



Climate-Resilient Development Pathways in Metropolitan Regions of Europe – Deliverable

Deliverable 1.8 Functionalities of a Stakeholder Community Hub (SC-HUB)

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Disclaimer

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Table of Contents

1	<i>Introduction</i>	4
2	<i>The Stakeholder Community Hub Tool Concept</i>	5
3	<i>Functionalities of the SC-HUB</i>	8
	Description of each functional module	9
4	<i>Upcoming Functionalities</i>	10
5	<i>Systemic Functionality</i>	11
6	<i>Feedback & Feature Request Process</i>	13
7	<i>Uptake and Re-use of Living Lab Outputs</i>	14
8	<i>Conclusion</i>	15

Table of Figures

Figure 1: Deliverable 1.8 structure	5
Figure 2: SC-HUB Landing Page	6
Figure 3: CARMINE 8 Case Study areas / LLs	7
Figure 4: SC-HUB List of Living Labs	7
Figure 5: SC-HUB Block diagram & functional modules	8

Executive Summary

The deliverable D1.8 Functionalities of a Stakeholder Community Hub (SC-Hub) introduces the Stakeholders Community Hub (SC-HUB) tool, as a practical means for facilitating the collaboration and interaction among Living Labs' stakeholders and enabling the digital representation of Living Labs. This report presents the concept and the notion behind the development of this tool and details the list of its core functionalities available within its first released version (January 2025). In addition, it includes the upcoming list of functionalities, currently under development, and sets up a process for receiving feedback and new requests from the Living Lab users.

1 Introduction

Deliverable 1.8: “Functionalities of a Stakeholder Community Hub (SC-HUB)” is related to Task 1.3: Stakeholder Community Hub: Online Living Lab Tool, which works on developing and making available an online web tool, to facilitate the collaboration and interaction among Living Labs’ stakeholders.

A Living Lab (LL) is defined as a participatory research methodology which brings together a collective of diverse key stakeholders to explore a focal issue. CARMINE established a network of eight Living Labs connected to the European Network of Living Labs (ENOLL). The CARMINE LLs are matched to and harnessed to collect baseline data and knowledge from Case Study Areas (CSAs). They apply a participatory multi-actor approach to initiate the co-design of geo-referred Adaptation and Mitigation (A&M) pathways [1]. By integrating local stakeholders’ insights on knowledge gaps, user needs, climate risks, and sectoral threats, the project aims to support transformative adaptation planning and develop resilient metropolitan communities. Conventionally, LLs run as physical meetings/ workshops where participants meet to discuss and find solutions to a specific problem. Supporting this concept with digital solutions to foster engagement and the future impact of LLs, CARMINE is introducing the innovative concept of Stakeholder Community Hub (SC-HUB). SC-HUB will promote knowledge exchange, open innovation, and co-development, as it offers a digital representation for each LL of an aiming to increase their impact and the adoption of their outcomes.

D1.8 details the first set of functionalities that will be made available with the first versions of the SC-HUB. The functionalities have been elicited through desk research, interaction with the CSAs leaders and members as well as feedback received during the first demonstration of the initial version of the web tool. It also presents the process that will be established for receiving continuous feedback from the users, following an agile development methodology.

As Figure 1 presents, the report starts with an introduction (current section), continues with the description of the core functionality and the already planned upcoming functionalities, and ends with the presentation of the process for receiving input and feedback from the tool’s users.



Figure 1: Deliverable 1.8 structure

2 The Stakeholder Community Hub Tool Concept

Conventional Living Labs often lack a clear focus and fail to establish spearheads to declare a distinguishable profile. In addition, they often struggle with ensuring stakeholders' engagement and collaboration and the exploitation and use of their results in the long-term, as such leading to limited visibility, impeding the extension of the Living Lab beyond its 'physical' boundaries directly tied with its core actors/actions. This is due to the lack of instruments for sustaining the collaboration among stakeholders and spreading their results outside the boundaries of the LLs and their physical presence.

The SC-HUB tool is designed to address the above gaps and shortcomings identified in the operation and realisation of Living Labs. Its objective is to improve and facilitate the engagement of participants, as well as the dissemination and uptake of outcomes and conclusions. The SC-HUB concept and functionality are based on the idea of supporting LL activities during the lifetime of the Living Labs and beyond their operation. It serves as an online tool that continuously assists LL organisers and participants, as well as external users interested in the work produced by each LL. It fosters collaboration and opinion exchanges outside the physical borders of LLs, ensuring continuous access to material, and information by providing an online collaboration space for interaction.



Figure 2: SC-HUB Landing Page

SC-Hub is an online tool (Figure 2 presents the landing page of the tool) that adopts by design a domain-agnostic approach and aims to create a framework that can accommodate and digitally represent any Living Lab, regardless of its application domain or offline methodology.

A set of core functionalities have been integrated into the first version, and are presented in the next sections, of the tool (available online at: <https://schub.carmine-project.eu/>), while during its development phases, additional functionality will be implemented and made available to ensure it meets the needs of the 8 CARMINE LLs, aiming to ensure their sustainability in the long term.

The eight LLs (matched to Case Study areas), of the CARMINE project operate in eight European metropolitan regions and are presented in Figure 3, while Figure 4 presents a snapshot of the LLs as exist in the SC-HUB tool.

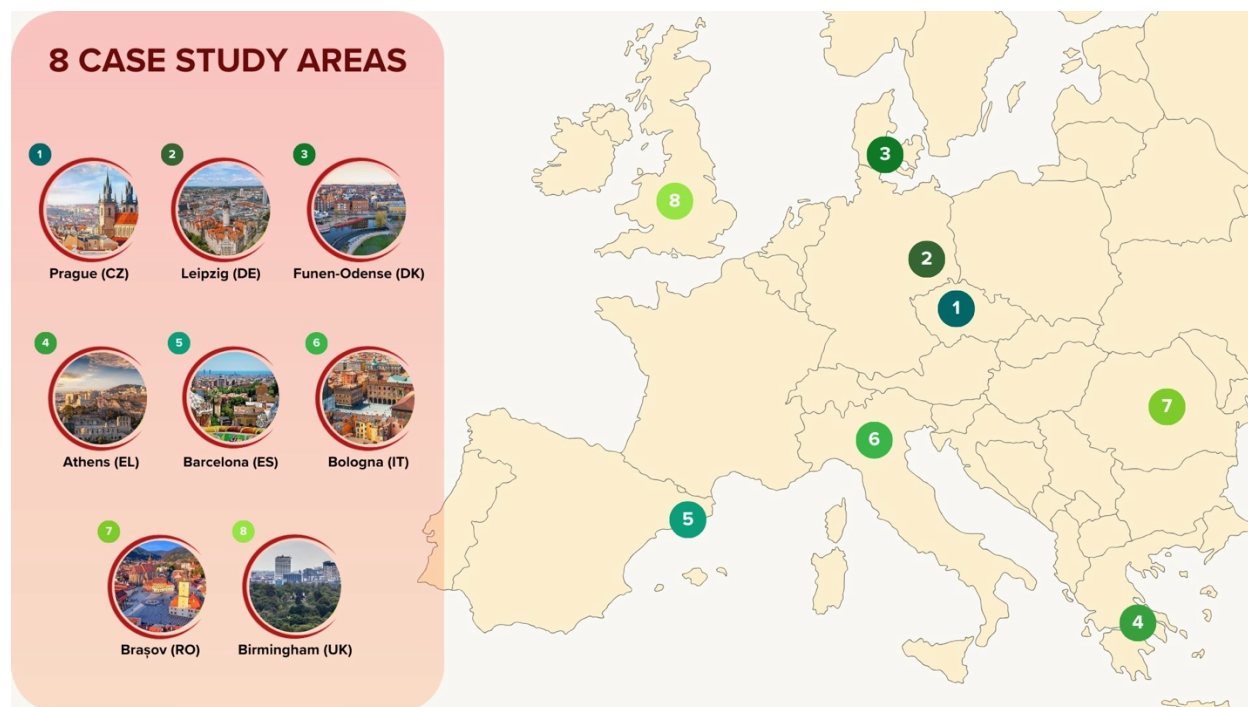


Figure 3: CARMINE 8 Case Study areas / LLs

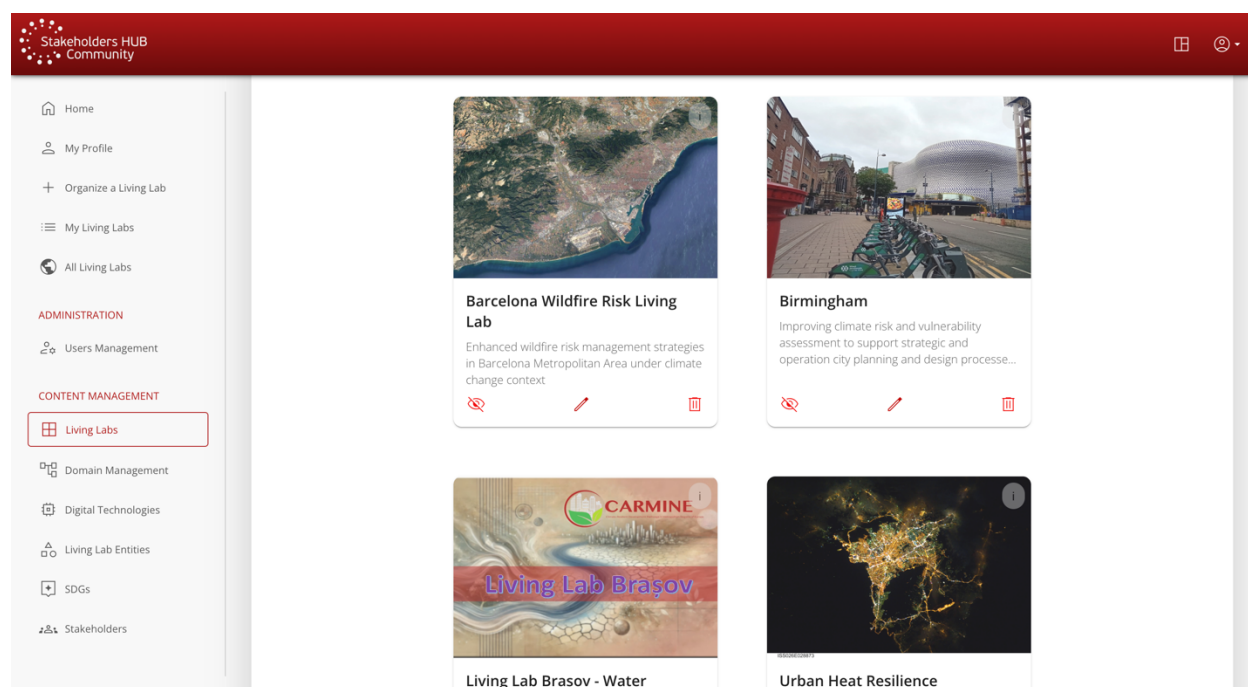


Figure 4: SC-HUB List of CARMINE Living Labs

3 Functionalities of the SC-HUB

The first version of the SC-HUB has been released with a set of core functional modules, some of them being mandatory while others are optional. For each LL, its organiser creates its digital instance including the mandatory modules and a selection of the optional ones.

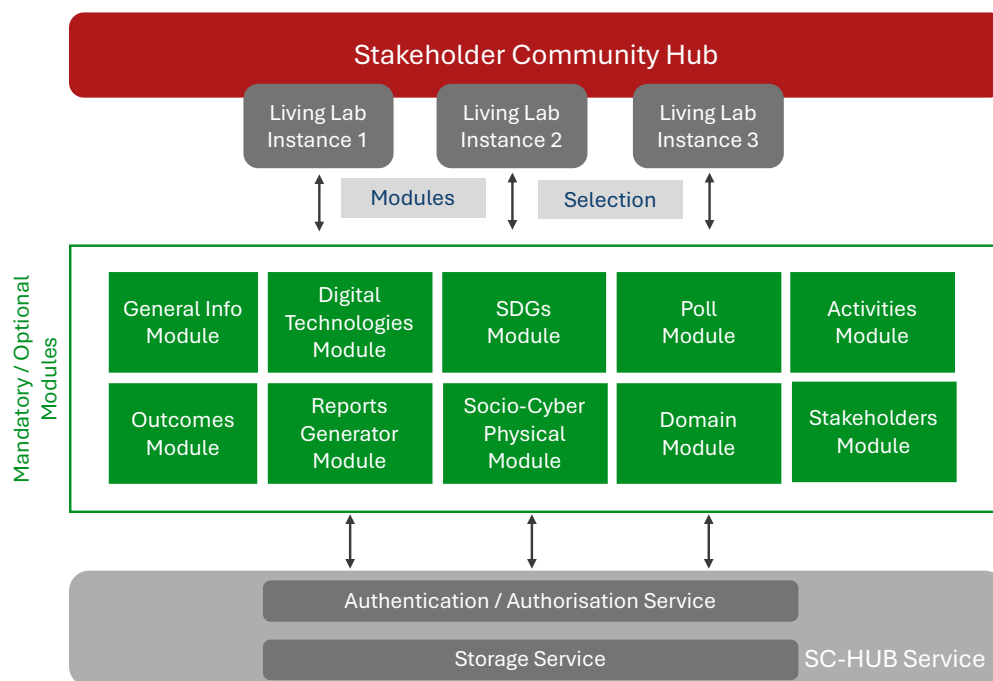


Figure 5: SC-HUB Block diagram & functional modules

The core functionality includes the following functional modules:

- Digital representation of a LL, by providing a set of general descriptive information: LL name, description, focal issue, location
- Stakeholders' list and attribute details
- LL activities and planning
- LL main outcomes
- Relevant Digital Technologies and SDGs
- Initiation of polls for stakeholders and members
- Modelling of the LL entities using the Socio-Cyber-Physical (SCP) approach
- Automatic report generation
- Users and membership management

As Figure 5 depicts, the SC-HUB tool includes the above core functional modules. A subset of the functionalities is mandatory for all LLs, but the rest are optional and the LL organizer selects the ones to enable for the specific instance. A common storage service lies at the bottom of the tool and based on the user's permissions and roles, different permissions are enabled.

The concept of mandatory and optional functional modules gives freedom to the organisers of each LL to decide which modules fit their work, since not all LLs have the same needs, while on

the other hand, the mandatory modules ensure that a minimal set of information is available for each LL.

Description of each functional module

The core functional modules of the SC-HUB are detailed below:

LL General Information

This module implements the basic descriptive information, mandatory for each LL. It includes its title, a more detailed description, the main focal question/problem statement and its location. This set of information has been selected based on the most important aspects, according to LL coordinators.

Stakeholders

The stakeholder mapping process is a crucial activity in the initial phases of a LL and impacts the success of its activities. This module supports the recording of the LL's stakeholders by providing a set of descriptive information together with a custom attributes list that is defined per LL and their categorisation as a main stakeholder, who is deeply involved in the operation and organisation of the LL, or as a contributor. The custom attributes provide flexibility and support the analysis of the stakeholders based on what it matters most for each LL. A common list of attributes can be used across the CARMINE LLs to enable the mapping of the stakeholders and their analysis. Additionally, bulk import of stakeholders' data is supported by uploading a CSV file following a specific scheme.

Activities

The activities module allows LLs to plan and keep track of their activities & events in a fine-grained manner. Exploiting this module, the LL organiser can make available in one place all the important information of a planned activity and ensure that all participants are informed before it takes place. In addition, the module supports the upload of the outcomes of each activity, thus ensuring that all the actions are recorded and made available.

Outcomes

It is already stated that LLs often fail to externalise their actions and outcomes, limiting their visibility and their potential to be extended outside their initial boundaries. Exploiting this module, a LL can make available all its outcomes, including descriptive information and files for each outcome, and present it in one place, easily accessible by anyone.

Digital Technologies

This module presents the Digital Technologies that are frequently used by LLs, based on the work conducted within the H2020 DESIRA project, to identify digital technologies that can be game changers [Bacco et al., 2020]. Each LL can select all that are relevant to its activities. This is important information for LLs, considering the contribution of digital technologies in the digital transformation and twin (green and digital) transition. This module can be extended to include additional Digital Technologies that are used by the LLs in a specific context.

Currently and for the CARMINE project this module refers to the following Digital Technologies: Digital Twin, Artificial Intelligence, Distributed Ledger (Blockchain), Local and remote sensing, Web-based technology, Social media and Social Networks, Data Analytics, Cloud/edge computing, Autonomous Systems and Robotics, Augmented Reality / Virtual Reality and 3D printing.

SDGs

The activities of a LL geared towards the achievement of the UN's Sustainable Development Goals (SDGs), this module enables the option of selecting the relevant SDGs of a LL and it also provides the option to describe the initial and the future impact, after completing the LL activities and producing its outcomes, the LL has on each SDG.

Poll

Enabling the interaction with the members of a LL, the module provides simple polls and open questions, enabling the collection of opinions on issues that are important for the LL and ensuring the fair participation of all its participants, facilitating their engagement and exchange of experiences. Polls support the co-design process of certain solutions.

Socio-Cyber-Physical System

A Social-Cyber-Physical System (SCP S) involves the interlinking of the cyber, physical, and social domains within a system-of-systems mindset. The SCP module supports the modelling of a system through the SCP approach by defining the distinct entities and their interactions [Metta et al., 2022]. This module offers a representation of the interlinkages between the systems. Similarly to the previous module, it provides useful information as part of the systemic approach to connect digital and physical entities for addressing a challenge in its entirety.

Reports Generator

This module auto-generates a report that includes all information related to the LL activities. This way, it improves efficiency in sharing among interested parties, facilitates knowledge exchange, saves time and effort when it comes to the documentation of activities and contributes to the sustainability of the LL work.

4 Upcoming Functionalities

The demonstration of the tool within the CARMINE consortium, which comprises 27 partner organisations and runs eight LLs as presented above, gave the opportunity to collect feedback on the existing functionalities and has driven the inclusion of additional ones. Upcoming functionalities of the tool have already been designed and are under development, aiming to support even more user engagement and interaction. The second release of the SC-HUB is planned to include the following functional modules:

Posts - Comments

A module that allows the members of a LL to submit a post and receive comments and reactions. Users can initiate a discussion by submitting a new post and interacting with the other members or submit read-only posts for informative posts.

Multilingual Support

This module will enable the support of multiple languages, making it easy to translate the tool in different, local languages, increasing the engagement of local stakeholders in the different LLs, and minimising the language barrier.

Material / File sharing

File sharing is an important functionality for a LL, as it facilitates the exchange of information among the participants. This module will allow the facilitators of a LL to upload and/or link any material/file with their members.

News

A news module is designed for the LL facilitators and supports publishing news items to the members of the LL, informing them about important activities and milestones.

These modules have been decided together with CARMINE LL facilitators during the WP1/WP6 regular meetings, where the initial version of the tool had been demonstrated, and the users had the opportunity to provide suggestions and request improvements.

5 Systemic Functionality

Besides the end-user functional modules, the tool has a set of systemic functionalities, which support its usage, operation and maintenance of it. These include:

Single Sign-on with external providers

External AAI authentication is enabled, allowing users to sign in to the tool with their existing accounts. Google and OpenAIRE's AAI (Authentication and Authorization Infrastructure) are the supported providers. OpenAIRE AAI enables user authentication with educational accounts (Edugain), Google, LinkedIn, Github and ORCID. For more information visit: <https://catalogue.openaire.eu/service/openaire.aai/overview>

Users' roles management

SC-HUB design incorporates the concept of roles, based on which, users are enabled with a specific set of permissions allowing them to manage, edit or view information. Two categories of roles exist: 1) Application roles and 2) LL membership roles.

1. Application roles

- a. Administrator: A user who can manage and configure the SC-HUB tool. The Administrator is able to deactivate and/or delete any existing LL.
- b. Living Lab Organiser: this role is assigned to any user after the initial login to the application. Users can create their own LL, and request to become members of other published LLs.

2. Living Lab membership roles

- a. Owner: The user who has initially created the LL. The only user that can delete an existing LL through the application.
- b. Living Lab Member: A Member of the LL can view existing information, participate in polls and view members' only content.
- c. Living Lab Facilitator: A user that has all the functionalities of a Member and can manage the content of the LL, including the upload of new information.
- d. Living Lab Administrator: A user with all the functionalities of a Facilitator and can manage (add or remove, manage requests) the users of a LL.

To manage the user roles, we utilize the necessary permissions on an App and Living Lab level that dictate if a user can view or modify a resource. We then synthesise these permissions into roles.

Entities Management

The SC-HUB manages a set of entities that are used by the LL instances. These entities can be moderated by the application's administrator and include: the stakeholders list, the entities used through the SCP functional modules, the list of Digital Technologies and SDGs. All mentioned entities can be managed and configured. Especially for the stakeholders list, the administrator can change the visibility of a specific stakeholder enabling the usage of the same entity across the different LLs.

Living Lab Visibility

Different statuses exist for each LL providing flexibility to its users to decide on who and when can access the available information. The following statuses exist:

- Published or / Unpublished: Initially the LL is unpublished and only its owner has access to the available information. When the owner publishes it, the members of the SC-HUB can see it as available in their dashboard and request to become members.
- Public: If the owner marks the LL as public, the LL becomes available/visible also to the tool's guest users (no account is required) and they can view its public information. This includes all available information, except the ones marked as accessible only by LL's members (activities, polls, etc).

Users Management

An administrative module for viewing and managing the application's user's basic data.

Living Labs Management

The application's administrator can manage all the available Living Labs and edit their information, temporarily deactivating them and/or deleting them. This functionality allows the administrator to moderate the provided content and avoid publishing inappropriate or abused content and data.

The tool provides information for each LL as provided by the LL owners and facilitators. ATHENA RC team, as the maintainer and administrator of it, is not responsible or liable for any false, inaccurate, inappropriate, or incomplete information presented herein. Users exploiting the tool, agree with the provided Terms of Use available at: <https://schub.carmine-project.eu/llm/#/llm/terms-of-use>

6 Feedback & Feature Request Process

The development of the SC-HUB follows an agile and iterative methodology, designed to support continuous co-design with the CARMINE Living Labs (LLs) throughout the entire lifecycle of the tool. User involvement is not limited to post-release feedback, but is systematically embedded in design, testing, validation, and prioritisation phases, ensuring that the platform evolves in close alignment with real LL needs and practices.

At the core of this approach is a structured feedback loop that combines regular coordination, hands-on user testing, and participatory co-design activities with relevant target groups (LL coordinators, facilitators, and stakeholders). Feedback is continuously collected, analysed, prioritised, and translated into concrete development actions within successive development sprints.

To operationalise this iterative process, three complementary feedback and co-design mechanisms are in place:

1. **Bi-weekly Living Lab Coordinators Meetings:** Bi-weekly meetings are held between LL facilitators, WP1 partners, and the SC-Hub product manager. These meetings function as a continuous user testing and validation forum, where:
 - Newly implemented functionalities are demonstrated and tested.
 - Feedback on usability, relevance, and clarity is systematically collected.
 - Upcoming features are discussed and refined before implementation.
 - Emerging needs, gaps, and change requests are jointly prioritised.

LL facilitators play a key role as *proxy users* and *co-design partners*, as they actively manage LL content within the tool and mediate interactions with the LL members and stakeholders. This ensures that feedback reflects both operational needs and stakeholder perspectives.

2. **Living Lab Workshops and Co-design Sessions:** The SC-HUB is fully integrated into the LL implementation plans and is actively used during LL workshops involving diverse stakeholder groups. These workshops serve as co-design and participatory testing environments, where:
 - The current version of the SC-HUB is demonstrated and used in real LL activities.

- A plan where users will interact directly with the tool in context-specific scenarios is established to take place in the feedback workshops to be held towards the end of 2026.
- Structured feedback is collected on workflows, functionalities, and missing features.
- New functional modules and improvements are co-designed collaboratively.

Insights from these sessions directly inform subsequent development cycles, ensuring that future releases reflect validated user needs and support long-term LL sustainability.

3. **Continuous Online Feedback and Feature Requests:** In parallel, the SC-HUB provides open and continuous feedback channels accessible to all users:

- A dedicated online feedback form allows users to report bugs, suggest new features, or provide general comments. Submissions are reviewed regularly and feed into the development backlog, with follow-up discussions with the reporting user is initiated when clarification or deeper user input is needed.
- A *Contact Us* page is also available for direct communication with the SC-HUB team: <https://schub.carmine-project.eu/llm/#/llm/contact>.

These mechanisms ensure that feedback can be provided at any time, complementing the more structured co-design activities. Together, these processes establish a closed-loop, user-driven development cycle, where feedback is continuously collected, validated with users, translated into development tasks, and re-evaluated in subsequent releases. This approach ensures that the SC-HUB remains responsive, user-centred, and co-designed, while progressively increasing its maturity, functionality, usability, and long-term impact beyond the project duration.

7 Uptake and Re-use of Living Lab Outputs

The SC-HUB is designed not only as a coordination and collaboration platform for Living Labs, but also as a mechanism to support the uptake, reuse, and scaling of Living Lab outputs by relevant organisations beyond the immediate LL borders. To this end, the tool provides structured access to LL results, processes, and insights in a way that makes them visible, understandable, and reusable by external stakeholders such as public authorities, practitioners, researchers, and other innovation actors.

Living Lab outputs (e.g. methodologies, use cases, results, lessons learned, and good practices) can be captured and made available through the SC-HUB using common templates, metadata and tagging mechanisms. This ensures consistency, comparability, and completeness of information across LLs, lowering barriers for external users to identify relevant outputs and assess their applicability to their own contexts. This information can be made available to external users without requesting them to become a member of the tool.

The modular structure of the SC-HUB further supports reuse by allowing outputs and produced material to be linked to:

- specific challenges or thematic areas.
- stakeholder groups and target users.
- implementation contexts.

This structured presentation enables organisations to identify relevant, transferable elements, understand enabling conditions, and adapt solutions.

In addition, the SC-HUB supports uptake through its interactive and community-oriented features, which allow interested organisations to:

- explore LL activities and results over time.
- engage with LL coordinators and contributors.
- initiate follow-up discussions or collaborations, by becoming members of the LL and interact with the existing members.

By combining structured documentation, transparency of processes, and opportunities for interaction, the SC-HUB acts as a bridge between LL's operational processes and wider adoption, supporting the long-term reuse and impact of LL outcomes.

8 Conclusion

Deliverable D1.8 provides detailed information about the available functionalities of the first version of the SC-HUB. It also presents additional functionalities that are already planned, based on the first round of feedback received through the CARMINE-internal evaluation process. As the deployment of the tool has just started and will continue throughout the LL activities, any additional features and functionalities will be decided, developed and released, based on the interaction with the CARMINE LLs.

Every release cycle will be accompanied by release notes, where the main updates and features will be listed, detailing the advancements compared to the previous version that is currently available through the following link: <https://schub.carmine-project.eu/llm/#/llm/about>

References

1. Akinsete, E., et al.: "D1.7 – Living Labs Creation in Case Studies, CARMINE Project", 2024, Public deliverable.
2. DESIRA H2020 project on Cordis, accessed 17 Feb 2024: <https://cordis.europa.eu/project/id/818194>
3. Bacco M., Brunori G., Ferrari A., Koltsida P. and Toli E., "IoT as a Digital Game Changer in Rural Areas: the DESIRA Conceptual Approach" 2020 Global Internet of Things Summit (GloTS), Dublin, Ireland, 2020, pp. 1-6, doi: 10.1109/GIOTS49054.2020.9119674.
4. Metta, M., Ciliberti, S., Obi, C., Bartolini, F., Klerkx, L., & Brunori, G. (2022). An integrated socio-cyber-physical system framework to assess responsible digitalisation in agriculture: A first application with Living Labs in Europe. *Agricultural Systems*, 203, 103533. <https://doi.org/10.1016/j.agsy.2022.103533>.