3. Visual Cues in Real-Time Dashboards: When co-analyzing insights:

- Highlight key sources (e.g., TripAdvisor review trends) with subtle color-coding or icons (, ,), nudging users to explore underutilized or contrasting data inputs.
- Use **"you're the first group to explore this dataset!"** type nudges to prompt deeper exploration of regional tourism portals or citizen-sourced feedback pools.

4. Context-Aware Micro Nudges: Within the platform during live sessions:

- Tooltips can gently suggest, *"This data gap could be filled with regional transport logs—want to explore that next?".*
- If the user often interacts with local data, the system may nudge them to contrast it with regional or platform-based inputs—*"How does this compare to visitor sentiment on TripAdvisor last summer?".*

5. Social & Gamified Nudges in Feedback Rounds- After group ideation:

- Show leaderboards or progress bars that reflect participation in sourcing data from varied platforms—*"You helped add 3 unique sources: AirBnB, Tourinform, local census—keep going!"*
- Nudges highlighting community-wide trends, e.g., *"75% of other focus groups considered seasonal TripAdvisor reviews—interested in reviewing them too?"*

Together, these nudge tools create a flow where **data collection becomes a shared, intuitive journey** rather than a task—*and stakeholders, both experts and end-users*, **feel more empowered to bring valuable data streams to the table.**

5.5.2. Visual Summary: Data-Driven Nudging for Sustainable Tourism

Purpose

To facilitate conscious, collaborative, and data-enhanced decision-making in Living Labs through gentle prompts—not mandates.

Nudge Tools in Action

Stage	Nudge Example
Ideation & Brainstorming	Color-coded prompt cards for data source diversity
Focus Groups	Smart defaults in survey tools (e.g., top-positioning sustainable choices)
DMSS Interaction	Tooltips: "Want to compare this with TripAdvisor summer data?"

Post-Session Feedback	Gamified dashboards showing contributions from multi-source datasets

Key Benefits

- Encourages eco-conscious decisions
- Increases inclusion of underused data sources
- Boosts tool engagement across Libeccio partners & end-users
- Strengthens co-ownership and long-term impact

5.6. The main benefits of data-driven nudging in the sustainable tourism

The data-driven "nudging" is found to offer several benefits for smart tourism:

1. **Informed Personalization -** Nudges powered by the collected data (from platforms like ***TripAdvisor, local tourism boards, different multi-data sources)*** can be tailored to each user's behavior, location, or preferences—making them more relevant and persuasive without being intrusive.

2. **Encourages Proactive Sustainable Choices -** By subtly highlighting eco-conscious actions—like suggesting off-peak travel times or green transport routes—nudges help tourists make better decisions without feeling restricted or lectured.

3. **Enhanced Stakeholder Collaboration -** Within Living Labs, *nudges can guide task forces, focus groups, and end-users* ***to explore underused datasets or highlight sustainability KPIs during co-creation sessions, fostering more balanced and holistic platform development.***

4. **Bridges Data Gaps with Soft Prompts** - Nudging can gently invite participants ***to share or validate data from multiple sources*** (e.g., regional portals, online reviews), improving the richness and diversity of the datasets feeding into the DMSS.

5. ***Boosted Engagement & Platform Adoption*** **-** Gamified nudges, visual cues, and contextual suggestions can increase participation in data collection, feedback loops, and platform usage—key for long-term success.

6. **Low-Cost, High-Impact Behavior Change -** Unlike mandates or hard incentives, ***nudges require minimal investment but can significantly shift behaviors toward climate-responsible and culturally respectful tourism practices.***

7. **Supports Ethical Data Use** - When integrated transparently, data-driven nudging reinforces responsible data practices by showing users how their contributions are used to improve shared outcomes—building trust and accountability.

In short, it's all about designing choice environments that are intelligent, not manipulative, making the sustainable option feel like the natural one.

These nudging strategies align with **Libeccio's DMSS framework**, ensuring **real-time monitoring, forecasting, and strategic planning** for sustainable tourism through workshops. *(Annex 6. Proposed Workshop Agenda on how to define data-driven nudging tools?)*

5.6. Towards a "Libeccio-Nudges" adaptation

To standardize and scale behavioral innovation across territories, the project proposes to adapt the proposed **LIBECCIO-Nudges as an optional tool**. *Nudging is not only about changing user behavior—it's about designing systems that make sustainable, inclusive choices easier and more intuitive for everyone. (**See in Annex 4**).*

The Tool can offer a practical way behind nudging and its ethical use:

- ➔ Provide templates, examples, visual summary and checklists for planning nudge actions,
- ➔ Include case studies from the new data-driven Living Labs.
- ➔ Offer tools for monitoring impact and iterating nudges over time,
- ➔ Facilitate training of Living Lab teams and public authorities .

6. MANAGEMENT AND IMPLEMENTATION STRUCTURE FOR LIVING LABS

Management and Implementation Structure for Living Labs is organized and effectively captures the **institutional, operational, and local dimensions** necessary for coordinated execution and emphasizes **strategic alignment, stakeholder interactions, and system integration**.

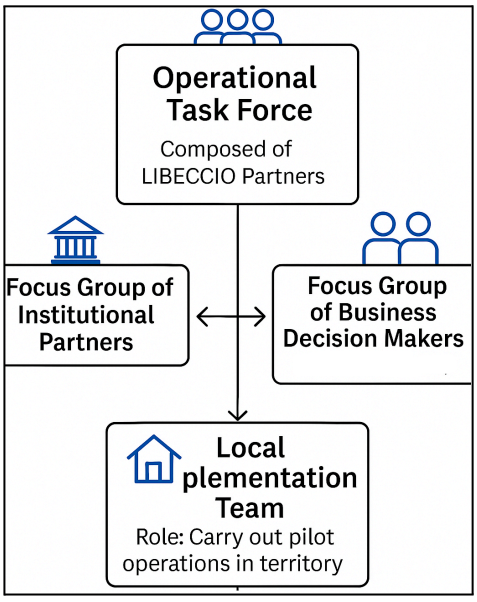

Fig 3. The Living Lab management structure

6.1. Operational Task Force

Purpose: A **hands-on, action-oriented team** (composed of Living Lab Managers, Tech experts of ISI, is responsible for executing pilot activities for implementing, testing, and iterating the key service **solutions within the Living Lab framework**. **Outcome:** Ensures structured **deployment, monitoring, and adjustments** based on real-world experimentation. Task Force **use in Living Labs:** This Dedicated group managing **technical integration, stakeholder coordination, and data-driven evaluations** in the Living Labs.

6.2. Focus Groups and their roles

The establishment of **two dedicated Focus Groups — one Institutional**, **coordinated by the Western Greece Region,** and **one Operational, coordinated by CNA Abruzzo (excluding Athena)** — is designed to ensure coherent and synchronized project activities. These groups collectively constitute the strategic backbone of the initiative, vital for **policy alignment, technical execution, and enhanced cross-regional collaboration.**

The Institutional Focus Group, *specifically coordinated by the Western Greece Region*, **emphasizes governance, regulatory compliance, policy integration, and the long-term sustainability of tourism innovations.** Conversely, **the Operational Focus Group (Business Decision Task Force)** spearheads **practical implementation, experimentation, and robust stakeholder engagement across diverse regional contexts.** Their coordinated efforts are crucial for *connecting local experimental practices to overarching policy frameworks,* effectively **embedding nudging strategies, data-driven insights, and co-creation approaches into a resilient and sustainable tourism landscape.**

The two Focus Groups created within the project should keep a **counseling role** giving **feedback to partners asking for orientation in the pilot phase**. They might **also give feedback about the Living Labs and pilot actions implemented at the local level.**

#No1. Focus Group of Institutional Partners

Coordinator: *Western Greece Region*.
Core Role: Ensuring alignment of policies, securing institutional authorizations, and facilitating the sustainable, long-term integration of innovative tourism practices.

Key responsibilities include:

- **Representation:** Advocate for the interests of public authorities at both regional and national levels, ensuring strategic coherence across governance tiers.

- ➢ **Compliance Assurance**: Guarantee that pilot actions comply with existing legal and administrative frameworks, proactively mitigating risks and facilitating seamless project implementation.
- ➢ **Policy Promotion and Sustainability**: Foster policy uptake by advocating for the integration of successful pilot solutions into future public tourism initiatives and securing long-term funding sources to sustain innovative practices.
- ➢ ***Behavioral Insights Integration (Nudging):*** Support the embedding of subtle, data-driven behavioral strategies (nudging) into public tourism governance to foster sustainable and responsible choices among tourists and stakeholders. Specifically, this involves:
- ➢ **Policy Design**: Incorporating behavioral science principles into tourism regulations and initiatives to guide tourist behaviors toward sustainable and eco-friendly practices (e.g., incentivizing eco-friendly activities).
- ➢ **Strategic Prompting**: Encouraging voluntary, meaningful actions through targeted, context-sensitive prompts rather than rigid mandates, leveraging tools such as mobile apps providing real-time sustainability suggestions.
- ➢ **Positive Reinforcement**: Utilizing incentives and feedback loops to reinforce desirable behaviors, such as rewarding tourists opting for sustainable transportation or responsible waste management practices.
- ➢ **User-Centric Environment Design:** Creating intuitive, accessible, and appealing environments where sustainable choices are naturally integrated into tourism experiences, for instance, enhancing bicycle accessibility or highlighting less-crowded, sustainable tourism destinations.

By strategically embedding these elements, the Institutional Focus Group ensures the durability, effectiveness, and sustainability of tourism innovations, ultimately contributing to enhanced environmental stewardship and improved tourist experiences.

#No2. Focus Group of Operational Partners (except Athena)

Coordinator: *CNA Abruzzo*.

Core Role: Setup, technical implementation, experimentation, and coordination of local Living Labs

The Operational Focus Group, coordinated by **CNA Abruzzo**, serves as the engine room of LIBECCIO's practical innovation. This group is tasked with translating strategic ambitions into tangible, on-the-ground actions across ten diverse territories—ranging from inland to coastal regions. Their mission is **to ensure that the project's vision of sustainable, data-driven tourism is not only piloted but deeply embedded in local realities**.

Key responsibilities include:

- ➢ **Living Lab Deployment:** Supporting the establishment and operationalization of Living Labs in 10 pilot territories, each tailored to local tourism dynamics and sustainability challenges.
- ➢ **Pilot Coordination:** Overseeing the design, execution, and monitoring of pilot actions, ensuring consistency in experimentation while allowing for regional customization.
- ➢ **Capacity Building:** Delivering hands-on support and training to local actors on data collection, digital tools, and co-creation methodologies, empowering stakeholders to take ownership of innovation processes.

- ➢ **Methodological Alignment:** Ensuring that nudging strategies and user-centered design principles are applied coherently across all pilots, reinforcing behavioral change and sustainable tourism practices.
- ➢ ***Cross-Regional Synergy:*** *Facilitating peer learning and knowledge exchange among territories, fostering a collaborative environment where best practices and lessons learned are shared and scaled.*

By anchoring innovation in real-world contexts and empowering local ecosystems, the Operational Focus Group plays a pivotal role in bridging policy with practice. Their work ensures that **LIBECCIO's digital and behavioral tools are not only tested but refined and adopted** in ways that resonate with local communities and tourism stakeholders.

6.2. Local Implementation Team roles

The **Local Implementation Team** plays a vital role in executing **Living Lab activities** at the territorial level. Composed of **coordinators, technicians, facilitators, and data analysts**, this team ensures that **pilot actions, stakeholder collaboration, and data collection** align with the broader **Living Lab framework**. Their responsibilities include organizing **co-design workshops**, monitoring **Key Performance Indicators (KPIs)**, and implementing **behavioral nudging strategies** in both **physical and digital environments**. By bridging **local insights** with **regional coordination efforts**, they help shape sustainable and user-centered tourism innovations.

Local Implementation Team (Living Lab Management Team)

Coordinator: *Project Partners*
Role: Carry out the **operational activities** and pilot actions in the territory.

- **Composition**: A local coordinator, technicians, facilitators, data analysts, designated by local public/private organizations.
- **Main Functions**:
    1. Organize *co-design laboratories* and field testing with stakeholders.
    2. Establishment of the **Task Force** - team of the Living Lab Managers).
    3. Collect data (quantitative and qualitative) and share them with the **Operational Task Force** (team of the Living Lab Managers) and the Coordination Committee.
    4. Monitor **local KPIs** and produce *periodic reports*.
    5. Implement **nudging strategies** in both physical and digital formats

6.3. Integrated Living Lab and DMSS Operational Model

The **Integrated Living Lab–DMSS Operational Model** establishes a **dynamic framework** for tourism governance, linking **data-driven decision-making** with **localized experimentation**. The model ensures a **continuous feedback loop** between the **Destination Management Support System (DMSS), Living Labs,** and the broader network of **project partners and stakeholders**.

Through **collaborative testing and validation**, Living Labs serve as **real-world environments** where **DMSS indicators and services** are refined, ensuring practical relevance. The architecture enables a **bidirectional flow** of data, where pilot projects generate **real-use insights** that enhance **dashboard usability** and inform policy adaptation.

Additionally, the **Tourism Innovation Platform (ETIP)** facilitates **cross-regional knowledge sharing**, fostering the **horizontal transfer** of best practices and scalable solutions across diverse territorial contexts. This **integrated approach** strengthens **participatory governance** while it is highly recommended to adapt the **behavioral nudging techniques** through regular interactions with the stakeholders.

The diagram illustrates the **operational architecture** linking the **Destination Management Support System (DMSS), the Digital-Physical Living Labs (Fig 1).,** and the broader ecosystem of project partners and stakeholders. It visually represents the **feedback loop** between platform design, local experimentation, and continuous refinement.

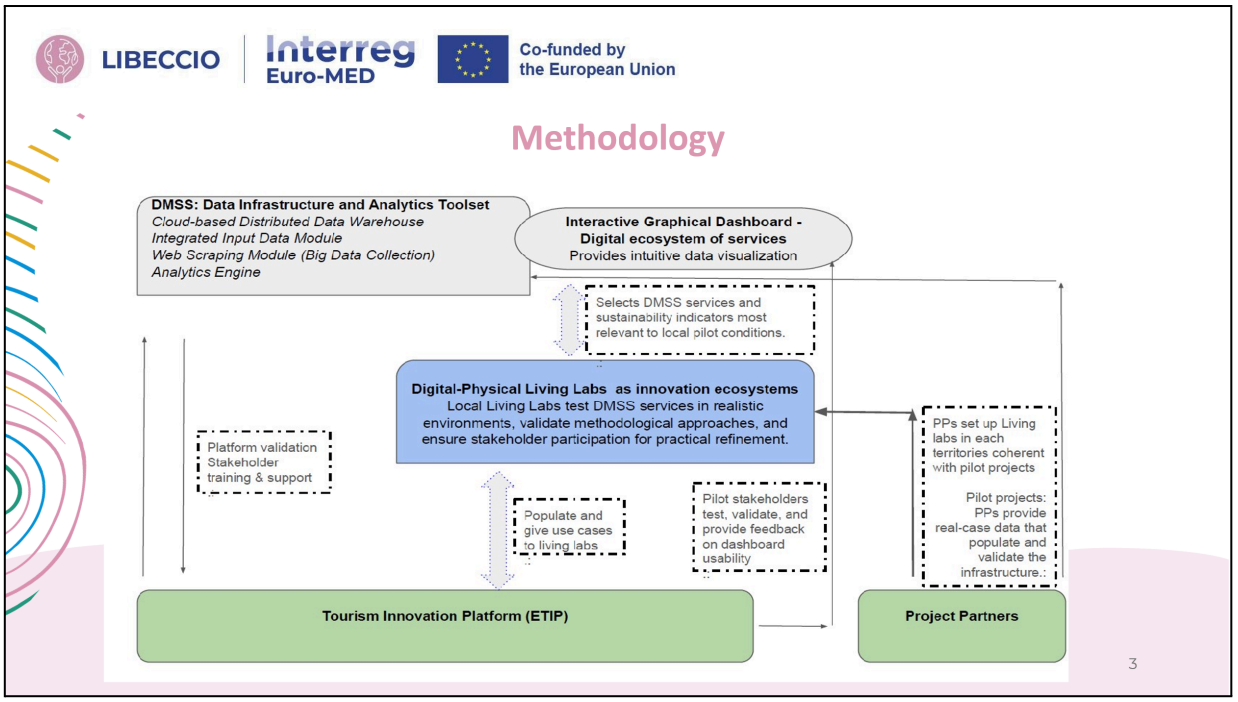

Fig 4. Operational architecture linking the Destination Management Support System (DMSS), the Digital-Physical Living Labs (Source: authors)

6.4. Data-Driven DMSS by linking Living Labs

Several **services and solutions** can be developed within the **Living Lab framework** and shared with stakeholders to enhance **tourism governance, sustainability, and innovation**.

6.4.1. Data-Driven Decision-Making Services

- **Interactive Destination Management Support System (DMSS):** Offers **real-time analytics** for tourism trends, visitor flows, and environmental impact.
- **Behavioral Insights & Nudging :** Provides data-driven recommendations for **user engagement and sustainability practices**.
- **Stakeholder Collaboration Platforms:** Facilitates **multi-level decision-making** and coordination across public/private sectors.

6.4.2. Smart Tourism & Digital Solutions

- **Personalized Tourism Recommendation Systems:** AI-driven tools for visitor experience optimization based on behavior patterns.
- **Augmented Reality (AR) Heritage Experiences:** Digital overlays enhancing cultural tourism engagement.
- **Mobile Engagement Apps:** Interactive apps for tourists and locals with **real-time updates, nudging strategies, and feedback loops**.

6.4.3. Sustainable Tourism & Climate Resilience Services

- ✧ **Eco-Certification & Green Tourism Labels:** Frameworks to encourage **responsible business practices** in hospitality and attractions.
- ✧ **Climate Adaptation & Coastal Resilience Tools:** Scenario modeling for **risk management and sustainability measures**.
- ✧ **Circular Economy Tourism Initiatives:** Strategies promoting **waste reduction, local sourcing, and low-impact travel**.

6.4.4. Community & Stakeholder Engagement Tools

- ✧ **Co-Creation Platforms for Local Communities:** Digital hubs that enable **citizen participation in tourism development**.
- ✧ **Training & Capacity-Building Modules:** Workshops for tourism businesses on **data utilization, sustainability, and digital transformation**.
- ✧ **Knowledge Sharing Networks:** Interregional **peer-learning communities** connecting Living Labs across Europe.

7. LIST OF KEY PERFORMANCE INDICATORS (KPIs)

A draft of KPIs for monitoring and evaluating the implementation of Living Labs is presented below. Each KPI is accompanied by a brief definition and a possible measurement approach. A more precise definition of Key Performance Indicators (KPIs) for evaluating the results and impact of the pilot testing will follow before the implementation phase.

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1. **Stakeholder Engagement**
    - **Definition**: Measures how many different types of stakeholders (public authorities, private businesses, NGOs, citizens, academia) are actively involved.
    - **Example Metric**:
        - *Number of stakeholder organizations* participating in Living Lab activities.
        - *Diversity index* (e.g., ratio of distinct stakeholder categories present).
2. **Focus Groups" Satisfaction**
    - **Definition**: Evaluates user experience and perceived relevance of Living Lab activities (e.g., from co-creation sessions, workshops).
    - **Example Metric**:
        - *Average satisfaction score* (1–5 scale) from post-session surveys.
        - *Net Promoter Score (NPS)* among Living Lab attendees.
        - % of stakeholders willing to participate in future Labs
3. **Co-Creation Activities**
    - **Definition**: 2 collaborative events aimed at designing or refining new solutions.
    - **Example Metric**:
        - *2 co-creation workshops attract how many participants ?*
        - *% of ideas generated* that progress into pilot testing.
4. **Data Readiness and Integration**
    - **Definition**: Evaluates how effectively each Living Lab identifies, collects, and integrates relevant data into a shared platform or data warehouse.
    - **Example Metric**:
        - *% of required datasets* successfully collected and standardized.
        - *Timeliness* of data updates (e.g., how often data are refreshed).
5. **Pilot Implementation Rate**
    - **Definition**: Measures the results of the LLs that are executed until the end of 2025.
    - **Example Metric**:

        - *Ratio* of implemented vs. planned pilot actions.
        - Number of active users of each tested digital/physical solution
        - *Adherence to timeline* for pilot milestones.

6. **Impact on Stakeholder Decision Making**
    - **Definition:** Measures the extent to which LLs shape key tourism performance indicators—such as visitor satisfaction, spending behavior, and overall engagement.
    - **Example Metrics:**
        - *Variation in **visitor satisfaction ratings** before and after implementing Living Lab solutions.*
7. **Stakeholder Capacity Building**
    - **Definition**: Reflects how much training or knowledge transfer Living Lab participants receive, boosting their ability to implement data-driven approaches.
    - **Example Metric**:
        - *2 training sessions will be* organized. *Improvement in skills test scores* (before vs. after training).
8. **Scalability and Replicability**
    - **Definition**: Evaluates the potential for solutions or methods tested in one Living Lab to be extended or adapted to other contexts.
    - **Example Metric**:
        - *Documented guidelines* or toolkits produced for replication.

Usage Tips

- **Tailor KPIs to Local Context**: While the above provides a general framework, each Living Lab should adapt metrics to its specific objectives (e.g., cultural tourism, sustainability, rural destinations).
- **Combine Quantitative and Qualitative Data**: Use both numbers (e.g., user counts, budget figures) and narrative evidence (e.g., testimonies, focus group feedback) for a holistic evaluation.
- **Review KPIs Periodically**: As projects evolve, new metrics may become more relevant, or targets may need adjustment to reflect lessons learned.
- **Ensure Data Quality and Consistency**: To allow comparability across all 10 Living Labs, standardize data collection methods and timing as much as possible.

8. Key Exploitable Results' Recommendations

With reference to the established list of Key Performance Indicators (KPIs), the LIBECCIO framework identifies **three preliminary Key Exploitation Results (KERs)**. These KERs are conceived as **initial recommendations** and illustrative examples to support partners during the Living Labs (LL) evaluation phase. The list provided should be considered a **working suggestion**. Following the finalization of KPIs and the release of additional supporting materials made available to all partners prior to the LL implementation, it will be possible to **refine or expand** these KERs. Specific elements from the evaluation outcomes may evolve into more **clearly defined and actionable KERs**, based on observed results and stakeholder feedback.

a) #KER1: Data-Driven Decision-Making Governance Model

The **Destination Management Support System (DMSS)** has successfully enabled **real-time analytics**, allowing stakeholders to make **data-informed policy and operational decisions**. Key achievements include:

- **Improved Visitor Flow Management:** Optimizing tourism experiences while minimizing overcrowding.
- **Stakeholder Engagement Metrics:** Providing insights into **regional tourism dynamics and governance strategies**.
- **Enhanced Predictive Capabilities:** Leveraging **machine learning** to forecast **economic and environmental impacts** of tourism policies.
- **Informed Sustainable Practices:** Data-driven **recommendations for eco-conscious tourism development**.

b) #KER2: Adaption of the Behavioral Nudging Technique in Sustainable Tourism

Nudging interventions under LIBECCIO have strengthened **tourist engagement and sustainability** without imposing restrictive measures. Achievements include:

- **Gamification & Incentives:** Behavioral nudges using **reward-based participation** have improved engagement with **local initiatives**.
- **Real-Time Adaptation:** Digital nudging tools provide **personalized recommendations**, adapting to **user preferences and behavior patterns**.

c) #KER3: Established Physical-Virtual Living Labs for co-creation and interaction

The integration of **physical and virtual Living Labs** has successfully fostered **innovation and collaboration** across tourism stakeholders. Achievements include:

- **Effective Stakeholder Collaboration:** Co-creation processes have facilitated **multi-level engagement** between **governments, businesses, and local communities**.

- ✧ **Testbed for Tourism Solutions:** Living Labs serve as **experimentation spaces** where DMSS indicators are validated and refined.
- ✧ **Cross-Regional Knowledge Transfer:** A **bidirectional flow of insights** between local and transnational partners enhances **methodologies and impact scaling**.
- ✧ **Hybrid Digital-Physical Innovation Model:** Combining **on-site field testing** with **data-driven simulations** has accelerated **solution deployment**.

9. SUMMARY

This document outlines the **management, governance, and implementation structure** of **Living Labs** within the **LIBECCIO framework**, focusing on **tourism destination innovation** through **data-driven decision-making and behavioral nudging techniques**. It introduces **two key Task Forces**:

- **Focus Group (Institutional) (coordinated by Western Greece Region)** ensuring **policy alignment, legal compliance, and long-term integration** of innovations into public tourism strategies.
- **Task Force (Operational) (coordinated by CNA Abruzzo)** leading **technical implementation, experimentation, and cross-regional collaboration** for Living Labs.

The **Local Implementation Teams** serve as the **on-the-ground facilitators**, managing **stakeholder engagement, pilot testing, and data collection** to refine solutions.

The document also presents the **Integrated Living Lab–DMSS Operational Model**, which connects the **Destination Management Support System (DMSS)** with **physical and digital Living Labs** through a **bidirectional feedback loop**—ensuring continuous refinement based on real-world experimentation. Additionally, it describes **services developed and shared with stakeholders**, including **smart tourism solutions, sustainability tools, and data-driven governance models** to support **inclusive and environmentally responsible tourism management**.

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Annex I – KPI Monitoring Table (Synthesis Format)

KPI Area Indicator Measurement Unit Data Source Frequency

This **draft version** provides a structured approach to monitoring and evaluating the implementation of **Living Labs** in **data-driven tourism governance**. Each **Key Performance Indicator (KPI)** is paired with a definition and a measurement strategy. (See Section 7).

KPI Area	Indicator	Measurement Unit	Data Source	Frequency
Stakeholder Engagement	Number of stakeholder organizations participating	Count of distinct entities	Event records, participation logs	Quarterly
Diversity Index of Stakeholders	Ratio of different stakeholder types (public, private, NGOs, academia, citizens)	Percentage	Stakeholder registry, surveys	After the 2nd workshop
Participant Satisfaction	Average score on Living Lab experiences	1–5 scale (survey-based)	Post-session feedback	After each event
Co-Creation Activities	Number of co-design workshops held	Count per period	Lab activity reports	Monthly
Ideas Progressing to Pilot Testing	% of generated solutions moving to implementation	Percentage	Living Lab project tracking	Quarterly
Data Readiness and Integration	% of required datasets collected and standardized	Data completeness rate	DMSS platform logs	Monthly
Timeliness of Data Updates	How often datasets are refreshed	Time interval (days/weeks)	Living Lab records	Until the end of 2025
Pilot Implementation Rate	Ratio of planned vs. implemented pilots	Percentage	Living Lab reports	Quarterly
Active Users of Piloted Solutions	Number of users interacting with	User count	Analytics from DMSS	Monthly

KPI Area	Indicator	Measurement Unit	Data Source	Frequency
	digital or physical tools			
Solution Adoption and Usage	Frequency of use of a tested tool	Session counts per user	Digital platform metrics	Monthly
Impact on Local Tourism	Change in visitor satisfaction scores (pre- vs. post-intervention)	Score variation	Tourism feedback surveys	Bi-annual
Change in Average Stay Duration	Change in tourist behavior after interventions	Days spent per visit	Tourism industry reports	By the end of 2025l
Stakeholder Capacity Building	Number of training sessions organized	Count	Training records	After the 2 meetings
Knowledge Gain Assessment	Improvement in skills test scores	Difference before vs. after training	Skills assessment surveys	After training
Scalability & Replicability	Number of solutions replicated in new territories	Replication count	Lab expansion data	By the end of 2025
Guidelines for Replication	Production of documented toolkits	Count	Living Lab publications	Ongoing
External Funding & Investment	Amount of additional funding raised	EUR (€) value	Grants, private investment logs	By the end of 2025
Partnership Growth	Number of new stakeholders joining based on pilot success	Count of new partnerships	Living Lab stakeholder records	By the end of 2025

Table 6 ensures continuous monitoring, data validation, and scalability across different tourism contexts.

Annex 2. - Mini - Handbook on how to set-up a data-driven Living Labs (3 pages)

The "minimum requirements" for operational management in each locality hosting a **data-driven living lab** depend on factors like governance, infrastructure, and stakeholder engagement. The general framework is standard - in each case.

Step 0: Minimum requirements for operational management of the newly established data-driven living labs

1. Governance & Institutional Support:

- *Local Authority Endorsement*: Commitment from municipal or regional governments to support the lab's initiatives.

- *Policy Alignment*: Integration with existing tourism, sustainability, and digital transformation strategies.

- *Stakeholder Representation*: A focus group of policy makers and business decision-makers to guide strategic direction.

2. Infrastructure & Digital Capabilities:

- *Data Access & Management*: Availability of **publicly accessible datasets (DMSS) for tourism analytics.**

- *Technology Readiness*: Basic IoT, AI, and cloud computing infrastructure for data-driven insights.

- *Physical Space*: A "collaborative hub" for workshops, co-creation sessions, and stakeholder meetings.

3. Human Resources & Expertise

- *Living Lab Manager***:** A dedicated coordinator overseeing operations and stakeholder engagement, nominated from each local LLs

- *Task Force*: Includes project partners and local Living Lab management staff implementation.

- *Focus Group*: Includes local tourism boards, municipal authorities, and business representatives

- *Data Analysts & Tech Experts:* Specialists in data processing, behavioral nudging, and smart destination management. (project partners).

4. Community & Business Engagement

- *Local Business Participation*: Involvement of hospitality, transport, and tourism service providers.

- *Public Awareness & Citizen Engagement:* Mechanisms for feedback loops and participatory decision-making.

- *Sustainability Commitment*: Integration of "eco-friendly tourism practices" into the lab's initiatives.

Step 1. Selection of living lab localities and ensure the physical & digital Infrastructure

Setting up a functional Living Lab environment requires careful planning of both physical facilities and digital/remote operations. Selecting a Suitable Location: Indicatively, we would suggest choosing a space of about 30-50m2. The availability of free wireless internet is considered essential. Availability of computers for the public (3-5 units) is desirable but not necessary. Likewise, there could be a large screen or a projector. Project Partners can customize their space in a way that aligns with their Living Lab's operational needs. It is crucial to ensure accessibility for key stakeholders (policy makers, business leaders, researchers). It is also essential to provide suitable infrastructure for specific meetings, workshops, and data collection activities. It can be:

Option 1: Co-working space to foster collaboration among stakeholders.

Option 2: Research center or university for access to knowledge, innovation, and technological expertise.

Option 3: Pilot test site (physical location, where tourism experiments and data collection occur, (like TourInform, Tourist Desks, Community center).

Step 2. Appointing a Living Lab Manager and LL governance

Designate a **Living Lab Manager** responsible for coordination, operations, and stakeholder engagement. Define managerial responsibilities, including:

- Facilitating **roundtables & focus groups** with stakeholders.

- Managing relationships with **public and private partners**.
- Ensuring effective **collaboration between technical teams and local authorities**.
- Disseminate the data-driven **Living Lab Guideline** to support the final beneficiaries with best practices, governance structures, and engagement strategies.
- Coordinate the creation of the local Operational **Task Force** with LIBECCIO consortium - (which is composed by LL Manager and local IT professional who will work with ISI mainly and with other living Labs, and LIBECCIO Partners)

Step 3. Access to the LIBECCIO Virtual Infrastructure, ensuring the Digital Integration with Data-Driven Platform

3.1. *Which kind of human resource is needed to work with ISI in the implementation phases ?*

A basic expertise of the LL staff to animate the LL is mandatory. A basic operation of the LL is to co-create services according to local needs based on data. This service creation should take into account local needs and engage stakeholders and the local ecosystem knowledge. The animator should be able to facilitate this process and drive stakeholders to understand the best data visualization options so that they are of utmost usability at LL level.

3.2. Data Access & Management: Availability of publicly accessible datasets for tourism analytics. (Which basic communication infrastructure is needed (HW and SW, Access rights etc..? To extract, download only or also upload the data by standardised criteria etc.?)

Ensure the access to the LIBECCIO **Decision-Making Support System (DMSS) platform to be a part of an evidence-based decision-making process by a) usage of key digital tools, including: GIS mapping systems** for spatial tourism analysis, and **AI-driven analytics** for visitor segmentation and trend prediction. The **IoT data collection** for real-time monitoring of tourism sustainability indicators. **b)** Establish **secure data access protocols**, ensuring compliance with **GDPR & cybersecurity requirements**. **c)** Set up automated **data harvesting mechanisms** (APIs, web scraping) for continuous integration with regional datasets. **Output:** Fully operational physical workspace with integrated digital infrastructure for collaborative innovation.

3.3. Technology Readiness: Basic IoT, AI, and cloud computing infrastructure for data-driven insights?

Basic computing infrastructure is necessary for the implementation of LLs envisaging the use and exploitation of the DMSS web enabled platform. Computing infrastructure is also necessary for the stakeholder engagement and pilot testing for the use of DMSS. No other specialized infrastructure is envisaged.

Annex 3. Proposed template for co-creation workshop Agenda with stakeholders

A well-structured workshop for Focus Groups , composed of policymakers and business decision-makers, Task Force - working on the Pilot implementations , composed of Project partners and Living lab teams that are working actively in tourism can foster collaboration, data-driven strategies, and impactful policy innovations.

Proposed workshop duration: 2,5 hours.

1. Opening & Context Setting (10 min)

- Welcome remarks by key stakeholders

- Overview of the data-driven Living Lab concept in tourism destination management

- Objectives of the workshop: integrating data-driven nudging into Decision-Making Support Systems (DMSS)

2. Keynote & Expert Insights (20 min)

- Presentation on data-driven tourism strategies and DMSS

- Case study of successful Living Labs

- Ethical considerations in behavioral nudging for sustainable tourism

3. Interactive Session: Policy & Business Collaboration (40 min)

- Roundtable discussion: Policy challenges & business opportunities

- Breakout groups: Addressing key issues such as sustainability, digitization, and visitor experience management

- Participants co-create policy recommendations based on real-time data analytics

Short break (10-15 min)

4. Technology Showcase & Nudging Applications (30 min)

- Demonstration of AI-powered nudging techniques

- Practical examples of data-driven insights for tourism governance

- Interactive Q&A with tech experts and business leaders

5. Action Planning & Roadmap Development (25 min)

- Policy & business leaders define priority actions, Mapping out collaboration frameworks for data-driven Living Lab pilots Next steps: implementation strategies and follow-up sessions

6. Closing Remarks & Networking (25 min)

- Summary of key takeaways and asking to fill up a Feedback form from the participants

End of the workshop