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How deep is your lab? Understanding the possibilities and limitations of living labs in tourism

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ABSTRACT

Living labs are increasingly popular in discussions on co-creation, destination design and education, particularly with regards to their potential to deal with so called ‘wicked’ problems. However, the living labs concept is ill-defined and critical practitioners warn that this undermines the potential of living labs and may lead to inflated expectations. This article seeks to provide more clarity on living labs, the kind of work that can take place in them and the depth of insights that they can deliver. We provide a taxonomy of different lab environments and the different purposes that they can serve within a tourism context. Based on experiences in two urban tourism living labs in the Netherlands, it is argued that living labs are not suited for solving wicked problems per se, and that greater modesty is required when discussing their potential. The paper concludes with a critical discussion and avenues for further research on the possibilities and limitations of using living labs to facilitate innovation in research and higher education practice.

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1. Introduction

As the number of people using places for leisure and tourism rises, competition for space among different users of a destination increases (Koens et al., 2018). To prevent negative impacts AND enable a transformation towards sustainable tourism, greater alignment between stakeholders and empathy for the other, is necessary (Bellato & Cheer, 2021; European Commission, 2022; Koens et al., 2019). However, opposing interests, fragmented decision-making structures and political intricacies can inhibit such alignment and the accompanying transformation (Horgan & Dimitrijević, 2020). Overcoming these issues is incredibly difficult and has been described as a ‘wicked problem’: a

societal challenge that is complex and “ill-formulated, where the information is confusing”; there are many stakeholders and “decision makers with conflicting values, and ... the ramifications in the whole system are thoroughly confusing”. As such wicked problems resist easy resolution, and it is impossible to decide when a working solution is found (Churchman, 1967, p. 141; Day, 2020; Rittel & Webber, 1973).

In recent years the concept of living labs has been popularized in academic literature and policymaking as a means to overcome wicked problems. Starting from the premise of deep reflection and long-term cooperation among stakeholders of the quadruple helix (i.e., the interactions and collaborations of academics, industry, government and the community), living labs can stimulate citizen participation, co-creation and the integration of education and practice (e.g., through communities of practice) (Ballon & Schuurman, 2015; Bylund et al., 2022; Hossain et al., 2019). Such practices are increasingly advocated in tourism, particularly in relation to design thinking and participatory governance for sustainable or regenerative destination development (Bichler, 2021; Koens et al., 2019; Volgger et al., 2021). They also

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feature prominently in the strategies for Destination Management and Marketing Organisations in European cities (e.g., [Amsterdam & Partners, 2020](#); [CityDNA, 2023](#); [Wonderful Copenhagen, 2021](#)).

However, the contribution of living labs toward triggering sustainability transformations in practice has been rather limited across all industries including tourism ([Campos, 2022](#); [Scholl et al., 2022](#); [Zivkovic, 2022](#); [Šker & Floričić, 2019](#)). Indeed, practitioners have, for years, warned of inflated expectations ([Kieboom, 2014](#)). The limited success of living labs to date may be due to a lack of clarity and understanding among practitioners with regards to what actually is a living lab. In their paper on experiences with living labs in Europe, [Bylund et al. \(2022\)](#) note that the term has been used to describe short-term projects with a strong emphasis on finding easy solutions that can be scaled up, or even to describe a set of workshops. This kind of paying lip-service to the living lab approach, without acknowledging the complexities that come with it, undermines the innovative potential of living labs. As such, a clearer conceptualisation of the living lab as a concept is required if it is to live up to its promise ([Bylund et al., 2022](#); [Høegh-Guldberg et al., 2022](#)).

In this paper, we seek to provide more clarity on living labs and how they can contribute to destination management. Our research goals are to increase understanding of the possibilities, issues and potential for using living labs in research as well as in educational contexts. We first provide a taxonomy of different lab environments, before looking at the different purposes that living labs can serve within a tourism context and relating these to two specific design approaches for working within a living lab setting, each with distinct characteristics, possibilities and limitations. We then reflect critically on our own experiences from managing two Urban Leisure and Tourism Living Labs in Amsterdam and Rotterdam, and their use in facilitating innovation in practice and

education. Finally, we provide avenues for future research to allow for living labs to better fulfil their potential.

2. Conceptualising living labs

Historically, a laboratory, or lab for short, was a facility equipped for conducting scientific experiments and procedures in controlled environments (e.g., in psychology) ([Stevenson, 2010](#)). In the early 2000s, the concept of lab-based working was extended to engage more with societal challenges, by bringing stakeholders together for collaboration and collective ideation either in physical or virtual environments ([Hossain et al., 2019](#)). The concept has grown in popularity in recent years, and, nowadays, a variety of interaction spaces work with these principles in mind (e.g., ‘living labs’, ‘hubs’, ‘fablabs’) ([Høegh-Guldberg et al., 2022](#); [Steen & van Bueren, 2017](#)). While it is beyond the scope of this paper to offer a full overview of the academic debate on the different types and classifications of such spaces (for this, see, e.g., [Hossain et al., 2019](#); [Leal Filho et al., 2022](#)), it is useful to discern four types of labs, based on differences in complexity with regards to their settings and their stakeholder involvement ([Fig. 1](#)).

Urban living labs (including ‘social living labs’) differ from other lab environments in that they act explicitly as containers “for social experimentation, with a team, a process and space to support social innovation on a systemic level” ([Franz, 2015](#); [Kieboom, 2014](#), p. 9). They are inherently transdisciplinary and place-based, with a focus on increasing sustainability and/or advancing capacities for resilience. To achieve this, in urban living labs there is a strong emphasis on network-building processes, and on modes of partnership for urban governance ([Voytenko et al., 2016](#)). By bringing together local stakeholders from the quadruple helix, living labs address real-world (societal) problems and deliver

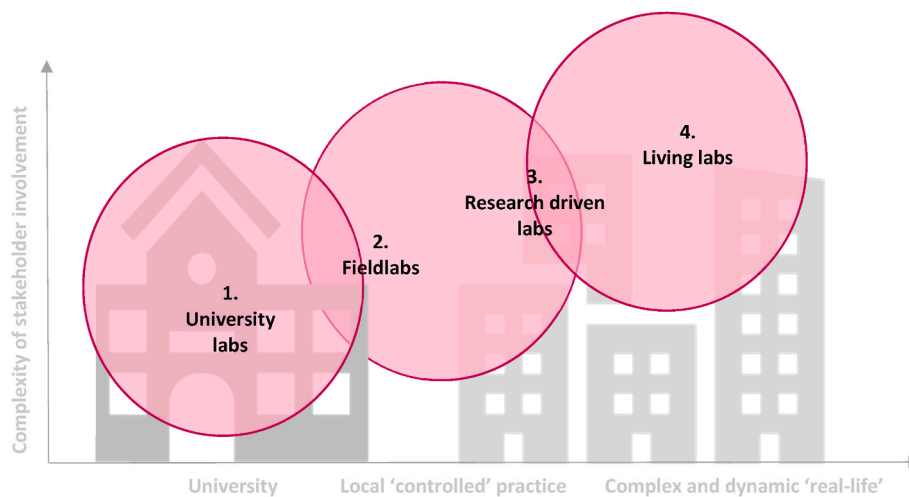


Fig. 1. Taxonomy of labs (Based on Vervloed et al., 2019).

- 1. University labs** are physical spaces on university campuses, used for education and applied research, mostly with university students. The setting here is relatively controlled – not unlike traditional labs. Often these have a focus on technology, like so-called makerspaces where participants design new ideas and experiences through iterative processes ([Barrett et al., 2015](#)).
- 2. Field labs**, or living testbeds, are commonly situated within a company, NGO or public entity, where knowledge institutions and partners meet to develop, test and demonstrate mostly technological and SMART solutions and new products ([Kolovou, 2020](#)).
- 3. Research driven labs**, or hubs, are located within a space in a city or a more rural setting. They are often established by the public sector in association with knowledge institutions. Industry and citizens may also participate, but this is not essential. The idea is to create spaces where participants can learn and reframe issues to change specific practices (e.g., co-creating models for problem-solving) ([Urban Living Lab Center, 2023](#); [Culwick et al., 2019](#); [Urban Living Lab](#); [Zavratnik et al., 2019](#)).
- 4. Living labs** have been defined as forums “for innovation, applied to the development of new products, systems, services, and processes ... employing working methods to integrate people into the entire development process as users and co-creators to explore, examine, experiment, test and evaluate new ideas, scenarios, processes, systems, concepts and creative solutions in complex and everyday contexts” ([JPI Urban Europe, 2015](#): 59). They are, in effect, user-centred, open innovation ecosystems based on a systematic user co-creation approach where research and innovation processes are integrated in real life communities and settings ([ENOLL, 2017](#)). Living labs focus on designing, testing and learning about social and technical innovation in real time and take a systemic perspective ([Steen & van Bueren, 2017](#)). Activities include prototyping and testing, as well as scaling-up innovations and businesses to provide joint-value to the involved stakeholders ([ENOLL, 2017](#)).

coherent actions for these issues (Gerritsma and Horgan, 2024; Carayannis & Campbell, 2009; Hassan, 2014; Zivkovic, 2018). They can be described as adaptive social ecosystems that intelligently change their composition, form and goals vis-à-vis the events that occur in the societal larger system. In addition, they are designed to be more flexible than would be allowed by a traditional ‘scientific’ research approach. For example, objectives and goals may change, and research agendas emerge rather than being defined beforehand (Luijten, et al., 2018).

These characteristics make living labs interesting vehicles to experiment with destination development. Moving beyond destination management, living labs are a suitable environment to bring together stakeholder networks, and to study the negotiation of influence and power in tourism destinations (Pechlaner et al., 2012). They are a practical means to ensure tourism is analysed as an integral part of the urban social system (Fyall & Garrod, 2019; Koens & Milano, 2023), where tourism is created as a result of the interplay between a network of suppliers and the demands of potential visitors (Laesser & Beritelli, 2013). In addition, the process-oriented perspective of living labs, with an emphasis on the development of local capacities for participation and decision-making, can help prevent solutionism (Horgan and Dimitrijević, 2020).

Following a systemic review of the literature on living labs in tourism, Thees et al. (2020) point to the potential of labs to support resident participation in destination governance. In particular, living labs can be employed to soften, or break away from, traditional hierarchies in tourism governance, and can contribute to innovative tools and ideas to create more sustainable and inclusive development. Thees et al. also highlight that a structured transfer to destination management is difficult to achieve. In particular, securing long-term community participation is seen as problematic (Šker & Floričić, 2019; Zucconi & Korstanje, 2023). Other researchers have highlighted the difficulties of moving from ideas to coherent tourist products or services and have found the development of realistic business models for entrepreneurship to be problematic (Torres Valdés et al., 2019; Šker & Floričić, 2019).

Turning towards the kind of activities that currently take place in living labs, Puerari et al. (2018) state that on the one hand, there are

activities that focus on *learning* together, where the emphasis is on building knowledge, learning from each other and creating networks; on the other hand, there are activities that focus on *working* together towards a specific output (e.g., product, service or process innovation). They also distinguish between activities that primarily seek to improve the conditions of a single sector, product or service and innovations in larger societal systems. Based on their reasoning, Van Tankeren et al. (2022) made a typology to understand the different ways in which activities in living labs can contribute to social innovation. Their logic can be applied to a tourism setting as seen in Fig. 2.

Within *lab-based education*, the emphasis is on collectively learning about (tourism) services and products and the ways in which potential innovations can improve upon existing designs. *Place-based education* is similar in nature, albeit that here the focus is on designing innovations that can have an impact on tourism and other societal systems. Both lab-based and place-based education activities often involve students, who are encouraged to go out of the physical setting of the living lab where they receive classes and engage with outside stakeholders. With *product and service innovation*, and with *social innovation*, the objectives aim more to stimulate and test innovations through different stakeholders working together. In doing so, product and service innovation activities limit themselves to specific products and services. Social innovation, however, focuses on stimulating innovation that may lead to system transformations or that may overcome any of the wicked problems inherent within social societal change. The different activities in the four typologies are not mutually exclusive. In fact, different activities are combined in living labs, as in tourism, which can strengthen the quality of outputs (Jernsand, 2019).

3. Comparing perspectives on design thinking for living labs

Most living labs explicitly mention design thinking as part of their approach (Brankaert & Den Ouden, 2017). The two appear to be a natural fit as both emphasise participation of (historically excluded) stakeholders and practices, and continuous learning and experimentation (Carlgren et al., 2016; Steen & van Bueren, 2017). Two main

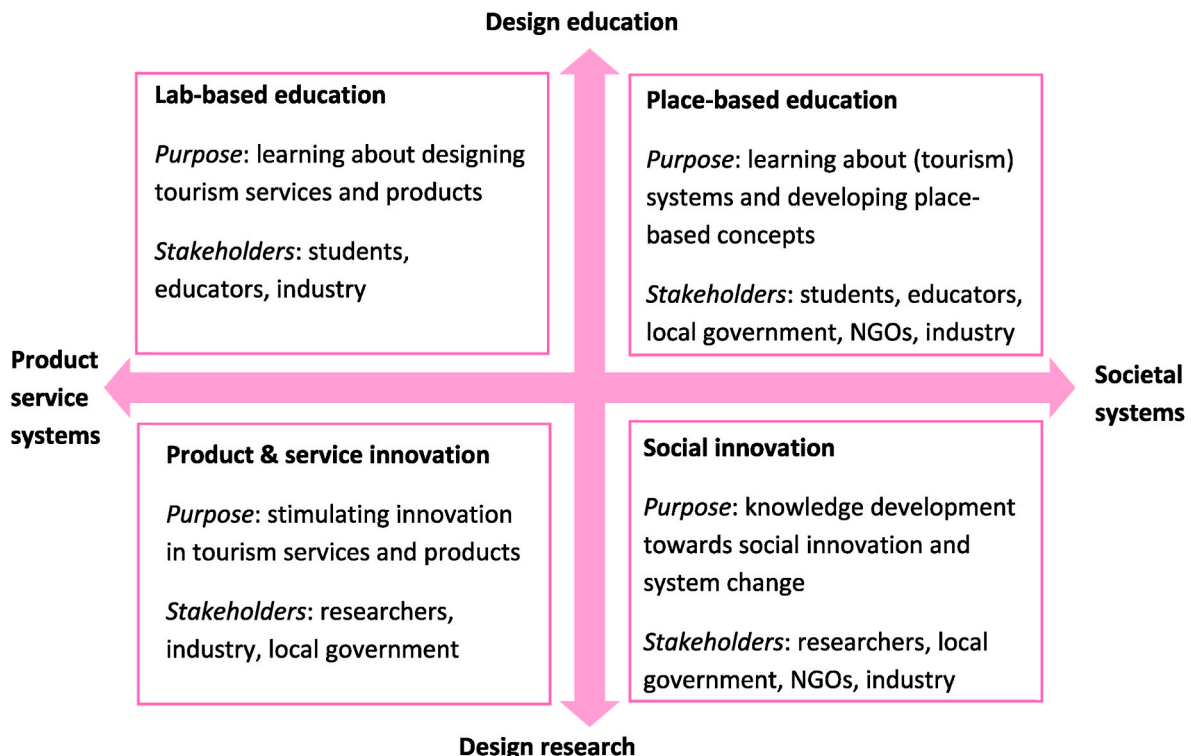


Fig. 2. Typology of living lab roles in tourism, based on their focus of activities (based on Van Tankeren et al., 2022).

schools of thought can be discerned with regards to design thinking: 1) design as rational problem solving, and 2) design as a reflective practice (Dorst & Dijkhuis, 1995; Visser, 2009).

Design as rational problem-solving is the historically dominant school of thought within the literature on design thinking (Brenner et al., 2016; Glen et al., 2015). It is particularly popular in the engineering domain. It describes design as a process, in which problem setting and problem solving are largely separated in time, often in a rather linear way (Simon, 2019). First, a problematic situation is analysed, then a design brief is defined and, subsequently, interventions are performed and tested. This approach offers guidance to novices and is embedded in many design thinking educational programmes. A popular example of this school of thought is the ‘Double Diamond’ framework (Rugman & D’cruz, 1993), which is used for co-designing tourism experience systems (Smit et al., 2021). Critics have warned that the Double Diamond approach overlooks that design knowledge is deeply ingrained in practices (Dorst, 2011; Kimbell, 2011). More specifically, it disregards the abductive logic of design in which problem space and solution space co-evolve (Dorst & Cross, 2001), and suggests there are ‘root causes’ that can be ‘fixed’. Adopting this stance bears the risk of ending up with the kind of technocratic solutionism that living labs specifically seek to avoid, and that does not fit with their open nature and process-based focus (Kieboom, 2014; Nussbaum 2010). This critique is particularly valid when the debate regarding living labs and design thinking is framed in a ‘smart’ or ‘technology’ oriented discourse, rather than on social innovation (Kitchin, 2015). With this in mind, it is useful to note that it is not uncommon within tourism to align living labs with the discourse on smart destinations and technological opportunities (Boes et al., 2016; Buhalis & Amaranggana, 2015; Guimont & Lapointe, 2016).

Design as a reflective practice explicitly focuses on the social aspects of innovation. It follows Schön’s (1983, 1992) ideas of emphasising experimentation in complex and ambiguous environments. Designers constantly iterate between framing situations based on their current understanding, and conducting experiments that are tailored to the environment as they perceive it. Rapid sketching, building models and early prototyping are used to increase understanding and provide a direction for potential ways to deal with issues at hand. It is acknowledged that experiments are likely to ‘fail’. In fact, this may even be encouraged, as the idea is that reflecting on such ‘failures’ leads to new insights. Thus, this school of thought considers design thinking as learning through creating; a highly iterative process that resembles more a generative dance than a linear step-by-step process (Stompff, 2022). The emphasis is on joint problematisation and navigating ways towards potential mitigations through co-definition of a problem with continuous testing and feedback loops (Schön, 1983).

The concept of design as a reflective practice appears to align particularly well with the practice of living labs in that it is less absorbed with problem definition and more focused on allowing problem spaces and solution spaces to co-evolve (Dorst & Cross, 2001). Design as a reflective practice is an iterative approach that makes it possible to explore and discover unknown territories and issues. Put differently, rather than establishing *a priori* the problem that must be addressed, problem definitions are developed and fine-tuned over time. This is particularly useful for urban destination development, as this context is so complex that it is impossible to appreciate all the potential impacts of interventions in advance (Laesser & Beritelli, 2013; Smit et al., 2024; Stienmetz et al., 2020). Design as a reflexive practice allows for a wide variety of stakeholders to participate, thus providing them with a platform to engage with tourism development. Participants can contribute to ideas or make sense of issues in facilitated co-design sessions (e.g., Sanders & Stappers, 2012), or they can reflect on outcomes, as prototypes that can be seen and experienced. In the context of living labs, design as a reflective practice inherently enables practitioners to design *with* others, including residents, entrepreneurs, experts, policymakers and so on, rather than *for* them.

4. Reflections on tourism living labs in practice

To appreciate how living labs and design thinking techniques work in practice in tourism, this section contains a critical reflection of labs as a means for research (Section 4.1) and labs as learning environments in higher education (Section 4.2).

4.1. Labs as a means for research

To appreciate the possibilities and issues related to the use of living labs and design practices in the context of tourism, we reflect on experiences with using living labs in the EU Horizon 2020 projects SmartCulTour and SMARTDEST. The aim of SmartCulTour was to support regional development through cultural tourism – leveraging important tangible and intangible cultural assets, including those located in rural peripheries and the urban fringe (SmartCulTour, 2023). The Urban Leisure and Tourism Lab in Rotterdam was one of six living labs used to facilitate civic engagement. Also, to engage local stakeholders to participate in visionary interventions for their neighbourhood. Facilitation was done by people from the lab and researchers from the project, with the former mostly engaging stakeholders and the latter doing facilitation during the sessions. SMARTDEST sought to inform the design of alternative policy options for more socially inclusive places in the age of mobilities (SMARTDEST, 2020). In Amsterdam, researchers already worked within an Urban Leisure and Tourism lab setting to support joint-problematisation and co-production with diverse stakeholders across the tourism ecosystem.

For both projects, the labs were embedded in physical locations in the community, even when they were mobile to an extent, meaning that activities could take place in a variety of locations. Activities took place in three neighbourhoods in Rotterdam, and at a variety of locations near the city centre in Amsterdam between 2021 and 2023. The focus of the living labs was predominantly on product and service innovation and social innovation activities, although with SmartCulTour, a group of students also performed place-based learning activities.

Within both projects, the term *living labs* proved highly popular to draw people in but, subsequently, a lack of clarity on what a living lab entails proved problematic. Stakeholders struggled with the open and fluid nature of the living lab setting. They were expecting clear guidelines with regards to potential interventions and expected the lab to work towards ‘solutions’. Community and business stakeholders pointed out that they wanted ‘results’ as they did these activities in their spare time – in contrast to researchers and policymakers, who were paid via the project or for whom participation was part of their work remit. These issues meant that not all stakeholders were willing to invest their time for the entire duration of the process and that the facilitators had to lead on setting the agenda. The open nature and long-term perspective of living labs are two of their strengths, yet those characteristics require deep engagement of participating stakeholders that only can be established over a longer period. For certain stakeholders, such deep engagement may not be sustainable unless they are remunerated, or otherwise motivated, sufficiently. For one of the projects, the COVID-19 pandemic meant that initial meetings had to be held online, which hindered engagement. In addition, because the co-design workshops and participatory design exercises were conducted largely in geographical isolation from one another and over a prolonged period of time, it proved difficult to build feedback loops and maintain rapport. Still, the participants enjoyed taking part in a living lab-setting and found the links with stakeholders from outside of their existing network highly useful.

Both *rational problem-solving* design interventions (e.g., the ‘double diamond’ approach) and *design as a reflective practice* interventions were employed in SmartCulTour and SMARTDEST. We found that both perspectives could add value within a lab setting, albeit that they do appear to serve different purposes. The more structured rational problem-solving interventions were recognisable and relatable for policymakers

as they corresponded well with the existing policy context. However, they provided only limited opportunities for engagement and interaction, and were at risk of becoming a ‘filling-in exercise’ that paid relatively little attention to (power) relations in a real-life context. In contrast, the reflective interventions were more engaging and helped bring the participants together to reflect on current issues and possibilities for sustainable tourism development. As such, the reflective practices made better use of the specific qualities of the living lab setting. A lack of concrete, actionable outputs was problematic here though. For example, a resident participant in Rotterdam mentioned after a co-creation session that, like earlier interventions, it was fun and resulted in wonderful ideas and concepts, but that this would mean nothing if no one took ownership or had a mandate to follow-up with actions.

Questions of ownership proved difficult to address in a living lab setting. When outcomes of living lab processes cannot be clearly defined beforehand, it is difficult to align activities within living labs with policies, funding structures or business plans. This can result in living labs becoming places where people can participate and co-create, but with little chance that these will result in actionable outcomes towards a more sustainable destination. It may be possible to overcome this issue by seeking foundational funding for implementing the lab activities beforehand. However, this requires active commitment and participation of stakeholders, which can take years to develop. This conundrum is a good example of the many complexities of using living labs to deal with complex issues and wicked problems. Moreover, issues such as these may lead to disillusionment and cynicism among stakeholders and participants, who engage and invest time but do not see tangible outcomes.

4.2. Labs as learning environments in higher education

We discuss the value of living labs for educational purposes based on experience gained from two Urban Leisure and Tourism labs, one in Amsterdam and the other in Rotterdam. The former was established in 2015 and the latter in 2020. Both were situated in peripheral areas of the cities that were in the process of tourism development with the accompanying dynamic spatial transformation. From 2020 onwards, the labs have facilitated a semester-long, interdisciplinary, undergraduate course in higher education (similar to a minor) in which third year students learn to apply principles of design thinking in a real-world environment (Gerritsma & Horgan, 2024). Both labs work closely with residents, and municipality and industry stakeholders. This community integration helps students understand the local context, verify assumptions and develop coherent design propositions (e.g., to align their ideas to broader strategies, policy agendas and business ventures). Commonly, the labs employ lab-based and place-based learning activities, although students are encouraged to engage in other methods of learning also.

The education within the living labs has been implemented with design as a reflective practice in mind. This is very different from the rest of the students’ curriculum. To provide structure for students who are not used to the iterative nature of design approaches, a framework of four design sprints is used. After each sprint, the students present to external stakeholders; the latter report that they enjoy these opportunities for interaction. The idea is that each sprint leads to a new iteration and reflection; however, in practice this is proving difficult. Confusingly, terminology from the rational problem solving ‘Double Diamond’ approach is used to characterise the sprints. This structure is useful in so far as it gives guidance to the students and the lecturers – many of whom are also inexperienced with design-based learning. The downside is that it takes away some of the flexibility that exemplifies living lab work, particularly, the reflexive practice approach that the labs seek to encourage.

Even with this structure in place, the students struggle with the messy and complex nature of design. The lack of clear problem setting is unusual for students, as is the extensive solution space that is offered,

ranging from designing a product or a service innovation, to defining a policy or even an adversarial intervention (DiSalvo, 2015). While designers are taught to embrace the ambiguity of design, students who are not used to this level of uncertainty in their pedagogical environment (i.e., within their curriculum) can find this highly frustrating. Also, the design-based group work and necessary interaction with stakeholders can make students who are not accustomed to engaging with people with different perspectives, uncomfortable. Experience with the living labs shows us that these issues can stifle momentum and lead to dissatisfaction among students. After several semesters, the living labs were not a popular choice amongst students compared to other courses.

Experience also shows us that it is not just the students who are challenged. Empowering students through co-creation processes also creates new uncertainties as to potential outcomes. In one instance, a group of students advocated a rather extreme ‘residents first approach’, which diverged from the perspective of the curriculum and from the expectations of lecturers and external stakeholders. We have found that reflecting on the implications of the students’ ideas and products can be beneficial to both the students and the lecturers. This experiential learning fits with a lab-based design approach, although, the reflectivity is still limited. Instead, the focus of the living labs as learning environments is strongly on the personal development of the students; the final learning outcomes need to be in-line with the rest of their curriculum – the curriculum takes precedence.

To clarify the most important considerations for the use of living labs

Table 1
Reflections on the use of living labs for research and education.

	Research	Education
Conceptualisation of living lab	<ul style="list-style-type: none"> ●Lack of clarity causes different conceptualisations of the living lab concept, which hinders comparisons ●Danger of using the living lab name as a gimmick 	<ul style="list-style-type: none"> ●Education in living labs requires radically different approach from traditional curriculum – need to ensure fit with course criteria
Stakeholder engagement	<ul style="list-style-type: none"> ●Positive framing of living lab brings new stakeholders together ●Expectation management is highly important to prevent unreasonable expectations ●Lack of clarity makes it difficult to keep stakeholders engaged over a longer period ●Facilitator with ‘local’ roots creates more trust and engagement 	<ul style="list-style-type: none"> ●Inexperience of educators and students, with respect to the principles of living labs, can create confusion and causes unrest ●Transdisciplinary approach provides new knowledge exchange opportunities ●External partners enjoy the living lab environment for working with students
Methods	<ul style="list-style-type: none"> ●Design as rational problem solving fits with policy context, but provides limited room for interaction ●Design as a reflective practice provides more engagement, in line with the concept of living labs, but labs need to be set up for this and stakeholders need to be willing to engage ●Online methods are less suitable for reflective practice and engagement 	<ul style="list-style-type: none"> ●Clear guidance and structure are needed, to help the students, as these remove some of the open-endedness and spontaneity of design thinking ●Educators can struggle to implement design methods
Outcome	<ul style="list-style-type: none"> ●Questions regarding mandate and ownership need explicit attention, yet often remain unresolved ●Long term governance of living labs is costly, yet highly important 	<ul style="list-style-type: none"> ●Outcomes are more informed by real-life experiences ●Reflections strongly focus on individual reflexivity, rather than on processes ●Assessment criteria need to be specified to fit with this new kind of educational approach

for research and education, Table 1 provides a summary of the findings discussed above, based on our experiences with the two H2020 projects and with the labs as learning environments.

5. Conclusion

Based on our findings, we provide our concluding remarks regarding the use of living labs in the context of destination development and education (Section 5.1), and discuss their practical implications and avenues for further research (Section 5.2).

5.1. Concluding remarks

Increasingly, reflective practices are suggested to help deal with ‘wicked problems’ related to the development of sustainable, resilient and regenerative tourism practices and destinations (Duxbury et al., 2021; Koens et al., 2019; Koens, Smit, & Melissen, 2021; Pritchard, Morgan, & Ateljevic, 2011). Recent publications have highlighted how living labs, and the accompanying design approaches, can become a strong catalyst for such practices (Jernsand, 2019; Lapointe & Guimont, 2015; Thees et al., 2020; Zavrtnik et al., 2019). Living labs can facilitate more holistic understandings of the complexities of sustainable tourism development to help deal with the lack of progress being made in the transformation towards sustainability (Becken, 2021). For example, the use of living labs and design approaches may help counter common fallacies with regards to the potential of technology as an easy ‘solution’ (i.e. technological solutionism) or inaction due to the overwhelming complexities of the issues at hand (DeFries & Nagendra, 2017).

In spite of their potentially positive attributes, our insights suggest the potential of living labs should not be overestimated. It can take years, and require many resources, before a living lab is working well and before sufficient trust can be built among stakeholders (see also Thees et al., 2020; Zuccoli & Korstanje, 2023). Many labs do not get to a point where they are high performing. Project based labs, in particular, often have a limited lifespan and a set agenda, as they lack funding options to keep running after a project ends. If only a few workshops are conducted, one may question whether the activities really represent a living lab, or whether they represent another lab-based environment. However, even within long-established living labs, there appears to be a tendency to reduce complexities into a limited set of issues (Bylund et al., 2022), or to focus predominantly on the development of specific products or experience, rather than broader place-based or social innovation.

It is important to recognise that the unique potential of living labs does not lie in producing ready-to-go solutions or products but, rather, in serving as a place where different stakeholders collectively make sense of an ambiguous situation to define alternative futures. To achieve this requires a certain open-endedness and lack of boundaries that can be overwhelming or confusing to participants and organisers alike. Engagement of stakeholders is not easy to achieve and there is a danger of falling into the trap of ‘participationism’, where participation becomes the goal rather than a means to an end (Gerritsma & Stomppf, 2023). Among stakeholders from industry and the community, in particular, this is frowned upon as they normally participate on a voluntary basis, in contrast to the facilitators, who are often paid.

We conclude that the application of living labs, in both tourism development and teaching contexts, is not easy and requires careful consideration. Without this, living labs may hinder, rather than aid, effective sustainable tourism development. Involving stakeholders in a living lab setting, without a clear understanding of what can and cannot be achieved, can lead to mismanaged expectations and participation fatigue. This risk is important to consider, as it relates not just to living labs, but also to broader stakeholder participation and co-creation in destination governance (Smit et al., 2024; Zhang et al., 2022).

It takes time and effort to develop interventions with all stakeholders

together and contributing toward meaningful transitions. To achieve their potential, particularly with regards to stimulating social innovation and driving paradigm shifts, living labs need to be better understood (Bylund et al., 2022; Karvonen, 2018, pp. 201–215). Earlier work on living labs, outside the context of tourism (e.g., Bylund et al., 2022; Dijk, 2020; Von Wirth et al., 2019), indicate general weaknesses within the living lab concept as it is currently used; our findings confirm this limitation. A lack of critical engagement with the concepts of living labs, limited clarity with regards to design thinking and insufficient participation, can all lead to labs becoming tokenistic. They may even serve as a means of depoliticization for politically charged, wicked problems related to tourism excesses, disturbances, and the climate impact of tourism mobility. In a worst-case scenario, living labs could lead to ‘organized irresponsibility’ (Beck, 1998) in tourism, where society becomes a laboratory, but there is no one held responsible or accountable for its outcomes (Von Wirth et al., 2019, p. 251)."

5.2. Practical implications and avenues for further research

The debate about urban tourism development excesses in the last 10 years has highlighted how tourism development can be a wicked problem. The COVID-19 pandemic, with its associated impacts and processes of exclusion and displacement of local city users, served to further highlight how tourism represents an integral – yet conflicted – facet of urban development (Koens & Milano, 2023). The pandemic helped make clear the importance of tourism for urban neighbourhoods and the importance of growing capacity for resilience, and for social and human capital in the face of uncertainty. In addition, once-peripheral ideas like degrowth or regenerative tourism have become more accepted in the tourism debate. However, operationalizing these ideas in practice to transition towards sustainable destinations is proving challenging (Gerritsma & Horgan, 2024; Kuenen et al., 2023). Living labs can act as useful test grounds to experiment with devolved decision-making and developing sustainable visions with a wide and diverse set of perspectives (Thees et al., 2020). In education, the pandemic increased the uptake of digital technologies and e-learning in tourism education. Whilst this has made teaching practices more flexible, it has limited personal interaction, which can hinder transformations of the tourism ecosystem towards greater sustainability (Zuccoli & Korstanje, 2023). Here too, living labs can play a vital role. They lend themselves well to becoming an experiential ecosystem in which innovative educational practices, like design thinking and communities of practice, can be used (Torres et al., 2019). Living labs can help improve tourism education to better fit with a world with wicked problems, in which uncertainty is rife (Stone et al. 2017).

To allow living labs to fulfil their potential, it is important to reflect on how they can best be used in a tourism context, both conceptually and in practice. Focusing on highly complex issues in a fluid and uncertain experimental environment can be overwhelming, particularly when combined with stakeholder involvement difficulties and the question of who takes ownership of outcomes. It may be that we need to be more modest when it comes to living labs. Rather than focus on their ability to address large and highly complex, wicked problems, living labs may be better framed as a means to bring together multiple small design and research projects (Schaffers et al., 2008). The logic here could, for example, follow that of action planning research, which is regularly used in the Global South to deal with complex questions in a relatively uncertain context (Halkatti et al., 2003); although other frameworks to structure and bring together insights from small-scale interventions may also work (see e.g. Bylund et al., 2022; Dekker et al., 2020; Dentoni et al., 2018). It would be useful to see how such frameworks could work within a tourism context, and the extent to which they could address the weaknesses of living lab approaches. Greater modesty with regards to the role of living labs in the context of societal and educational change, can help address inflated expectations regarding living labs and design approaches, whilst still allowing for more systemic insights to arise over

a longer period.

We conclude with six avenues for further research, practice and teaching.

1. When setting up and/or running a living lab, especially with research in mind, it is important to clarify to stakeholders (both residents and the tourism sector) what the living lab's intended purpose is, if only to manage expectations. A plethora of 'living labs' have been set up in recent years, often as part of project-based research projects that have an expected lifespan of a few years. Such a short-term project-based approach severely limits the ability of the labs to address wicked problems, which can take more than a few years to understand, let alone solve (Bylund et al., 2022). Our initial characterisation of different kinds of living labs helps shed light on the suitability of different types for different issues, but more research is needed to understand how living labs can work most effectively within a tourism context.
2. Further work is required to better understand how different activities (e.g. teaching, social innovation and research) in living labs align. A lack of clarity on this matter can confuse stakeholders and limit future participation. To further appreciate the (im)possibilities of lab-based work, it would be useful to learn more about how different design approaches and methodologies fit with certain activities in tourism. Whilst the literature on design approaches in tourism is increasing (e.g., Koens, Smit, & Melissen, 2021; Stienmetz et al., 2021; Volgger et al., 2021), more clarity is needed on this aspect.
3. As with many activities, a key problem is that of ownership. It is relatively easy to bring stakeholders together to engage in design activities. However, failing to address questions of ownership of outcomes risks the living labs becoming a purpose in themselves rather than a means to an end. As such, ways in which to activate ownership require urgent attention, particularly in tourism contexts, which, by their nature, require a wide range of stakeholders to work together. Bylund et al. (2022) propose that public administrations need to engage deeper with living labs to steward urban transformations and develop required capacities to facilitate systemic change. This engagement needs to include adequate funding to ensure outcomes can be realised and needs to find ways to make participation worth the effort for stakeholders (either financially or by other means), thus allowing the living labs to develop an experimentation-mindset towards sustainable governance.
4. For living labs to achieve their full potential, it is necessary to engage critically with their political dimension. There is a danger that the labs become tokenistic places that merely give the impression of meaningful participation while business as usual continues. Research in planning has revealed how other forms of participatory processes have been co-opted by powerful actors and used for the depoliticisation of debates (Turnhout et al., 2020). There is no reason to believe that such things could not happen within living labs, so questions regarding politics, ownership, control and follow-up require extra attention.
5. The concept of tourism living labs, as envisaged in most publications to date, has been based on experiences in the Global North (Bylund et al., 2022; Campos, 2022), and often in countries in which participation and collaboration are encouraged. Learning more about ways in which living labs could operate in different contexts, ecosystems and governance structures, would enrich the literature and might help overcome existing issues, to improve the effectiveness of current living labs.
6. Specific to tourism education-oriented activities, it is necessary to investigate how lab-based and design-based work can better relate to curricula and educational structures. It can be tempting to add a 'design flavour' to existing courses and offer this via living labs. Our experience suggests that this does not work, and is likely to result in dissatisfaction and negative perceptions of lab-based education. Rather than trying to fit labs within the current educational system, it

would be useful to investigate how the qualities of education in living labs can be employed to enrich current educational approaches and to rethink the way we educate new tourism professionals to be better prepared for the complexities of modern-day tourism.

CRediT authorship contribution statement

Ko Koens: Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Guido Stompff:** Writing – original draft, Visualization, Resources, Project administration, Methodology, Investigation, Conceptualization. **Janneke Vervloed:** Writing – original draft, Conceptualization. **Roos Gerritsma:** Writing – original draft, Resources, Investigation, Funding acquisition, Conceptualization. **Donagh Horgan:** Writing – review & editing, Writing – original draft, Resources, Investigation, Conceptualization.

Data availability

Data will be made available on request.

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