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A Living Lab-inspired Double Diamond approach to co-creating cross-border rural digital policy

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This article explores the development of a cross-border rural digital policy using a Living Lab inspired Double Diamond approach in the Muodoslompolo (Sweden) and Muonio (Finland) region. The study combines participatory, speculative, and critical design methods with structured stakeholder engagement through the PentaHelix model. Empirical data were collected through an interdisciplinary researcher workshop, a field visit involving interviews and a focus group with local residents, and a semi-structured focus group with seven international Living Lab practitioners conducted at the Open Living Lab Days 2025 conference. The research process followed the four phases of the Double Diamond model: Discover, Define, Develop, and Deliver. The findings highlight the importance of trust-based facilitation, informal communication practices, and institutional learning in co-creating policy in rural settings. A draft policy framework was produced, including a prioritization matrix aligned with relevant Sustainable Development Goals (SDGs), thematic policy domains, and a set of participatory working methods. The study contributes to Living Lab literature by demonstrating the application of LL principles in rural, cross-border policy contexts and offers a transferable methodology for inclusive digital policy development in underrepresented regions.

KEYWORDS

digital, Double Diamond, living lab, PentaHelix, policy, rural

1 Introduction

Rural areas are often marginalized in digital transformation agendas due to infrastructural gaps, demographic decline, limited institutional capacity (Roberts et al., 2017), as well as a lack of awareness and knowledge about the specific circumstances of rural villages (Pfaffl, 2019). These challenges are further exacerbated in cross-border regions, where national-level governance structures, administrative systems, and digital service provision often diverge. As a result, rural communities situated along borders face a dual disadvantage: their needs are underrepresented in national policy frameworks, and they encounter additional friction when attempting to collaborate across territorial lines. The area around Muodoslompolo in northern Sweden and Muonio in Finland represents such a context, where shared cultural, environmental, and economic characteristics are not matched by integrated digital policy or infrastructure.

While national and European strategies for rural digitalisation exist, they are frequently implemented through top-down mechanisms that do not sufficiently consider the complexity of place-based realities or the diversity of rural experiences (Lindberg, 2024; Pfaffl, 2019). In response, there is a growing body of literature advocating for more inclusive, participatory, and context-sensitive approaches to rural innovation and policymaking (Habibipour et al., 2021; Cognetti and Maranghi, 2023).

Living Labs (LLs) have emerged as a promising framework for addressing this gap. Traditionally used to support user-driven innovation in urban and technological contexts (Schuurman, 2015; Ståhlbröst, 2012), LLs have increasingly been adapted for rural environments, where they offer opportunities for empowering local actors, facilitating co-creation, and bridging institutional divides.

At the same time, the application of LLs to policy development remains underexplored, particularly in rural and cross-border settings. Existing LL literature has largely focused on service and product innovation, while policy-related outcomes have often been secondary or emergent (Veckman and Temmerman, 2021). Moreover, most studies have taken place in urban or metropolitan environments, where institutional coordination and stakeholder access are significantly different from those in sparsely populated rural areas (Rizzo et al., 2021). This article contributes to this emerging area by examining how LL principles can be operationalised in a structured policy development process, using the Double Diamond model (Kochanowska et al., 2022) as a guiding design framework. The main principles guiding LLs can be summarized as follows: (1) early and continuous stakeholder engagement, (2) value co-creation, (3) openness and transparency, (4) iterative processes, (5) real-life experimentation, (6) distributed decision-making, and (7) social inclusivity (Bagalkot, 2009; Habibipour, 2024; Leminen et al., 2012; Leminen and Westerlund, 2012; Schuurman, 2015; Ståhlbröst, 2012). The Double Diamond provides a staged approach to problem exploration and solution development, allowing for iterative synthesis of insights across four phases: Discover, Define, Develop, and Deliver. Integrating this design logic with the participatory ethos of Living Labs enables the co-creation of digital policy that is both structured and adaptive to local conditions.

The study builds on empirical work conducted in the Muodoslompolo–Muonio area and combines community-based data collection with interdisciplinary research collaboration and international practitioner reflection. The study draws on participatory, speculative, and critical design methods such as cultural probes, design fiction, and scenario-based workshops, and engages stakeholders across the PentaHelix model, including public authorities, private actors, academia, civil society, and environmental stakeholders. It is guided by two research questions:

- RQ1: How can Living Lab principles be applied in the co-creation of digital policy in rural settings?
- RQ2: How do spatial scale and rural characteristics shape the implementation of Living Lab processes in policy development?

By responding to these questions, the study aims to generate both theoretical and practical insights for the development of

inclusive rural digital policy. It advances understanding of how design methodologies and co-creation practices can be used not only to inform policy content but also to reshape policy processes in a way that reflects rural realities and fosters cross-border collaboration.

The main contribution of this article is a structured and transferable way to organize and facilitate rural cross-border digital policy co-creation by integrating Living Lab principles with the Double Diamond process, illustrated through the Muodoslompolo–Muonio case and resulting in a draft policy framework and practical facilitation materials. The main contribution of this article is a structured and transferable way to organize and facilitate rural cross-border digital policy co-creation by integrating Living Lab principles with the Double Diamond process, rather than presenting a finalized policy outcome.

The article is structured as follows. Sec. 2 reviews relevant literature on rural Living Labs, participatory digital policy development, and the Double Diamond model. Sec. 3 outlines the conceptual framework and methodological approach used in the study. Sec. 4 presents the empirical findings across the four phases of the Double Diamond process. Sec. 5 discusses the results in relation to existing literature, followed by Sec. 6, which concludes the article with reflections on its scientific contributions, practical implications, limitations, and directions for future research.

1.1 Previous research

Urban Living Labs (ULLs) is a promising but underdeveloped tool for addressing challenges in deprived urban contexts. This article focuses on a shift moving from technologically driven Living Labs to socially oriented ULLs that prioritize empowerment and local capacity-building (Cognetti and Maranghi, 2023). Empowerment, inclusivity, and local leadership are central elements in the rural Living Lab approach used to enhance digital services and strengthen rural retail, aiming to improve the quality of life in villages (Lindberg, 2024).

ULLs have the potential to influence policy by making local, often overlooked, competencies visible. This shift helps transform how residents are perceived; from being passive “targets” of interventions to active “agents” in policymaking (Cognetti and Maranghi, 2023). A similar dynamic is evident in rural development, where women often engage through unofficial networks beyond formal organizations, challenging and reshaping traditional boundaries between public, and private roles (Arora-Jonsson, 2017). This form of grassroots participation is often described as self-organization, where citizens take the initiative to drive change in their communities (Edelenbos and van Meerkerk, 2016). In a rural Living Labs in northern Sweden, the implementation of digital services has further supported this by opening new spaces for participation and promoting a relational view of competence (Lindberg, 2024). By engaging in small-scale, robust LLs, like in the SoHoLab and Digiby projects, LLs have provided evidence-based micro-interventions that can feed into broader policy agendas (Cognetti and Maranghi, 2023; Lindberg, 2024; Lindberg et al., 2025).

From a policymaker's perspective, it is important to create opportunities for direct interaction with residents. One effective method is to establish local "pop-up venues" in villages, which can help reach individuals outside established networks (Lindberg et al., 2024). These interactions should follow a LL approach, prioritizing listening and co-exploration over predefined solutions. The goal is to act as a facilitator; supporting residents and organizations in voicing their perspectives and contributing meaningfully to policy development (Lindberg, 2024).

This study aims to contribute to the LL literature by emphasizing the importance of acknowledging intra-rural diversity when designing participatory digital policy processes. While ULLs have been reframed as tools for empowerment and decentralized governance, RLLs introduce specific conditions related to distance, limited resources, and tight-knit social structures. By focusing on the interaction between rural centers and villages in a cross-border context, the study demonstrates how RLLs can support place-based innovation, strengthen local capacity, and tailor digital policy to the realities of rural life.

1.2 Conceptual framework

This study is conceptually grounded in participation and inclusivity in rural policy-making, with particular attention to cross-border contexts where trust, language, institutional arrangements, and distance shape who can participate and how. We treat participation as a means of incorporating situated knowledge and enabling local ownership, while inclusivity concerns who is represented and whose needs and values are made visible in the process and outcomes. These concepts are central for understanding how policy co-creation can be organized in rural cross-border settings.

In the RLL approach explored in this study, we have the following commitments. We see the local participants possessing invaluable expertise of their local conditions that should be utilized in the design of digital policies affecting their lives. We see their participation as their right and a necessary condition for high quality outcomes. We see digital policy making as a complex power—laden endeavor requiring multiple types of expertise, which is not possessed by one party only, but negotiation, translation and co-creation among various participants and types of expertise is needed (Väyrynen et al., 2025). By relying on participatory speculative and critical design, we work toward empowerment of local participants in policy processes by inviting them into (1) critical exploration and reflection of the current realities, (2) collective dreaming of desirable (digital) futures, and (3) collective action taking toward that direction (see e.g., Iivari et al., 2024a,b).

1.3 Context

The surrounding region of Muonio and Muodoslompolo present a distinctive interplay of natural landscapes, cultural heritage, and cross-border cooperation. Muodoslompolo is a small village with a population of around 70 residents in the

municipality of Pajala, situated approximately 110 kms north of the municipality's central town. The village hosts a privately owned grocery store, and the local school, although closed in the early 2,000s, still remains as a physical landmark. On the Finnish side of the border, the municipality of Muonio has approximately 2,430 inhabitants and offers well-developed community services, including schools, shops, and hotels. Muonio's economy is largely oriented toward tourism, with popular activities such as dog sledging, snowmobiling, reindeer safaris, and winter fishing. The Muonio Mountain area is particularly notable for its extensive ski and snowmobile infrastructure. Concession-based reindeer herding is a vital aspect of both the region's cultural identity and its economic activity. The area lies between two core reindeer herding zones and is intersected by traditional migration routes used by reindeer.

A diverse mix of developed land and natural forests characterizes the local landscape. Architectural traditions in the Tornedalen region include enclosed farmyards dating from the 1920's to the 1940's, reflecting a historically significant rural built environment. The region's waterways are important sites for transport, fishing, and outdoor recreation, as well as a focus for nature restoration. The lakes in this region form part of the Torne River catchment area, designated as a Natura 2,000 site due to its high ecological and good chemical status.

2 Research methodology

This study uses an exploratory co-creation process structured by the Double Diamond design model (Kochanowska et al., 2022) and informed by Living Lab principles (Habibipour et al., 2021; Ståhlbröst, 2012) and participatory, speculative, and critical design (e.g., Bardzell and Bardzell, 2013; Dunne and Raby, 2013; Ventä-Olkkonen et al., 2021). In this article, participatory approaches refer to research and design strategies that actively involve those affected by the policy as co-creators throughout problem framing, ideation, and evaluation. The purpose is to surface situated knowledge, share influence over decisions, and support empowerment and local ownership of both process and outcomes. We operationalise this through community interviews and focus groups, stakeholder engagement activities, and iterative workshop-based reflection (Bannon et al., 2018; Bergvall-Kåreborn and Ståhlbröst, 2008). The aim is to support the development of a cross-border digital policy tailored to the rural realities of the Muodoslompolo (Sweden) and Muonio (Finland) region. The Double Diamond model, with its four phases, namely Discover, Define, Develop, and Deliver, offers a structured yet flexible process. The LL principles bring focus to collaboration, real-life context, iteration, and inclusiveness. In this study, iteration refers to repeated cycles of (1) collecting input, (2) synthesizing it into draft outputs such as policy structure, thematic domains, and facilitation materials, and (3) revising these outputs based on feedback from stakeholders and researchers. While the Double Diamond supports iteration through alternating divergence and convergence within and between phases, the Living Lab perspective emphasizes iteration as continuous learning and refinement through stakeholder engagement over time. Based on the interdisciplinary workshop and prior research in participatory, speculative, and critical design, we selected a toolbox

of methods including cultural probes, personas and scenarios, miracle discussions, design fiction workshops, and drama- and activism-based methods (see e.g., Iivari et al., 2024a,b, 2023; Sebastian et al., 2024; Sharma et al., 2023; Ventä-Olkkonen et al., 2021, 2025). These methods were chosen because they help elicit participants' current lived realities and support structured reflection on alternative and desirable futures, which fits the study's participatory and futures-oriented policy work.

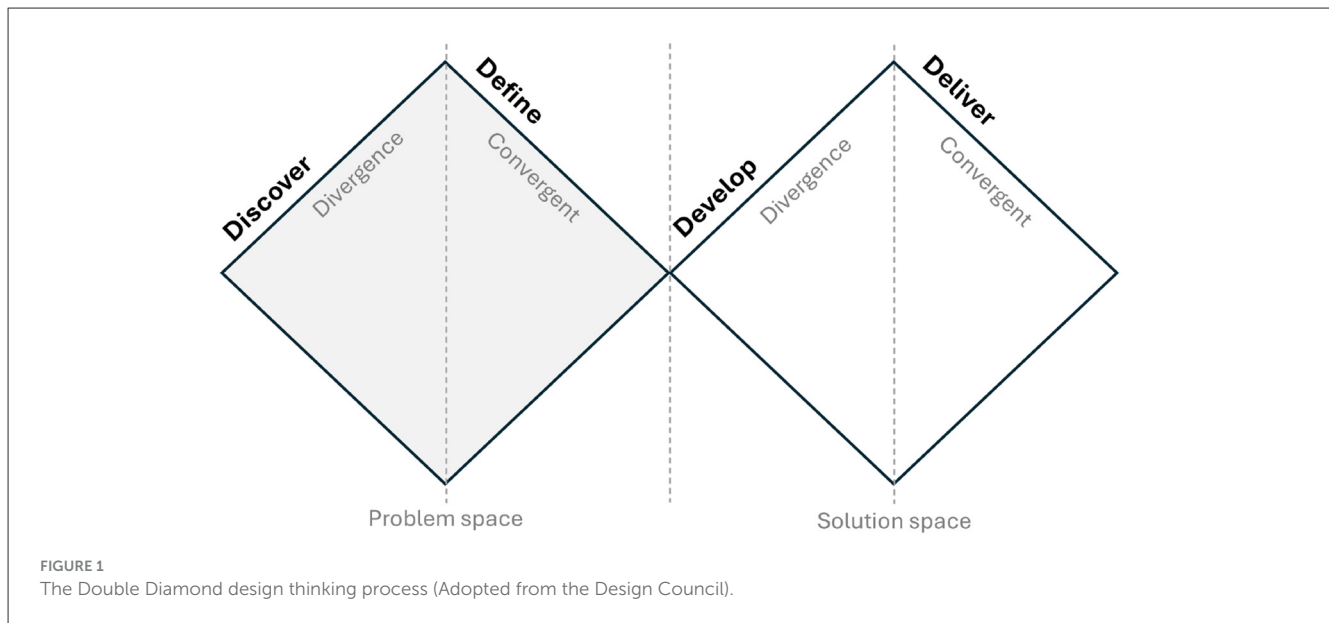
The Double Diamond model, developed by the UK Design Council, provides a four-phase structure that is widely used in design and innovation. These phases are called Discover, Define, Develop, and Deliver which facilitate both divergent and convergent thinking (Kochanowska et al., 2022). In this context, divergent thinking refers to opening up the problem space by exploring multiple perspectives, needs, and possibilities. Convergent thinking refers to narrowing and prioritizing insights to define a shared focus and decide on directions for action. See Figure 1. In this project, the model serves as the overarching structure for designing and implementing a digital policy that emerges from community-identified needs and is refined through collaborative prototyping and feedback. Here, collaborative prototyping refers to jointly developing and iteratively refining draft policy artifacts such as the policy structure, prioritization matrix, thematic domains, and facilitation materials, together with stakeholders and researchers. To support this design structure to a higher level, the study applies the LL approach as conceptualized in recent research on rural innovation ecosystems (Bergvall-Kareborn et al., 2009; Habibipour et al., 2021). The research study integrates seven foundational elements to operationalize the LL approach: early and continuous stakeholder engagement, value co-creation, openness and transparency, iterative processes, real-life experimentation, distributed decision-making, and social inclusivity (Bagalkot, 2009; Habibipour, 2024; Leminen et al., 2012; Leminen and Westerlund, 2012; Schuurman, 2015; Ståhlbröst, 2012). In this study, value co-creation was implemented by jointly defining policy priorities and co-developing draft policy artifacts with stakeholders during workshops and validation discussions, then revising these artifacts based on participant feedback across iterations. To ensure broad and balanced participation throughout all phases of the policy development process, the research study employs the Penta-Helix model, which engages stakeholders from academia, government, industry, civil society, and non-governmental organizations (NGOs). We applied PentaHelix across all four Double Diamond phases as an engagement lens, first to identify and recruit a balanced set of stakeholders for interviews and focus groups, and later to plan who should be involved in later co-creation activities. In practice, this meant mapping relevant actors in each helix and using that map to check representation and avoid over-relying on a single sector.

We will augment the RLL approach by integrating insights from participatory, speculative, and critical design traditions (see, e.g., Bardzell and Bardzell, 2013; Dunne and Raby, 2013; Iivari et al., 2024a,b; Sharma et al., 2021; Ventä-Olkkonen et al., 2021). Speculative and critical design, developed within Design Research tradition, are specific in their approach toward design as critique and in their strong futures orientation. Such design approaches

wish to criticize and question the status quo, to introduce alternative values to mainstream design, to provoke, to explore ethical issues, or to raise awareness and debate (e.g., Bardzell and Bardzell, 2013; Dunne and Raby, 2013). Critical design may be geared at exploring the current problematic conditions made visible through design, or it may be a highly activist endeavor working toward social or political change (Iivari et al., 2022). It should refrain from importing external normative frameworks. Contemporary neoliberal logic tends to fragment society into isolated sectors, in contrast to the understanding of society as an integrated whole. Accordingly, the values and desirable futures that guided the draft policy artifacts were articulated by participants through the participatory and speculative activities, rather than being pre-defined by the researchers. The foundation of critique must be grounded in people's everyday lived realities. When social structures systematically constrain individuals' capacity to realize their own conceptions of a good life, the conditions for critique are firmly established (Rosa, 2013; ?). Speculative design is heavily geared at raising speculation, exploration, and debate on (desirable, probable, plausible, possible, impossible, digital) futures, which can be used to stimulate action to shape the future but also it may also act as a valuable critique and commentary of the present (Dunne and Raby, 2013).

As a first step, an interdisciplinary workshop was held with four researchers from Luleå University of Technology and six from the University of Oulu. Workshops as a research method are intended to be both practice-oriented and analytically robust, balancing the participants' own motivations with the generation of valid insights into the topic being explored. Participants are encouraged to take an active role in guiding the process, while conversations are organized around clearly defined objectives that remain open to adaptation (Ørngreen and Levinsen, 2017). The purpose was to shape the structure of the policy co-creation process. The workshop outlined preliminary ideas on which stakeholders might be involved, what methods could be relevant in each Double Diamond phase, and how to link these to concrete, manageable actions. Discussions focused on identifying opportunities for stakeholder engagement, mapping challenges in the rural policy context, and exploring how LL principles could be meaningfully applied within a limited and localized project. For example, the workshop produced shared criteria for inclusive engagement and an initial plan for how local actors would contribute to and validate successive versions of the policy artifacts. The emphasis was on staying grounded in the realities of a small-scale initiative, where flexibility, responsiveness, and simplicity are key. The workshop lasted 4 H and included a preliminary evaluation of the study's alignment with the United Nations Sustainable Development Goals (SDGs).

In addition, a recorded, semi-structured focus group was conducted during the Open Living Lab Days (OLLD) 2025 conference in Andorra. The session lasted approximately 90 min and included seven participants from six different countries: Greece, Finland, Denmark, Italy, Sweden, and Romania. All participants were actively involved in Living Lab initiatives related to rural development, digital innovation, or local policy work. The focus group was structured according to the four phases of the Double Diamond process: Discover, Define, Develop, and



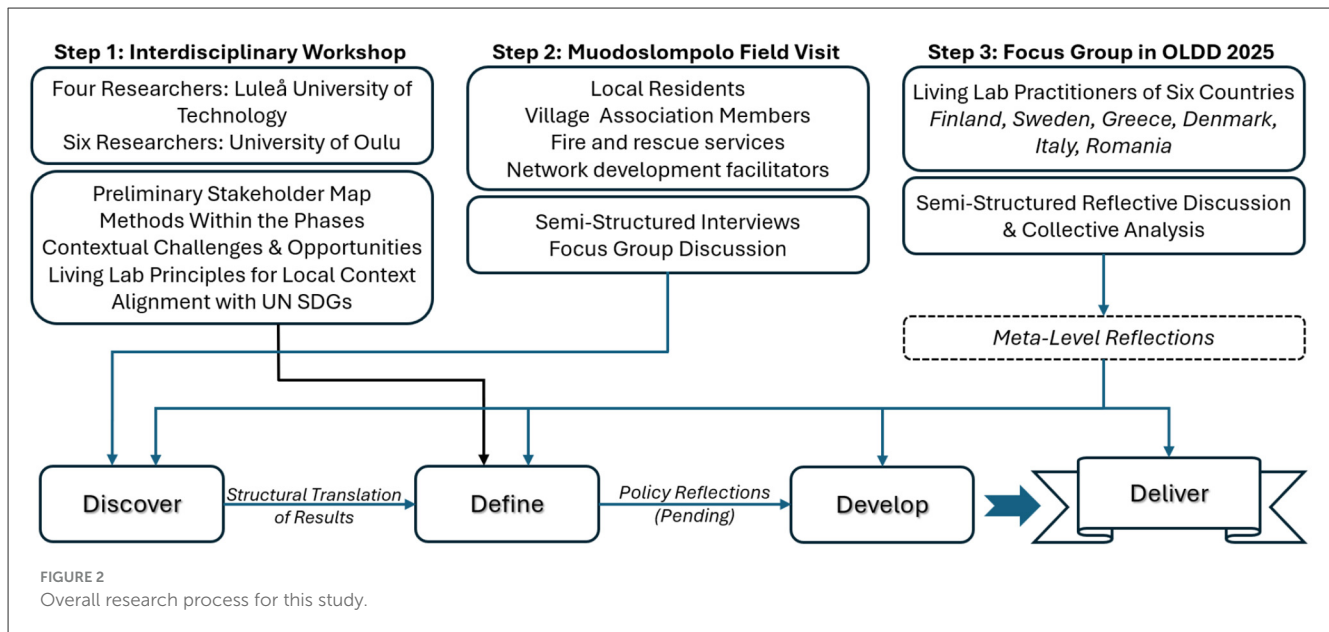
Deliver. For each phase, participants were asked a series of open-ended questions, including who should be engaged, what actions are needed, what methods might be suitable, and what potential barriers could arise. The session followed a semi-structured format designed to encourage reflective discussion and collective analysis, in line with the LL principles of openness, participation, and iterative learning. The focus group served as both a source of empirical data and a meta-level reflection on the application of participatory and design-oriented approaches in rural policy-making. Participants provided verbal consent to be recorded, and participation was voluntary. Ethical considerations, including anonymity and the right to withdraw, were observed throughout the process.

The idea of developing a cross-border digital policy originated from the village association in Muodoslompola, with whom we have long-standing collaboration from previous projects. The association has repeatedly emphasized the need for improved cooperation across the national border, particularly among local businesses. Following the workshop in Oulu, which established the foundation for our Living Lab-based policy work using the Double Diamond approach, students from the course IT Design from a Systems Perspective were engaged to design a digital solution to enhance cross-border business collaboration. They conducted interviews with the chair of the Muodoslompola village association and the director of the Leader region Lappi Tunturi, and from these insights, developed system models illustrating how communication between companies in both countries could be strengthened.

As part of the initial fieldwork, a 2-day visit to Muodoslompola and Muonio was conducted, during which one semi-structured interview and one focus group with seven villagers, including members of the village association, were held. Prior to the visit to Muodoslompola, we conducted an in-depth interview with two regional politicians based in Haparanda who had shown particular interest in cross-border healthcare issues. Following the visit to Muodoslompola, we continued with a series of interviews in Muonio, including discussions with Finland's coordinator for rural

healthcare, the director of the Leader Tunturi Lappi, and the head of the Muonio fire and rescue service, covering emergency response and local preparedness. These conversations offered valuable local insights and helped contextualize the findings from the OLLD focus group. The discussions highlighted several cross-border concerns, including dental and healthcare, elderly care, schools, and education, environmental issues (particularly water), art and culture, and business collaboration. These early insights informed the design of subsequent activities and helped define the focus of future co-creation workshops involving stakeholders from both sides of the border. Figure 2 shows the research process for this study. Figure 2 should be read as an adapted and iterative use of the Double Diamond. Step 1 represents an initial scoping and planning activity that was necessary to organize the subsequent fieldwork and stakeholder engagement, including a provisional framing of the policy problem and the selection of methods. The Discover phase then provided empirical grounding through interviews and focus groups, and this material was subsequently used to refine and re-define the policy focus in the Define phase. In other words, the process included an initial provisional definition that enabled discovery work, followed by a more substantively grounded definition based on the collected material.

Data from the interviews and focus groups were transcribed and analyzed using thematic analysis with an inductive approach (Braun and Clarke, 2006). Here, 'inductive' means that codes and themes were developed from the empirical material rather than being based on a pre-defined coding framework or *a priori* categories. The analysis began with repeated readings of the transcripts to gain familiarity with the material. Initial codes were generated based on recurrent words, phrases, and ideas emerging from participants' reflections, such as trust-building, communication practices, and challenges in engaging municipalities. These codes were then refined and organized into preliminary themes that represent shared experiences and methodological insights across both practitioner and community perspectives. Key themes included the importance of local



facilitation practices, stakeholder engagement strategies, and perceived barriers to co-creation in rural contexts. The OLLD focus group provided broader, cross-contextual reflections on methodological adaptation, while the Muodoslompolo data illustrated local, place-specific needs. For example, practitioners from six countries emphasized low-barrier, trust-based engagement (for instance visiting stakeholders in person and using informal meeting formats), and they also warned that without explicit attention to continuity and institutional learning, co-creation processes risk producing recommendations that remain difficult to implement beyond short-term funding. Although the dataset is limited, the thematic analysis generated early patterns and concepts that now inform the ongoing design of stakeholder workshops and the evolving cross-border digital policy framework.

3 Results

This section presents the findings of the study, structured according to the four phases of the Double Diamond model: Discover, Define, Develop, and Deliver. The analysis is based on empirical material from four sources: a planning workshop with researchers from Luleå University of Technology and the University of Oulu; student project work involving two semi-structured interviews; a field visit to Muodoslompolo and Muonio including five semi-structured interviews and a focus group with residents; and a recorded focus group with seven international Living Lab practitioners held at the Open Living Lab Days (OLLD) 2025 conference.

The interview and focus group transcripts were coded inductively using thematic analysis, and the resulting themes were then organized according to the Double Diamond phases to make the logic of the process explicit. In practice, themes related to needs, barriers, and local conditions were reported under Discover; themes related to prioritization and the narrowing of policy focus were reported under Define; themes related to translating priorities

into draft policy elements and working methods were reported under Develop; and themes related to validation, refinement, and early implementation considerations were reported under Deliver.

3.1 Discover

The Discover phase focused on identifying local needs and cross-border challenges in the Muodoslompolo–Muonio region. During the field visit, participants in the interviews and the focus group described recurring concerns related to limited access to dental and healthcare services, gaps in elderly care, and the consequences of school closures. Environmental regulation, particularly the absence of rules governing the tributaries of the transboundary Torne River, was also highlighted. As one interviewee remarked, “without tributaries, we don’t have a border river.” Participants expressed a strong interest in strengthening cultural activities and supporting small businesses through digital tools. When one interviewee on the Finnish side was shown the student project work, she exclaimed, “This is like music to my ears!”. However, language barriers, policy fragmentation, a too-narrow focus, and weak infrastructure were seen as obstacles to cross-border cooperation. Discussions on infrastructure collaboration have progressed through meetings with Leader organizations on both the Finnish and Swedish sides.

One resident described a medical emergency where a Finnish ambulance arrived but could not transport the patient across the border to the nearest hospital. The participant stated, “The ambulance from Finland came but wasn’t allowed to take him. He had to wait 2H for the Swedish one. That’s why he had such a long rehab.” This example illustrates how administrative boundaries and service regulations undermine practical solutions in rural border regions.

Further perspectives from the same region highlight how cross-border emergency cooperation operates in practice. An interview conducted with a representative of the fire and

emergency services indicated that collaboration between the Finnish and Swedish rescue systems is well established and generally functions effectively. Each country maintains its own authority radio network, such as Finland's *Virve* and Sweden's *Rakel*, but these systems can be interconnected through shared communication channels. According to the interviewee, these interoperable systems have been tested and confirmed to work, providing a reliable digital foundation for joint operations when incidents occur near the border. Operational collaboration is formalized through agreements that specify how assistance is provided when one country's units are geographically closer to an incident. This arrangement is particularly evident in the Tornio–Haparanda area and extends northward through Muonio–Pajala and Enontekiö–Kiruna, with earlier examples of shared equipment and cross-staffing, such as Swedish firefighters operating on the Finnish side.

The interview also pointed to communication challenges in this cross-border digital context. In certain areas, mobile devices may automatically connect to the Swedish network when its signal is stronger, particularly if automatic network selection is enabled. When this occurs, emergency calls to 112 may be routed to Swedish emergency centers rather than Finnish ones, which can lead to language barriers and other complications. The interviewee noted that such incidents have even occurred by accident. While residents in the border region are generally aware of this issue, tourists are less likely to recognize the implications of network switching. The interviewee described this situation as both a problem and an opportunity: when Finnish coverage is weak, connection to the Swedish or Norwegian network can still provide access to emergency communication. Nevertheless, the potential for misrouted calls emphasizes the need for clear public information and continued development of cross-border coordination protocols to address such complications.

Insights from the OLLD focus group reinforced these observations. The group consisted of seven practitioners and researchers from Greece, Finland, Denmark, Italy, Sweden, and Romania, all involved in Living Lab projects in rural contexts. Participants emphasized the importance of face-to-face engagement and informal facilitation methods. One participant explained, “We call ourselves the professional coffee drinkers... we go out and meet the farmers, the startups, the politicians.” Another added, “We were thinking to hire a car and literally go farm by farm... because that's the only way. You have to go there, sit in the café, gather them, and talk to them.” These accounts reflect a shared understanding that rural innovation begins with personal connection and local knowledge.

Findings from this phase were synthesized through PentaHelix stakeholder mapping and aligned with relevant Sustainable Development Goals (SDGs), including SDGs 4, 8, 10, 11, and 17. We applied PentaHelix across all four Double Diamond phases as an engagement lens, first to identify and recruit a balanced set of stakeholders for interviews and focus groups, and later to plan who should be involved in later co-creation activities. In practice, this meant mapping relevant actors in each helix and using that map to check representation and avoid over-relying on a single sector. In this workshop, we relate to the SDGs so that the overall policy reflects the goals as a whole, rather than aligning each thematic

domain with every goal. At the same time, each thematic domain maintains a critically reflective stance toward all the SDGs.

Overall, these practitioner accounts point to a consistent finding: in rural cross-border settings, participation depends on locally embedded facilitation and face-to-face outreach rather than platform-centered engagement. Based on these findings, we selected the most salient and actionable issues for further work by prioritizing themes that (1) were repeatedly raised by participants, (2) reflected cross-border coordination needs, and (3) could be influenced through municipal and regional policy instruments.

3.2 Define

In the Define phase, the research team worked to translate the findings into the structure of a cross-border digital policy. A workshop with researchers from both partner universities was used to group needs into four thematic domains: healthcare and care services, environmental governance, education and youth engagement, rural entrepreneurship and digital infrastructure.

Reflections from the OLLD focus group supported the research team's emphasis on practical and context-specific tools. One participant remarked, “Start with small successes. That builds trust. Then you can continue and make the big change.” Another noted, “We don't need another platform where they need to log in and check documents. If you're interested in getting something from people, you need to do the work for them.” In Finland, one of the interviewees stated, “Even my boss said to me that you could think about making it more efficient. Just remotely monthly visits.” (referring to remote health-care visits). These statements supported the decision to center low-barrier, familiar communication methods such as printed materials, phone and video calls, and informal community meetings.

Concerns about institutional engagement were also raised. One participant observed, “Our local administration... they just want pictures. They want to be in the picture, but not in the work.” This reflected a broader pattern of superficial involvement from public actors and highlighted the need to design policy interventions that are locally anchored and co-owned by communities.

Taken together, these quotes capture a shared preference across participants for low-barrier communication and service solutions that fit everyday rural routines and capacities. The Define phase resulted in an agreed policy focus and an initial structure for the policy work, informed by the synthesis of local interviews and focus groups and validated through stakeholder discussion.

3.3 Develop

The development phase involved refining the draft policy framework and preparing materials for future co-creation activities. Although large-scale stakeholder workshops have not yet been conducted, we have had two smaller workshops with researchers and one with stakeholders. Using this as a starting point, together with the data collected in the previous phases, the research team

produced several key artifacts, including draft personas, detailed visuals, and scenario templates.

Participants in the OLLD focus group shared examples of scaling local initiatives through symbolic actions and persistent outreach. One participant described, “We started with no infrastructure. We just invited someone who believed in what we do. He came, and then 86 people from 16 countries came to a village that has 10 people.” Another explained, “I started alone... I had something, but no legal entity. I built my network, registered the company, and kept going, even through COVID.” These experiences illustrate how trust, visibility, and long-term relationship-building can shape the success of rural initiatives, often with minimal institutional support.

The methods developed during this phase were grounded in the Living Lab principles of value co-creation, openness, realism, and social inclusivity. They were designed not only to evaluate policy content but also to support community reflection on digital futures and local governance.

In our analysis, this theme repeatedly appeared as a practical success factor: trust-building, visibility, and sustained relationship work were treated as prerequisites for scaling rural initiatives. In Develop, the prioritized themes were translated into concrete draft policy elements and working methods, and these drafts were iteratively refined through feedback from stakeholders and the wider Living Lab practitioner group. [Table 1](#) summarizes the draft policy outputs produced through the co-creation process and how each output was used to translate empirical insights into provisional policy content and practical working materials.

3.4 Deliver

The Deliver phase has not yet resulted in finalized policy recommendations. However, the study has generated a range of outputs that serve as concrete foundations for policy development. These include a draft policy structure, a clear idea on how to utilize SDG, a set of facilitation guidelines, and a validated methodological framework for participatory policy-making in cross-border rural settings.

Throughout this phase, participants consistently stressed the importance of making the process visible to policy makers. One participant stated, “What needs to come back to policy is not just the digital solution. It’s the process, the way we got there, that matters most.”. Another reflected, “Policy makers want the outcome, but they don’t understand the time it takes to build the trust. The social flow has to be made visible.” These insights informed the structure of the policy framework, which includes not only content recommendations but also documentation of the participatory process and underlying assumptions.

The issue of sustainability beyond study funding was also raised. One participant noted, “I’m also worried about the sustainability of the Living Lab after the project ends. What do we do next?” These concerns were addressed through the development of reusable methods and the integration of local actors into the facilitation process. The framework has already been used to produce a foundation for science-based policy recommendations for the forthcoming Swedish national rural

digital policy. The accompanying report follows the Living Lab policy approach, applying the Double Diamond design model and drawing on empirical material from this study, complemented by an extended literature review. Importantly, the report also includes a cross-border component, highlighting shared challenges and opportunities between Sweden and Finland, and demonstrating how collaborative approaches can inform national policy development in rural digitalisation.

While final policy recommendations have not yet been published, the research has delivered a replicable working method for rural policy co-creation, a validated cross-border stakeholder framework, and a set of design materials to support local implementation. These outputs form the basis for the final stages of the study, to be discussed in the next section.

This finding suggests that the policy output needs to document not only recommendations, but also the co-creation process and the conditions that enabled trust and collaboration. Deliver therefore focused on validating and refining the draft outputs and clarifying practical conditions for future adoption, including roles, responsibilities, and feasible next steps in the cross-border context. See [Figure 3](#).

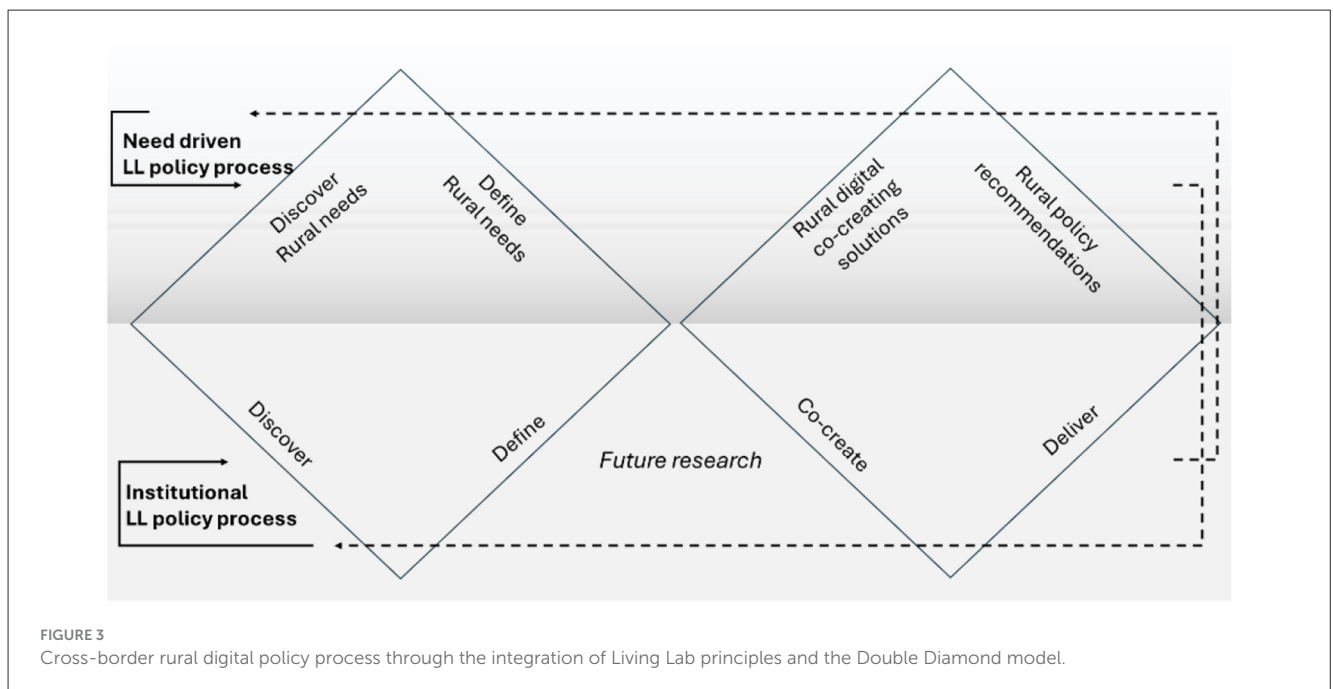
4 Discussion

The combination of Muodoslompolo fieldwork and the OLLD focus group revealed a shared emphasis on informal, trust-based engagement. This was not only a practical necessity in remote areas but also a strategic choice aligned with the LL principles of realism and inclusiveness ([Ståhlbröst, 2012](#)). Participants repeatedly emphasized the importance of face-to-face methods, personal networks, and direct contact over platform-based communication or digital-only tools. These findings reinforce the call in recent LL literature for socially embedded and place-based approaches ([Lindberg, 2024](#); [Cognetti and Maranghi, 2023](#)). For example, one OLLD participant described their approach as “going farm by farm,” while another spoke of “professional coffee drinking” as a method of stakeholder engagement. These accounts underscore the central role of embedded facilitation in building trust and sustaining participation in rural contexts.

The interdisciplinary researcher workshop and the fieldwork both contributed to the development of a draft digital policy framework grounded in local needs. The use of the Double Diamond model ([Kochanowska et al., 2022](#)) provided a structured, iterative process that supported the organization of findings and the progressive narrowing of policy focus. By this we mean that the initial broad set of issues raised in discovery activities was gradually prioritized and translated into a smaller number of policy themes and actionable recommendations through successive synthesis and stakeholder feedback. In practice, iteration occurred by revisiting the emerging themes and draft outputs after each major activity, including the researcher workshop, local fieldwork, the OLLD practitioner focus group, and follow-up workshops, and then adjusting the policy focus and refining the materials for the next stage. However, the framework was not applied rigidly. Instead, it was adapted to incorporate the LL principles of openness and distributed decision-making, allowing the process to remain responsive to stakeholder input. The methodological decision to

TABLE 1 Draft policy outputs produced in the co-creation process.

Draft policy output	What it contains	Status and use in the process
Draft policy structure	An outline of the cross-border rural digital policy, showing the main sections and how themes link to proposed actions	Iteratively refined through stakeholder feedback
Prioritization matrix	A set of criteria used to rank issues (for example urgency, feasibility, cross-border relevance, inclusion impact) and the resulting priority topics	Used to narrow the policy focus from a broad issue set to a smaller set of priorities
Thematic domains	Four policy domains: healthcare and care services; environmental governance; education and youth engagement; rural entrepreneurship and digital infrastructure, each with short descriptions and example actions.	Consolidates the main themes emerging from interviews and focus groups
Facilitation materials	Workshop agenda templates, guiding questions, and practical guidance for low-barrier engagement in rural cross-border settings	Used to run activities and adjusted based on what worked in practice
Participant-facing design materials	Personas, scenarios, and future-oriented prompts used to support discussion, idea generation, and reflection	Adapted to the local context and used during co-creation activities



frame activities within both the LL and Double Diamond traditions proved to be effective in maintaining both structure and flexibility.

The OLLD focus group further deepened the methodological reflection. The inclusion of seven Living Lab practitioners from six countries brought in diverse perspectives on how Living Labs operate across rural Europe. The participants stressed that Living Labs must be seen not only as experimental spaces for innovation but also as vehicles for social learning and institutional change. Their reflections on long-term engagement, sustainability beyond study funding, and institutional inertia echoed the challenges documented in rural LL projects such as Digiby and SoHoLab (Lindberg, 2024). Participants raised concerns about the long-term sustainability of Living Lab activities beyond the project's duration, emphasizing the need for continuity and local ownership once external funding ends. They also reflected on the gap between policy and practice, noting that policy-makers often focus on tangible outcomes while underestimating the time and effort required to build trust and sustain the social processes that underpin collaborative work. Another participant expressed

concern that the Double Diamond approach did not sufficiently lead to institutional learning, noting that the process risked leaving the policy recommendations without clear implementation pathways. This concern is echoed in recurring statements by Swedish regional rural strategists, who report that rural areas would not secure access to state support unless they resorted to what they term a “creative implementation” of strategies (Lindberg et al., 2024).

These reflections highlight a gap in the existing literature regarding the translation of co-creation processes into institutional practice. While previous studies have shown that ULLs can make local competencies visible and shift residents’ perceptions from passive recipients to active agents (Cognetti and Maranghi, 2023), implementing these shifts in rural areas remains uneven. The findings suggest that policy development in rural settings must incorporate institutional learning as a core component. This includes documenting facilitation methods, supporting intermediary actors, and addressing issues of administrative fragmentation and role ambiguity.

Furthermore, the study confirms recent arguments for acknowledging intra-rural diversity in LL practice (Lindberg et al., 2024). The challenges and strategies used in Muodoslompolo differ from those in more centralized rural municipalities, yet both are classified as rural in statistical terms. The participants at OLLD contributed insights from rural regions in Greece, Finland, Italy, and elsewhere, confirming that digital inclusion and policy engagement must be locally tailored. The shared emphasis on starting small, adapting tools, and working relationally across sectors aligns with the notion of differentiated digital policy design rather than one-size-fits-all models.

By aligning empirical findings with Living Lab theory and SDG-related policy goals, this study also provides a methodological contribution. The integration of thematic analysis, scenario planning, and speculative design methods within the Double Diamond structure offers a reproducible yet adaptable approach for similar rural regions. While the final digital policy is still under refinement, the study has already developed a transferable model for policy co-creation that respects local scale, supports institutional alignment, and embodies LL principles in practice.

5 Conclusion

This article has examined the development of a cross-border rural digital policy through the integration of Living Lab principles and the Double Diamond model. Drawing on data from a local field visit, student project work, several researcher workshops, one stakeholder workshop, and a focus group with seven international Living Lab practitioners, the study illustrates how participatory, situated methods can be adapted to meet the specific needs of rural communities at the intersection of digital transformation and territorial fragmentation. Accordingly, the article's main contribution is the process-oriented methodology and facilitation approach for organizing rural cross-border policy co-creation, while the policy content itself remains under refinement. The findings show that rural digital policy cannot be detached from the processes that generate it, and that stakeholder trust, informal facilitation, and institutional learning are not secondary but essential components of successful policy design. Regarding RQ2, the study provides an initial answer by showing how spatial scale and rural characteristics shaped the Living Lab process. Geographic distance, small population size, and limited local institutional capacity made low-barrier, face-to-face engagement and embedded local facilitation central for building trust and sustaining participation. In the cross-border setting, administrative fragmentation and differences in service and governance arrangements further influenced who could participate and how insights could be translated into actionable policy directions, reinforcing the need for locally tailored rather than one-size-fits-all approaches.

5.1 Scientific contribution

Overall, the article contributes a transferable process model for organizing rural cross-border digital policy co-creation, together

with early-stage outputs such as the prioritization matrix, thematic domains, and participatory working methods.

This study advances Living Lab research by extending its scope beyond urban innovation and technological experimentation to the domain of rural policy co-creation. It provides empirical evidence that LL approaches can be used to develop inclusive, grounded digital policy frameworks in geographically remote, administratively complex settings. By integrating the Double Diamond model with participatory and speculative design methods, the study contributes a structured yet adaptable methodology for facilitating community-based digital policy processes. It also introduces a cross-border perspective that is often underrepresented in the Living Lab literature, offering insight into how policy engagement must navigate both institutional differences and community-level diversity.

5.2 Practical implications

The research has produced a set of methods and materials that can support rural digital policy development in other small-scale and cross-border contexts. These have recently been applied in a background report for the Swedish national rural strategy on digitalisation. These include a prioritization matrix aligned with SDG targets, a draft stakeholder engagement framework based on the PentaHelix model, and scenario-based facilitation tools designed to support participatory workshops. The findings show that successful policy co-creation in rural areas depends on integrating low-barrier communication strategies, ongoing relationship-building, and strong local facilitation capacity. These elements are transferable to other regions seeking to involve residents in shaping policies that affect their digital futures.

5.3 Limitations

This study was conducted within the scope of a small-scale project in a specific cross-border region. While it includes data from multiple sources and participant groups, it does not aim for statistical generalisability. The fieldwork was limited to two cross-border villages, and while the OLLD focus group broadened the scope of reflection, it was not designed as a comparative study. Furthermore, the co-creation activities involving community stakeholders were in early stages at the time of writing, and the final policy had not yet been completed. These constraints affect the extent to which outcomes can be extrapolated beyond the study region.

5.4 Future research

Future work should examine how the policy framework developed through this approach is taken up by institutional actors and implemented at different governance levels. Longitudinal studies could provide insights into the durability of co-created rural digital policy and its impact on local communities. Comparative studies across other cross-border rural regions would be valuable

in refining the model and understanding how scale, geography, and institutional context affect participatory processes. Finally, further exploration of how digital tools such as digital twins and data spaces can be integrated into co-creation in a socially embedded and context-sensitive way would offer important extensions to the work presented here.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the studies involving humans because This study involved adult participants in semi-structured interviews and focus groups about their professional and community experiences in relation to rural digitalization and policy processes. No sensitive personal data or vulnerable populations were involved. Participation was voluntary, and all participants provided verbal informed consent prior to participation. All participants were informed that the interview and focus group results would be used for research purposes only, and they all agreed to these terms. In accordance with the ethical guidelines of Luleå University of Technology (Sweden) and the University of Oulu (Finland), formal Ethics Committee approval was not required for this type of low-risk, non-sensitive qualitative research.. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

AH: Supervision, Writing – original draft, Methodology, Conceptualization, Writing – review & editing, Investigation, Formal analysis, Resources, Data curation. JL: Investigation, Writing – original draft, Funding acquisition, Methodology, Writing – review & editing. LH: Writing – original draft, Data curation, Writing – review & editing. SB: Writing – original draft, Data curation, Writing – review & editing, Methodology, Conceptualization. PK: Writing – review & editing, Writing –

original draft. NI: Methodology, Writing – review & editing, Conceptualization, Writing – original draft. MP: Writing – review & editing. DS: Writing – original draft, Writing – review & editing. DC: Writing – original draft, Writing – review & editing. HO: Writing – review & editing. PS: Writing – review & editing. SP: Writing – review & editing.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was not used in the creation of this manuscript.

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