

# How to build consensus between multidisciplinary teams on methods and tools for co-designing interventions in the energy transition through Living Labs

*A review of the Living Lab Integrative Process methodology using a Delphi method based approach.*

## Authors

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## Abstract

Using appropriate methods and tools throughout the innovation process is essential to maximise resources and ensure success towards a sustainable energy transition. In the Lantern Project, interventions in the energy field will be developed through applying the Living Lab Integrative Process (LLIP) (Mastelic, 2019) using a range of participative, analytical, open innovation methods and tools. A review of these methods and tools using an adapted version of the Delphi method, to obtain consensus, will be undertaken. Insights from transitions labs, *Reallabore* and Living labs outside Lantern will be sought to build consensus on the methods and tools proposed. The research is expected to help identify differences in methodological approaches between researchers and practitioners, gain consensus on, and identify tensions as well as new approaches, methods and tools in the Swiss and EU research and practice communities.

## Key words

Living Lab Integrative Process (LLIP), Multidisciplinary, Delphi method, Consensus, Energy Transition



## Introduction

Living Labs have a significant potential to impact sustainability transitions through co-created quasi-experiments (Puerari et al., 2018) potentially leading to systemic change, particularly in urban environments (von Wirth et al, 2019; Fuenfschilling et al. 2019). Starting from highly contextualized, often spatially limited niche experiments trialing alternative socio-technical configurations and use practices (van Waes et al., 2021), change momentum can be built up towards transitioning incumbent socio-technical systems such as the energy, mobility or building systems (Geels, 2004). In order to achieve a sustainable, long-lasting effect on social practices, norms, and technical artefacts, as well as increased legitimacy and user acceptance, Mastelic (2019) proposes using participatory processes of co-design (Puerari et al., 2018), the quadruple helix (Carayannis and Rakhmatullin, 2014) and Open Innovation (Chesbrough, 2003). This is translated into the methodological framework known as the Living Lab Integrative Process (LLIP) (Mastelic, 2019), illustrated below, on which the Lantern consortium is based.

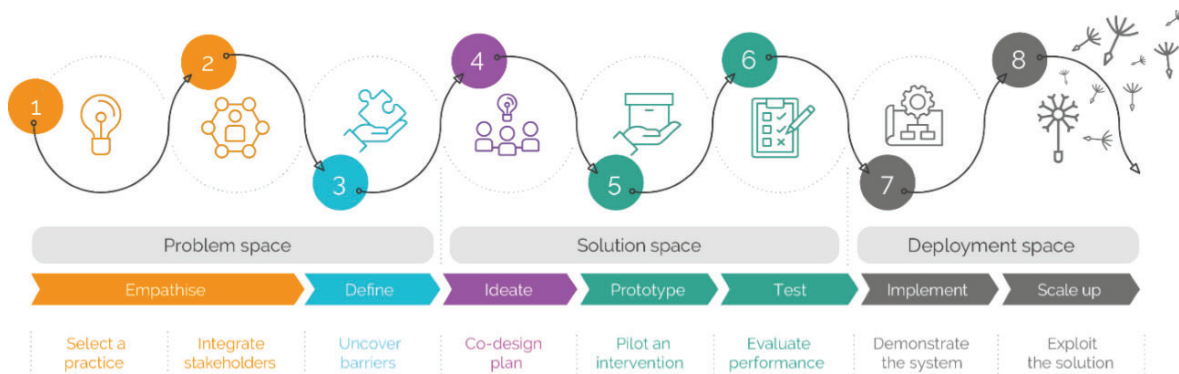


Figure 1. The Living Lab Integrative Process (LLIP) adapted from Mastelic 2019

The LLIP process is not linear and will evolve iteratively during the 8-year program as a meta-process nourished by learning feedback loops from experiments, methods, and tools developed in six different, topical and research-focused Work packages, five Urban Living Labs and one Pre-Living Lab. Urban Living Labs (ULL) are considered spaces to facilitate experimentation about sustainability solutions (von Wirth et al., 2019), and are located in a built-up and well-connected urban or suburban area. In Switzerland, urban and suburban are defined by the Federal Statistical Office (the first three categories (Agglomerationskerngemeinden / communes-centre d'agglomération)). A Pre-Living Lab is defined as a testbed, a platform for experimentation of large development projects.



Testbeds allow for rigorous, transparent and replicable testing of scientific theories, computational tools and new technologies (Mastelic, 2019). For the purposes of this research, it is defined as a controlled environment (not real-life), with users often represented by researchers mainly (a specific category of users, not the same level of energy literacy). Testbeds are seen as pre-Living Lab setting, with a smaller scale and level of analysis for example one building). Multidisciplinary teams from engineering, science, social science, humanities, and business will work together with public and private cooperation partners and citizens through the Living labs to develop and trial solution approaches for societal problems associated with the energy transition.

The research presented in this paper forms part of the Living Lab Interfaces for the Energy Transition (Lantern) project which aims to co-design, test, validate, and scale up a portfolio of novel, socio-technical interventions, for a user-empowered, low- carbon, resource-efficient and -sufficient Switzerland. The 8-year project (2022-2030), partially funded by the Swiss Federal Office of Energy (SFOE) and sixteen research partners, will be executed in form of applied research and development at the interface between markets, technology, policies, and society and provides an excellent opportunity for long term research into transdisciplinary change management using a Living Lab approach.

Within the project, four Living Labs and one Pre-Living lab in Switzerland will provide the setting and context for multi-stakeholder experimentation across six thematic areas including *Smart Energy Users*, *Energy at Work*, *Sustainable Mobility*, *Energy Communities and Cooperatives at District Level*, *Affordable & energy-efficient housing and retrofitting* and *Low Carbon Recreational Cities*. The labs are conceptualized and operationalized using a three-level perspective for Urban Living Labs (Schuurman, 2017):

- Macro level: governance of the ULL, focusing on organizational and stakeholder management challenges,
- Meso level: projects in ULLs,
- Micro level: methods and tools for interventions in ULL

The three-level perspective is also used for targeted support for Living Lab practitioners and managers, and researchers active in Living Labs, in the form of capacity building activities related to governance, stakeholder management, project implementation, methodological consideration and use of specific tools, implemented through an online



platform and a series of workshops.

The methodological approach presented in the remainder of this work is mainly concerned with the meso and micro levels, empirically focusing on Lantern work packages, potential spinoffs and continuation activities, and individual methods and tools implemented as part of the work package tasks and interventions. The main research objectives are as follows:

- To provide a comprehensive review of the proposed methods and tools by the Lantern Researchers at each step of the LLIP
- To obtain feedback from expert practitioners in Living Labs, transition and Reallabore on the methods and tools proposed
- To build consensus on the methods and tools using a Delphi method approach
- To identify new research methods and tools throughout the innovation lifecycle, to drive collaborative, user centered, open innovation and design thinking as well as scale-up methodologies and measures.

## Methodology

A systematic literature review (Tranfield et al., 2003) to study the conceptual genealogy of the theoretical frameworks preceding and contributing to Living Lab methodologies (i.e., *Reallabore*, *Sozialabore*, participative methodology, social marketing, sustainable transitions research, systems theory and particularly innovation systems, institutional theory...) with reference to energy transitions is currently being carried out. The keywords used in the searches included quantitative, experimentation, co-creation, Living Labs AND Transitions, institutional logics, practitioners, Co-creation methods, Design thinking Process, Co-Design methods, Living Lab methods, transdisciplinary, energy transition and consensus.

The strongly trans- and cross-disciplinary nature of the Lantern consortium with more than 60 researchers and 10 Living Lab Practitioners, as well as the heterogeneous backgrounds and research aims of the consortium’s members, led to a broad range of opinions and preferences on the tools to be used within the consortium work packages and in individual interventions. Initially, a review of methods and tools proposed at each step of the LLIP was undertaken and a matrix of tools was co-created.



The Delphi method was defined as an approach of choice for reviewing the Living Lab methods and tools in the Lantern proposal based on its flexibility of implementation together with a focus on consensus-gathering among expert practitioners. The method is based on the principle that forecasts (or decisions) from a structured group of individuals are more accurate than those from unstructured groups (Linstone and Turroff 1975; Okoli and Pawlowski, 2004). A high-quality delphi method identifies the most important issues of interest by engaging qualified experts. Our approach adds to the single-panel sample approach, often taken as standard in qualitative research (Okoli and Pawlowski, 2004), by engaging two expert panels representing distinctive and partially separate groups of knowledge: one panel consisting of research professionals engaged in the Lantern consortium as WP leaders and/or task leaders (12 members in total), and a second panel consisting of practitioners in Living Lab, Transition Lab and Reallabor settings (28 members in total). Selection criteria for the first panel were solely role-based, i.e. the individuals assigned the relevant role within the consortium were invited to join the panel, while the selection approach for the second panel used a combination of snowballing and self-assessment based on i) current engagement in a lab/experiment setting, ii) utilisation of participatory and design thinking methods and tools, iii) co-design and experimentation with (innovative) solutions and iv) experience, in a partner role, in at least one energy-related project. While overall the methodological approach is qualitative-dominant, the first panel (Researchers) is approached using predominantly qualitative methods in the form of semi-structured respectively structured interviews while the second panel (Practitioners) is approached using a mix of quantitative (preference scoring-based survey) and qualitative (focus group discussion also including members of the first panel) methods. The moment of analysis across the methodology is neither ex-ante nor ex-post.

In terms of sequencing, the approach consists of a series of distinctive steps, with the research team collecting, analysing and synthesising data in between each step and using them to inform the tools applied in the subsequent one. In this way, a quasi-dialogue is established between the two groups, followed by an on-site exchange in the final step. The following is an overview of the approach sequence:

- Preparatory Round (Round 0), April-May 2023: semi-structured interviews with members of the first panel (Researchers – Lantern WP leaders and task leaders)



- Delphi Round 1 – May 2023 – Quantitative questionnaire sent out to the second panel (Lantern Living Lab managers & External EU Practitioners (20))
- Delphi Round 2 – August 2023 – Structured interviews with members of the first panel (Researchers), based on questionnaire results
- Delphi Round 3 – September 2023 – On-site focus group discussion combining members of the first panel (Researchers) and selected members of the second panel (Lantern Living Lab managers & Practitioners)

In line with the Delphi method logic (Linstone and Turroff, 1975), a consensus position on the utilization of Living Lab methods along the Living Lab Integrative Process is sought following each step, with the core dialogue taking place between the two panels. The final round of the approach will lead to an inter-group consensus, representing the shared positions of both panels.

Following the delphi method a cascade approach will be applied to deep dive into the results and to explore further the competing institutional logics, and methods on barrier definition using semi-structured interviews with Practitioners outside Lantern project. This will form part of a separate research paper.

## Conclusion

Other than the direct benefits for the Lantern project in undertaking this comprehensive review of methods and tools and the application of the Delphi method in building consensus, the research has relevance for the wider Living Lab Community by bringing the energy and environmental practitioners together with scholars working in these areas. By identifying common grounds as well as potential conflict areas, further collaboration as well as methodological co-creation will be enhanced.

There are several European projects currently working in the energy sector (oPEN Lab, SCORE, DomOS, 2ISECAP) where the LLIP is now being used to solve the wicked problems associated with the energy transition. Comparisons of methods and tools by Practitioners applied in the projects as well as their impacts will help to determine the effectiveness of the application of the LLIP methodology, as well as for scale up of social and technological innovations.

Given the urgency and importance of the energy and climate crises, many Living Labs





across Europe are diversifying to solve these problems and will greatly benefit from this research because it provides a practical demonstration of what methods and tools are applicable at what stage of the innovation process and in an energy context and how to use the delphi method to build consensus amongst a variety of actors with dynamic capabilities and competencies. Indeed, the approach is expected to reveal tensions when opening up the research proposals for feedback while also contributing to better participation in the long term, and sharing of new tools and approaches between the Living Lab, Transdisciplinary and Reallabore Communities. The methodological approach will later be expanded out to review methods and tools through the lens of learning theories and knowledge frameworks.



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