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JIM
ISSN: 2183-0606
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Vol. 12, 3 (2024)
p. 175-201
AM: Apr/2024
SM: Aug/2023

Living Labs: Knowledge Infrastructures to Forge a New Social Contract of Science?

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Abstract

Living Labs (LLs) are heralded as new and inclusive platforms for collective and transformative knowledge production and innovation management with actors from science, practice and society. This begs the question what kinds of social relations emerge between these actors especially as the leading institutions vary, in other words, whether LLs give rise to distinct knowledge infrastructures and new forms of social contracting (of science). A comparative analysis focusing on structural and power-related aspects of four LL case studies with different leading institutions (university, industry, city and civil society) show specific features of social ordering while performing social contracts with regard to the leading institution. The cases result, on the one hand, in rather closed off spaces in which science and innovation for and in society is enacted by technology-oriented industry and university LLs. These are embedded in and solve set problems for society. On the other hand, in less confined spaces science and innovation with and by society is conducted in city and civil society run LLs. Here, a more communal contracting towards defining and solving societal problems is established. A reflexive approach to structuring and governing LLs in practice and a more robust theoretical foundation would therefore be beneficial.

Keywords: innovation, knowledge, power, infrastructure, contract.

Cite paper as: John, S., (2024). Living Labs: Knowledge Infrastructures to Forge a New Social Contract of Science?, *Journal of Innovation Management*, 12(3), 175-201.; DOI: https://doi.org/10.24840/2183-0606_012.003_0008

1 Introduction

The pressing problems and required transformations facing societies worldwide create challenges to be addressed in a scientifically sound and democratically legitimate way. The key question is: how to ensure sustainable and applicable solutions for today's complex problems? There is a broad consensus, that, for doing so, appropriate forms of innovation and thereby new arrangements and kinds of knowledge are needed. This can be generally shown e.g. in the debate about Mode 2 knowledge production (Nowotny, 2003) or on innovation through triple or quadruple helix models (Carayannis & Campbell, 2009; Etzkowitz & Leydesdorff, 1995).

Moreover, some of these ideas have been concretized in the notion of Living Labs (LLs), which emerged as a method and approach for knowledge production and innovation amongst universities, companies and public actors. In this paper, they will be interpreted as knowledge infrastructures (Bowker, 2017) for processes of collective problem-solving thereby (collaboratively) producing knowledge and stimulating innovation action. As a central novelty, they contextualise innovation in complex fields e.g. mobility and the energy transition, in their specific real-world environments and form concrete and stable sites with new alignments amongst the quadruple helix actors.

Considering that different leading institutions will (per)form alliances in specific ways (Leminen et al., 2012), it is likely, that unique and distinguishable (infra)structures emerge, when different

actors with their logics of action are heading the respective Living Lab. Negotiating relationships, entitlements, expectations and forming power structures between the partners are seen in this paper as performative processes of structuration for the emerging infrastructure. In other words: a social contract between the actors is enacted and performed. This contract must not be understood like a legally binding one. It is rather unwritten and vague, yet established and shaping the production of knowledge and innovation. Drawing from the debate on a social contract between science, as the most prominent source and service for new knowledge and society (Gibbons, 1999; WBGU, 2011), the linking between (infra)structuration and social contracting become apparent. They set and articulate rights and obligations between the contractors and assign roles and competencies to face grand societal problems. These are two sides of the same coin and should thus be analysed alongside.

The focus of this paper lies on social contracting in LLs. Neglected in favour of a processual focus by the literature, these structural aspects of performative establishment of order are important to understand for managing the LL itself, its internal workings and the relationships in knowledge and innovation related matters. The central thesis is, that different leading institutions heavily influence how *social contracts* or *constitutions of different Living Labs* are created and performed. This paper wants to inquire if and how distinguishable acts of social contracting are executed in knowledge infrastructures for innovation action by different leading institutions. If this is the case, which distinct forms can be seen and what implications for practical management can be derived? Pointedly, there are two aspects of management of innovation via LL. The first, is influenced by the structure and performative establishment of social order in LL. The second derives from the topic as well as situational actor constellations. By describing and analysing these processes of structuration and situational collective innovation action, conclusions for the management of innovation through LLs can be drawn.

Against this background, the argumentation is divided in the following steps. First, a conceptual and theoretical tool to analyse LLs as knowledge infrastructures and the performative social ordering in them has to be created, with regard to aspects of structuration and power. On that base, four Living Lab case studies, each with a different leading institution (university, industry, city and civil society), will be presented and analysed in a comparative way, leading to a discussion of the most prominent themes. The conclusion reflects on the questions of different structural designs of LLs and displays the two most prevalent approaches in the case studies and new contracts between science and society.

2 Living Labs as knowledge infrastructures for innovation

The following sub-chapters will discuss three distinct concepts leading towards a framework for the case studies. In a first move, LLs will be introduced. Second, a new and distinct way of viewing them as knowledge infrastructures for innovation is laid out. Third, the argument is focussing on concepts of power-relations and structuration allowing to more thoroughly analyse processes of social contracting in Living Labs. Fourth and lastly, a framework will be presented summarising the relevant angles, seeking to uncover processes of structuration stabilized by different forms of power.

2.1 Living Labs as new and relevant sites

LLs exist and are seen in a number of different ways, shapes and sizes, following different strategies and approaches (Backhaus et al., 2022; Fuglsang & Hansen, 2022). An overall agreed definition is not established, yet several papers attempted to define a set of characteristics (Compagnucci et

al., 2021; McCrory et al., 2020). In short and for this paper, Living Labs are places/institutions in a broad sense for the simultaneous (co-)production of knowledge and innovation through real-life experiments (Gross et al., 2005), pursuing a transformative agenda (Schäpke et al., 2018) and following a transdisciplinary or quadruple helix approach in a specific spatial context.

They can be seen as problem-solving tools, employing transdisciplinary and transformative methods to sustainably and responsibly (Grunwald, 2014, p. 274) solve grand societal problems and manage the co-production of innovation. Emerging in the late 1990s and early 2000s, both in the US and Europe (Leminen & Westerlund, 2019) mainly as part of a general trend towards open innovation (Chesbrough, 2003), a substantial part of LL literature comes from management and (collaborative) innovation oriented sciences. Here they are seen e.g. as open innovation networks (Leminen et al., 2012) or public sector innovation tools (Fuglsang et al., 2021; Leminen & Westerlund, 2017). Several studies on Living Labs and their impact on and utilization for collaborative innovation and knowledge co-production were brought forward (e.g. Leminen et al., 2016; Westerlund et al., 2018). Great attention was paid to the collaborative innovation and knowledge production *processes* in and through LLs, while the (infra)structural aspects have been neglected so far in the current literature. For this paper LLs are analytically split up into their experimental practices on the one hand and their (infra)structural aspect on the other, which is in focus here. To fill the gap in the literature, this paper interprets LLs as knowledge infrastructures, which allows for a deeper and richer analysis on the basis of literature from sociology and similar fields.

Often both the literature and internal documentation ends with the project, in recent years, efforts were taken on evaluation, impact, effectiveness and generalisation of LLs by different strands of research (Bernert et al., 2024; Bronson et al., 2021; Kampfmann et al., 2023; Paskaleva & Cooper, 2021; Wiefek et al., 2024). Internal evaluation of either pre-given or (collectively) established goals depend heavily on the structure, power relation and capabilities of the actors. Looking at the external impacts and overall evaluation, these usually consist of different indicators or areas. The structural view, including the leading actor is often overlooked but may be a suitable further criterion to consider. Another point for consideration is not a goal-oriented evaluation and assessment of impacts, but also the process-knowledge gained and possibly changed social order through LL projects. Here the focus of this paper and forthcoming framework is beneficial. At the moment, ideas for a standardised case reporting schemes for LLs are being discussed in the literature. Bernert et al. (2023) proposed a first scheme, which includes questions on the organisational structure, e.g. on leadership and ownership and collaboration. A deeper dive into the power aspect and processes of structuration resulting in social contracts would be beneficial in the reporting, for a better comparability in-between the cases and a more nuanced ground, including different social contracts for evaluation and impact research.

2.2 Knowledge Infrastructures as a new lens

LLs can be seen as a specific knowledge infrastructure, bridging the perceived trenches between science and practice for innovation and overcome the "European paradox" between knowledge production, its transfer and the commercial success of innovation (Conti & Gaule, 2011). Yet, cooperation between academia and e.g. industry as external actors is not a recent phenomenon. Universities have always played a vital role in technological development or innovation (Hulsink et al., 2007) and the resulting social transformation. The spin LLs add here is the promise of a more robust embedding of diverse needs and demands to solve grand societal challenges and relevant problems for a sustainable transformation (Schneidewind et al., 2016). In comparison to other knowledge infrastructures, LLs form an unusual type of infrastructure, in which set rules are

not yet established and a state of constant (re)iteration and customisation is needed. Analysing the modes of infrastructuring as a method for dynamic stabilisation, allows for examining the performative acts of contracting at the same time. Although the term *infrastructure* is occasionally used in the literature on Living Labs (Rose et al., 2019), an in-depth and systematic description of the understanding and usage of this theoretical lens is sparse yet relevant and needed (Jahn & Keil, 2016; Schneidewind et al., 2018). As they form the materialisation of social contracting, this allows unveiling relevant layers and points for consideration i.e. materiality, the linkage of different social worlds and logics of action as well as the internal organization and overall structure.

Edwards et al. (2013, p. 5) understands knowledge infrastructures as "robust networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds". LLs produce knowledge and innovation by possibly other means, i.e. different actors, spaces and methods and disseminate them to different audiences and with multiple purposes, for example practically applicable knowledge. In contrast to networks, LLs as knowledge infrastructures are seen in their material formation, their fixed contracts, funding, etc., making them, as Edwards says, robust and steady. Despite good insights e.g. by Leminen et al. (2012), classifying them as (innovation) networks, a pure analysis and view as networks would not be sufficient to cover their material and formalising aspects, which are central to this paper. In other words: a network is limited in the relation between the actors, the infrastructural angle allows to point as well on the material form and its embedding e.g. in the city or region.

Here and in other examples of establishing a new knowledge infrastructure, e.g. in specific forms of citizen science, the design momentum is apparent and important qualities can be implemented in an institutionalized way. In the words of Bowker (2017, p. 393): "it is a vast and complex social project of deciding which qualities to sink into the technical (by which I mean both the physical and the bureaucratic) infrastructure and which to assign to the knowledge producer, the academic". LLs are concrete sites of (re)ordering of socio-technical arrangements and possible futures through innovation. Bowker's view on these infrastructures is coined by an academic focus, these infrastructures are emerging in "complex and messy processes with inevitable involvement of academics" (Bowker, 2017, p. 394). The LL, although widely used in academic contexts, is also designed and used by non-academic actors. This diversity makes them prime examples of studying social contracting.

These infrastructures are built by actors from the quadruple helix model (Carayannis & Campbell, 2009, p. 203). Here different innovation networks and knowledge clusters lead to the "co-existence, co-evolution and co-specialisation of different knowledge paradigms and [...] modes of knowledge production and knowledge use as well as their co-specialisation as a result." The transdisciplinary alliances are designed and founded alongside the quadruple helix in LLs, which "operate as an open and dynamic research and innovation ecosystem involving solution developers (technology push), research labs and universities (knowledge and technology), local authorities and policy makers (inclusion and social wealth), and user communities (application pull)" (Compagnucci et al., 2021, p. 4). Previously neglected groups such as users, consumers or more broadly citizens, and public actors can be addressed directly as internal forces with valuable sources of knowing and even as initiators and heads of LLs. These insights strengthen the assumption, that different central actors perform social contracts for knowledge production and innovation action in distinguishable ways. While the metaphor of the helix suggests a balanced and symmetrical structure and thus relations between all actors involved, it is paramount to see the different forms of power and possible contortions manifesting in the social relations in and through LLs.

2.3 Power and structuration

Power needs to be addressed in a LL context both analytically and practically as it stabilises their performative ordering and hence social contracting. To describe different forms of power apparent in LLs, classic theoretical views and theories of power concerning transdisciplinary research (Fritz & Meinherz, 2020) can be used. The analytic categories of *power over*, *power to* and *power with* (Allen, 1998) appear useful for the task ahead. To fuse both aspects of power and structuration, Schneidewind's terms of *political* and *management power* will be added to the description in Table 1.

Table 1. Overview of different kinds of power. Based on Fritz & Binder, 2020; Fritz & Meinherz, 2020; Schneidewind et al., 2018.

Power over *Political power*	is asking questions about the presence or absence of power in a situation, e.g. by actively influencing decisions or actions of others (first face or instrumental power Dahl, 1957) or setting the agenda and covertly influencing decisions (second face or structural power Bachrach & Baratz, 1962). On a more structural level, questions on the shaping of norms, ideas and intentions (third face or discursive power Lukes, 2005) or the general construction of subject and subjectivity in a Foucauldian sense (fourth face or discursive power Digeser, 1992)
Power to *Management power*	describes the individual capacities to shape and form processes despite resistance. This is often described as empowerment or emancipation (Partzsch, 2015).
Power with *specific local context*	defines the collective capacity to learn and act. It is inspired by Hanna Arendt's understanding of power as the human ability not only "to act, but to act in concert" (Arendt, 1970, p.44). The specific local conext aims at utilizing the collective and locally specific momentum to generate an outcome communally.

This perspective allows for dissecting different kinds of power, yet the focus of this paper lies in their interplay and not just their classification. As power structures are mediating the distribution of resources in transdisciplinary research and innovation actions, they heavily impact on process of structuration (Giddens, 1986; Schneidewind et al., 2018). For Schneidewind et al. (2018, p. 14), "interpretative schemes and norms, as well as allocative and authoritative resources, are mobilized for real-world experiments" in LLs. These aspects form the modalities of structuration and are made up of power aspects in distributing the resources as well as other kinds of modalities. In order to yield empirical insights tracing the social ordering in LLs, a shift from the view of power structures stabilizing the social ordering towards covering all modalities of structuration is needed.

The established structures in LLs do not exist in isolation or independent of actors but are (re)produced through agency, where actors draw on rules and resources in social interaction (Schneidewind et al., 2018, p. 13). "Structure exists as knowledge about how things are to be done, said or written. Social praxis is based on this knowledge and the actualization of it" (Lippuner & Werlen, 2009). Actors, meaning human beings, have agency through motivation, rationalization and reflexive control of their activities and social and physical aspects of their context. The resources drawn from are either allocative (financial and civil society commitment) or

authoritative (political and/or management power). The introduced distinction between different kinds of power can help to better portray and analyse the structuration. For LLs, as places for knowledge production, the *research approach* and *methodology* are of high importance. Hence it is included in the framework under *authoritative resources*, as the kinds of power take effect there. Through communication between actors and referring to shared interpretative schemes, rules on the constitution of meaning are (re)produced. Here common understanding and its development of key concepts and terms, e.g. the problem defined and the innovation produced in LLs are negotiated. Actors "evaluate and sanction other actors' behaviour by making use of norms" (Schneidewind et al., 2018, p. 13). Norms form the base of ideas, standards, credibility and participations formats. They describe the rules of legitimized interventions and boundaries between experts and lay people. This also includes the (regional) culture and norms regarding openness and co-creation. The duality of structure is created through the actors and their intentions, and through the established structures, at the same time. This duality shows itself in the LL, where "scientists refer to rules and resources, that is, the modalities of structuration. At the same time, they try to change them in line with a sustainability-oriented transformation during their interaction with practice partners" (Schneidewind et al., 2018, p. 14). This aspect shows the dynamic processes of social ordering and contracting with regard to knowledge production and innovation. Hence it is essential to look at the structural and power level for a better understanding and educated account of its negotiation.

It is important to make the selected categories applicable to the contracting and infrastructure designing of LLs. To synthesise the structural and power view on LLs and add a workable framework to study them, the *interpretative schemes*, *norms*, *allocative resources* and *authoritative resources* were chosen. For a comprehensive view of the key terms for the combined framework, see Table 2. The categories must be seen in an interrelated way for a more nuanced and deeper understanding of localized forms of different power dynamics, social ordering through contracting and the resulting materialized form as research infrastructure for the co-production of knowledge and innovation. In its completeness they help to trace the various ways of structuring LLs.

Table 2. Structuration theory at a glance.

Interpretative schemes	Common understanding and its development of key concepts and terms, e.g. the problem defined and the innovation produced in LLs.
Norms	Base of ideas, standards, credibility and participations formats and boundaries between experts and lay people.
Allocative Resources	Financial and civil society commitment.
Authoritative Resources	*Research approach/Methodology, power over, power with* and *power to*
Research approach/Methodology	Setting the methods and drawing the boundaries for participating in the knowledge production and innovation design.
Power over/Political power	Actors and who execute the powers, deciding the basic aspects of participation in LLs and drawing system boarders.
Power with/Specific local context	Collective and locally specific momentum to generate an outcome communally and form new understandings and alliances.
Power to/Management power	Capacities of actors from research and/or practice to achieve their goals.

2.4 Analytical Framework

To study the question, how power relations and social contracting are stabilized and performed in LLs as knowledge infrastructures, questions related to actor dynamics have been developed for each of the categories. The comprehensive table with all categories and questions can be found in Table 6 in the appendix. The questions in the framework sometimes overlap and certain criteria are concerned with similar issues e.g. interpretative schemes and power over, yet they ask on different levels. While power over asks more about the actors and who executes the powers, the interpretative schemes help to investigate the underlying discourses and structures leading up to it. One is more concerned with the stabilization and the other with the performative structure.

The questions elaborated were specifically designed for Living Labs. To illustrate the framework and give a first impression of the leading institutions' characteristics, see Table 3. Here the general research aspects were applied to the leading actors' societal fields as a whole. This allows a first look on specialties of each actor and gives expectations for the following analysis of the four cases.

Table 3. Application of the framework to the leading institutions as a whole.

	Interpretative schemes	Norms	Allocative Resources	Authoritative Resources
University	Scientific rigorosity, academic expertise as criteria albeit inter- and transdisciplinary tendencies	Mertonian	Medium and expensive infrastructure, little to no civil society commitment	Self-governed agenda setting, new aspects through self-interest or political nudging
City	Election and constitution shape framing of issues and established discourses	Democratic participation	Big and expensive infrastructure, strong civil society involvement	Agenda setting through political discourse, complex and context-open strategy
Industry	Market logics and feasibility issues	Economic	Big and expensive Infrastructure, little to no civil involvement of civil society	Individualistic agendas and problem definition guided by demand, rather closed and narrow boundaries
Civil Society Organisation	Constitution and civil support shape framing of issues and discourses	Citizenship and involvement	Small infrastructure, much civil society commitment	(Small) collective agenda setting and problem definition guided by bigger political discourse, rather context-open strategies

3 Methods

In the following, I will give an overview of the methods used to choose, conduct and analyse the four case studies. Three examples were drawn out of the empirical work by the Living Labs Incubator. These insights are based on a screening and subsequent interviews of Living Lab initiatives at and around RWTH Aachen University. Their self-designation did not play a role in the screening, as proposed by Ballon and Schuurman (2015). Essential for the selection was the linkage with the RWTH Aachen University with a focus on sustainable transformation through a transdisciplinary attempt. The initiatives should have an observable orientation towards experimenting, application and learning embedded in a multi-stakeholder structure.

The resulting interviews were conducted between March and November 2021 and held due to the pandemic via Zoom. Additionally, one interview was conducted via Zoom solely for this paper with a LL led by societal actors. Lasting between 45 to 90 minutes each, the interviews were transcribed using AmberScript and a manual review and were coded using MAXQDA. Loosely following the qualitative content analysis by Kuckartz (2018), in which the interviews were first broken up into deductive main categories based on the interview guideline, inductive subcategories were established iteratively and assigned to the interview transcripts.

For the general method of comparing case studies, taken from Eisenhardt (1989), building theories from case studies is especially appropriate in new topic areas, such as LLs. Here, cross-

case comparisons serve as a database for patterns and differences amongst them. It forces the researcher to go beyond initial impressions especially by using structured and diverse lenses during the comparison (Eisenhardt, 1989, p. 541).

The cases were chosen with different institutions or groups in the lead, expecting different LL (power) structures and resulting *constitutions*.

4 Case studies and Analysis

This section further introduces the four case studies. The individual cases are presented with respect to each dimension of structuration processes in and though Living Labs and practices of contracting influencing the management of innovation through LLs. To avoid potential (public) criticism and respect their individually chosen attempts and structurations, the LL initiatives were anonymised. LL1-4 will be used instead of the real names with an additional mentioning of their leading institution. Two of the case studies consist of two different Living Labs with the same leading institution, yet they are similar enough in structure and power relation to be combined. This grands additional and more robust data to analyse the social contracting. Only the most significant findings from the analysis will be introduced to give a comparable insight into the cases. From here, theoretical and practical implications of the respective forms of social contracting performed in and through the created knowledge infrastructure in each case will be focused in the discussion afterwards. For clarity, tree different Living Lab layers: organisation, project and activities are considered.

Table 4. Overview of the four case studies.

Pseudonym	Leading institution	Topic	Duration	Funding
LL1	University	Autonomous and connected driving	2020 – 2022	11 Mio. €
LL2	City	Mobility and city development	2020 – 2021	N/A
LL3	Company	Sector coupling and energy transition	2020 – 2024	16 – 19 Mio. €
LL4	Civil Society Actor	Mobility and city development	2019 – 2023	3 Mio. €

4.1 LL1 University

LL1-university, led by the university, focuses its activities on establishing test rooms for autonomous driving and associated modes of communication. The two-year plan equips traffic lights and lamp posts with sensors for a digital twin and a test field. The project is research-intensive, involving leading players in mobility and telecommunications. With a transdisciplinary organisation structure, partners share a focus on simulation, data modelling, and autonomous vehicles. For this, actors from local and internationally leading players in the mobility and telecommunications sector and public authorities from the city and other street authorities joined the project.

While attempts are made to embed regional conceptions, citizen agency is limited. Although yielding feedback and ideas from citizens for general aspects of future mobility through workshops and a "festival of mobility" and collaboration with the city through its co-creation center, the

majority of LL activities in this direction were more seen as informative than collaborative. Civil commitment is planned for feedback and information, keeping systemic boundaries open to certain influences.

The city is seen as "the largest mouthpiece" of the project and responsible for PR but also in "building the V2X test field" (LL1 interviewee). The overall approach and norms the participation formats allude to is an unintegrated inter- and transdisciplinary design with a more technical and functional focus through several non-connected activities. The pandemic affected planned events like implementing an autonomous bus shuttle. The expert/lay divide is drawn along academic lines and credibility is based on formal expertise as the division of influence and power over assessing or altering the research focus and insights.

Real-world interventions involve equipping streetlights with sensors and computers and using the test environment with test cars. The organisation design enhances capacities for decision-makers and the university, facilitating data generation for research and developing digital twins and databases for autonomous vehicles.

4.2 LL2 City

The LL2-city case comprises two Living Lab projects (LL2a and LL2b) with a shared focus on social innovation for repurposing city spaces and a short implementation phase of nearly one year for LL2b and 6 months for LL2a, which was prolonged. Both organisations are city-led with varying regional and local partnerships. LL2a originated from mobility-focused clubs and was integrated into a larger mobility plan for traffic elimination and a circular cycle path by the city. LL2b was managed by a new city department serving as a point of contact for all people passing by, also offering discussion rounds and other measures to assess the public opinion about the actions. Motivated by a political program, both projects co-creatively developed agendas through interventions from various actors.

In both cases the motivation lies in a political program that needs real-world input to be further designed and implemented on a bigger scale. The key concepts, road closure and a larger cycle network, were city-driven, with additional activities organized by civil society e.g. weekly student beer gardens, sports classes, and cycling events. Communal experimentation in both LL projects aimed to explore redesign possibilities for city squares. The cases operated "interdisciplinarily" between city departments, the new city management office is an example of institutionalized interdisciplinarity. The unique interventions and direct feedback facilitated collective learning led to a final report with a number of feedback and recommendations and also critique against the initial design and activities conducted in the project. The city council and planners gave the final assessment of the projects, leading to a planning competition with criteria set by the LL in LL2b.

The structural aspects of both LL organisations were collaboratively taken with actors early in the LL lifespan. Open formats and low involvement thresholds allowed diverse groups to contribute. Expertise is given to citizens knowing "their space", different and non-academic expertise of arts, shop owners and others was acknowledged, influencing final recommendations. Credibility in redesign processes connected citizenship, private commitment, and democratic norms. Under these circumstances the organisation granted access to LL activities. Citizenship can be tied to democratic and open participatory norms on the basis of concernment to aspects of involvement and location of the actor close to the LL.

Open interventions provided opportunities for various actors to advocate for their goals. While the city sought diverse achievements, such as road closures with minimal public uproar, the overarching interest was in achieving long-term changes in traffic and improving inner city living quality.

4.3 LL3 Industry

LL3-industry comprises two LL projects (LL3a and LL3b), funded by the "Living Labs for the Energy Transition" program and operated by the same energy company, with funding amounts of 16.7 million Euros (LL3b) and 19.5 million Euros (LL3a). Their shared goal is sector coupling and heat transfer networks, alongside embedding and testing new technologies in quarters. LL3b focuses on creating a digital twin. The leading institution manages the innovation through the LL under market logics, and university institutes, energy companies and cities collaborated in proposal and planning, i.e. defining the problem and the research or implementation design of the project. It can be assumed, that the organisation leader, in this case a private company, can finally assess and approve the proposal yet not work totally on their own and set the design.

Structural involvement of civil society differs. This is generally seen in a more quantitative way in comparison to other LL projects, e.g. through standardized questionnaires, conducted by the university partner in the case of LL3a. Especially in LL3b, acceptance is also mentioned as a reason for these measures. There is a possibility to co-design the agenda outside the organisation, but the process is formalized, hence the issues are filtered through certain structural levels and decided by the consortium and is bound by the solution approach. LL3a has a political and citizen advisory council, providing external corrective feedback. The first consists mostly of members of ministries and local mayors. Both organisations tend to invite established actors, fostering collaboration between businesses, universities, and local politics. This is an attempt in creating a context-open project and for external factors to be discussed in the LL. The factors are assessed on a higher and political level by the political council. Linkage and envisioned opening up to context in lower levels and with the inhabitants is done through monitoring, surveying and few workshops.

The expert/lay division is evident, with real-world interventions regulated and conducted by (academic) professionals. The LLs are influenced by a business mindset, emphasizing the establishment of new business models, particularly the shift from energy consumer to "prosumer". LL3a invites participants with regard to financial and economic sustainability and feasibility and less with ecological or democratic aspects. Invitation to participate as a homeowner in a pre-existing quarter i.e. to let sensors be installed, is accompanied by promises of heating and energy analysis and potential savings.

Both LL projects adopts a transdisciplinary approach, focusing on industry and politics. The political advisory council exemplifies collective learning, bridging insights from research and practice to formulate political recommendations. The understanding of problems deepens through collaboration, resulting in a new political understanding formed by diverse actors.

4.4 LL4 CSO

LL4-CSO, led by a civil organization, focuses on city development and mobility under elevated subway tracks for cyclists. The four-year plan aims to co-creatively establish a 200m test field as a method for renegotiating the unused space. The project is bottom-up and less institutionally bound, allowing open discussions and propositions, e.g. exact arrangement, possible greenery and other features are open for discussion and propositions by all involved and invited actors. Initially started by a civil society organization, it transitioned into a non-profit company with 3.3 million Euros in funding, partnering with state and district administration and state-run companies for social innovation.

Methodology and agenda setting involve inputs from stakeholders, including residents, clubs, and initiatives. The advisory council, chosen by the leading institution and comprising 14 individuals from various backgrounds, plays a role in assessing the outcomes. All other activities are open invitation and should attract a diverse group of people and initiatives. This is ensured by translating

flyers and invitations in up to five language, as the area of the test field is multicultural. Initiatives and ideas stemming from participatory methods e.g. workshops can and will be added to the projects scope. The LL also uses a randomized invitation method for hosting the first round of citizen workshops. Here preliminary expectations and design choices are co-produced and assessed by planners afterwards.

The project envisions collaboration for upscaling the test field and general transferability. While the project's scope is fixed, it remains open to additional ideas and input from invited actors. The LL project serves as a platform for interacting with official institutions, with the final decision resting with the leading initiative. Though initially focused on mobility and cycling, the project aims to integrate aspects of mobility and city development, challenging established institutions and practices. The tripartite goal includes realizing the test site, scientific assessment, and a new idea of citizen participation. Key concepts focus on ecological sustainability and democratic participation, challenging existing norms and practices.

Despite strong involvement from initiatives and clubs, the evaluation is primarily conducted by traditional and academic experts, slightly maintaining a structural expert-lay divide. Open formats and workshops facilitate collective learning and bridge-building among various actors, discovering new knowledge areas. From this angle new knowledge areas are discovered by different actors from the LL organisation in terms of institutional logics, permits, laws for cycling tracks, traffic lights, etc.. As a citizen initiative, LL4-CSO provides an opportunity for other groups to co-design the test field and shape a potentially upscaled model. It serves as a structural home and example for achieving respective goals.

5 Discussion

Based on insights in the four case studies, the following discussion focusses on the similarities and differences, led by the question how the establishment of structure and the power relations took place. Drawing from the practices laid out above and observations how the initiatives structure and stabilize themselves, the discussion portraits four central aspects in contracting and innovation: *creating focus*, *creating figures*, *creating facts* and lastly *creating contracts*. From here, also practical implications to enhance the managerial value of the case studies and for practitioners are derived, as the analysis of structuring and subsequent establishment of a social contract with deviating opportunities of participation and unique infrastructures heavily influence the management of innovation through LLs.

Creating focus

All initiatives address a specific problem, of which the general area was pre-given by funding institutions or political actors, and enact one or multiple solutions. The practices of creating that focus and its structural embedment are of interest here. The process and participation of defining the problem and solution vary between cases. Sometimes these are pre-defined through a political program and the LL's task is to demonstrate and design them further. Other times the idea and solution predate the funding. The method to create solution strategies is to pose open questions and create points of contact for actors to react and answer to them.

The discussion in the city and civil initiative includes smaller forms of asking "how can and should we redesign (unused) space, squares and subsequently the city" through scaling up these solutions designed and accepted in the LL projects. As LL2-city accounts its "ice breaker" role in opening up heads and demonstrating possibilities, the city and the industry case study are

Table 5. Summary of the case studies along the framework themes. The *Authoritative Resources* consist of the individually analysed points below it and are too complex to display it in the table.

Framework themes	LL1 University	LL2 City	LL3 Industry	LL4 CSO
Interpretative Schemes Common understanding and its development of key concepts and terms, e.g. the problem defined and the innovation produced in LLs.	Autonomous driving and its communication and infrastructure aspects as a technological challenge	Rededicating central spaces in the city through changes in the traffic and implementation in bigger political plans	Heat and energy transformation in local quarters through technological innovation in heat, power and IT aspects	Repurpose unused spaces in the city through new infrastructure and social innovation.
Norms Base of ideas, standards, credibility and participations formats and boundaries between experts and lay people.	Unintegrated inter- and transdisciplinary design, academic credibility	Citizenship, democratic and open participatory norms	Financial and economic, academic credibility	Citizenship, democratic and open participatory norms
Allocative Resources Financial and civil society commitment.	Medium financial commitment	High civil society commitment	High financial commitment and political involvement	High civil society commitment
Authoritative Resources (consist of the individually analysed aspects below)				
Research approach/Methodology Setting the methods and drawing the boundaries for participating in the knowledge production and innovation design.	Unintegrated inter/trans-disciplinary approach for R&D	Open yet controlled environment	Controlled setting for R&D and roll out	Open for workshop and randomized input

Table 5. Summary of the case studies along the framework themes. The *Authoritative Resources* consist of the individually analysed points below it and are too complex to display it in the table. (continued)

Framework themes	LL1 University	LL2 City	LL3 Industry	LL4 CSO
Power over/Political power Actors and who execute the powers, deciding the basic aspects of participation in LLs and drawing system boarders.	Consortium and University as lead	Civil society and city at the end	Consortium and industry as lead	CSO and civil society with organization as main actor
Power with/Specific local context Collective and locally specific momentum to generate an outcome communally and form new understandings and alliances.	Collaboration between city and industry	Direct feedback and strategy by the city to test and redesign the city	Collaboration between city and industry	Co-creation and new alliances within the city
Power to/Management power Capacities of actors from research and/or practice to achieve their goals.	Shared goals achieved	Mainly political and shared goals achieved	Controlled and shared goals achieved	Main goal set and open for collaborative enhancements

following a political program and articulate further possibilities of its implementation through the LL activities. For the city this means redesigning the traffic and inner-city quality of life, for the industry, the energy transition and relative technology openness so far by politics. Hence the basic question in both is not what all actors combined should do about the problems, but how to design and implement the chosen solutions. In the city and civil society led LLs the findings from workshops and the concluding results are presented to professional planners, in case of LL2b-city via the city council. LL4-CSO and LL2a-city leave the agenda for designing the solution more open in comparison to other cases. Difficulties to measure outcome and no standardized routines unlike more technically focused LL factor in this approach towards solution and problem design.

In comparison to that, the more technology-oriented case studies reduce the discussion of problem and solution towards feasibility and questions of ability. Here albeit the partial integration of co-creative methods, the main focus lies in acceptance, putting other questions outside the frame of the project. Yet in the LL projects with university and industry in the lead a transdisciplinary consortium co-authored the proposal during a long time period, or the actor constellation had previous similar projects in which the LL is rooted thematically. They tend to be more bound and structured by actual contracts, influencing the possibility participation in shaping the problem and solution. Here the focus lies on intellectual property and establishing possible business models, hence more accounts were given on contracts and agreements that shape the LL in all layers fundamentally. This step is organizing the question of ability to solve a predefined problem with a given solution and utilize further aspects that were found in the implementation or demonstration of the chosen technology.

For a more streamlined approach and clear focus, it is crucial for the management of LLs and its innovation and involved actors to discuss the focus point of the project i.e. finding or enacting a solution between which are many possible LLs designs and goals. Both poles can benefit from involving users/lay audiences. The first one benefits from an open/user innovation (bricolage (Garud & Karnøe, 2003)) strategy in pooling ideas, while the latter lowers problems of public acceptance through incorporating users.

All LLs are interested in scalability or serve as a demonstration or use-case, yet set different emphases on questions of ability, ought and will (Böschen & Sigwart, 2020). The main problems and solutions are structured in the funding request, structural differences occur in the flexibility and openness of designing and fine-tuning the objective in the LLs. Practices vary from open invitation workshops with the opportunity to address and incorporate different areas to informing citizens after enrolment.

Creating figures

In all Living Lab case studies research, assessment, reflection for evaluation and learning are mentioned and envisioned. This leads to the question how reflexive the initiatives are and to what end, e.g. if the agenda and approach is challenged. In other words: which opportunities and types of power are available for which contract partner?

All LLs contain at least one actor from the university or broader science. Their specific role, significance and function varies between the case studies. Science and university actors can be used as an "add-on" for surveying and empirical data collection and its analysis. There are also examples of LL projects in which research and data is conducted without scientists, e.g. the city and civil led case studies survey themselves and assess the data collected through workshops and feedback interviews. Here other alliances with university actors were established e.g. in an advisory role or final evaluation.

Reflection and evaluation for projects is usually done in reports, following a classical project logic. LL projects hold the possibility to assess the outcomes in real time and by multiple actors in- and outside of the project. The process of co-evaluating the insights within the project is done in a few examples, e.g. citizens could evaluate the interventions at the city square. Only the city LLs reports on several citizens criticizing the agenda and solution, being included in the final report for the city council. Yet no LL accounts for a possibility to truly question the agenda after its engrossment early in the process. It might be open to invited members of the project consortia, but not actors later in the process due to path dependencies, funding restrictions and no structural consideration. For longer evaluation and measurement of effectiveness of LL, the aspect of social contract and power-structure of LLs need to be emphasized in more detail, as the findings show different forms of social contracting and hence innovation action within the LLs. This means as well, that innovation management measures have to ensure the fit of evaluation schemes chosen for the social contracting form in the respective LL.

Reflexivity is tied to the grades of opening or closing the LL for contexts. Here the freedom of changing the agenda and reflexively questioning it is given, but in clearly defined borders. Even the non-project organized LLs show a pressure for creating solutions due to a political imperative. The structural logic of research projects with previously defined outcomes, methods, etc. is further hindering the possibility of reflexivity. Hence failure and radically changing the agenda set by an exclusive range of actors is not a viable opportunity for the LLs.

As a practical measure or implication from these case studies, it would be beneficial for non-academic and non-profit actors to receive a form of funding in the planning and proposal state as well as in an obligatory co-evaluation phase, including a case reporting scheme with consideration of structural and power aspects and their formation. At least partially, a change regarding a paid and assisted proposal phase is seen in recent calls for LL funding. This can ensure a more reflexive start of the program, easing questions of altering the agenda and allows for a more robust evaluation of results leading to better innovation results and aspects of scalability.

Creating facts

Facts here is meant in a specific way. It is concerned with (epistemic) authority and legitimacy i.e. that a fact, innovation and infrastructures presented and set as final and irrevocable (German: *Fakten schaffen*). All LLs implement real-life interventions and experiment with existing infrastructure, e.g. roads, energy grids and heating. These alterations happen in the lifeworld of residents and affect a number of people. The question remains in how far the LL is democratically entitled to alter previously developed and create new socio-technical arrangements and innovation for a lasting time. Permits are given by the city or other respective authorities, yet in what way is the direct legitimatory aspect reflected by the LLs? In other words, the question can be understood as drawing boundaries between internal and external factors for LLs and how the new knowledge infrastructure for innovation action is legitimizing itself.

Within labs by the city and the civil society with prevalent democratic and participatory norms, these questions are the subject of feedback talks, workshops and the overall strategy, yet all case studies analysed tend to understand themselves as demonstrators of feasibility in which these political questions of legitimacy were not mentioned. The legitimation is pre-given and seen as an external factor and not a major concern for LL projects and activities. For some case studies acceptance and legitimation tend to become subjects after the changes are made. One LL project concerning the energy transition held citizen and resident events for informing the public after the new network, sensors, etc. are built and the quarters are ready for usage. Most LL activities draw on broad political decisions for legitimation. The points of friction, where broader political

questions can be discussed are mostly excluded and set as a prerequisite, either as a direct political decision or funding program set by ministries. The problems are therefore reduced to questions that focus technical ability and innovation action. This communal neglect might be rooted in the prevailing logic of projects through which LLs are funded, including the missing financial, personal and temporal resources. Similarities to traditional scientific laboratories in which not nature but an extracted and specifically modified objects allegedly free of context and entanglements are analysed can be seen.

Yet there are different points of focus and what are considered factualities. These connect to the approach and therefore leading institution of LLs. Confirming the point of Böschen et al. (2021), a loss of control, happening in open processes of establishing and questioning legitimacy, by scientists having the authority over knowledge related matters but also leading institutions overseeing the structure of LLs, is seldom seen and democracy is stimulated in the majority of case studies. In other words: the existing social contract with classical division of roles and legitimation strategies is often just expanded into the real world and not addressed specifically within the institutions. A closer look is presented in the next subsection.

Implications for practitioners include directly addressing the existing political aspects of the LL activities and innovation stemming from these fields. This ties to the inclusion of diverse stakeholders mentioned in the previous aspects. LL projects, organisations and activities can be used as novel infrastructures to co-produce knowledge and innovation while simultaneously acknowledging the specific surrounding and implications of the change they bring. Funding for LL projects may include not just a review in terms of content but also regarding structure and democratic legitimacy. Context sensibility measures is further helpful in embedding the LL organization and activities to the surroundings. As an example, LL4-CSO was operating in a diverse and mixed area of a city, therefore they translated brochures and handed out invites in up to five languages, to allow people with different backgrounds to participate.

Creating contracts

Central to the previously given answers is the question how social contracting is performed and stabilized under diverging surroundings. As this study aims at analysing LL as knowledge infrastructures, the notions of *innovation/design for, with and by* users were chosen in accordance with the descriptions by the EU programs *science in/with and for society*.

"*Design for* denotes an innovation approach where user involvement is limited to passive user feedback, [...]. *Design with* denotes an innovation approach based on co-creation, as users and manufacturers work together in an iterative manner, where the locus of innovation can be seen as shared between both involved actors. *Design by* refers to an innovation approach where users innovate themselves, which is in line with the Lead User-approach and the CAP, as the locus of innovation resides with the user" (Schuurman et al., 2015, p. 9). The EU understandings stem from different flagship funding programs, emphasizing the idea of the societal contract of science by the European Commission. Combining the terms leads to a good description of the result of contracting and innovation happening in LL projects.

As seen, there seems to be a dichotomy between the city and civil society led LLs and the industry/university ones. This holds also true for the performed contracts. The two emerging practices of social contracting can be depicted as *science and innovation in and for society* and *science and innovation with and by society*.

In the more technical case studies, there is a tendency towards management of innovation through LLs by implementation and a stronger centricity on solution and usability. Here LL actions are seen as a room of visioneering and transfer of science and early technology to application

with consequential modes of decontextualizing and narrow borders of the labs' perimeter. The organisations focus on questions of technical ability and seldom show aspects of participation. They tend to have a more closed down (Stirling, 2008) and less flexible infrastructural design partially because of their expensive technology infrastructure. Political questions are put outside the scope of the lab, so the contract prevalent in them is not discussed and often transferred from other sites. Inclusion of partners happens on the normative foundation of questions of ability. The practiced transdisciplinarity is first and foremost targeted at the triple-helix i.e. a cooperation between industry, university and government. Actors from the unorganized civil society are rarely found and included. Civil partners are mainly coming from the city or public administration. The initiatives drive the technological development and lean on grand political decisions and guideposts for legitimacy. The resulting social contract setting and its related expectations as well as obligations on science and innovation can be described as *science and innovation in and for society*. "In" depicts the localization of LL activities within the existing real-world and the changing socio-technical arrangements they bring on the one side and the service idea, the transdisciplinary collaboration with industry and government for societal development steered by these actors in the LL organisation on the other side. "For" means that resulting contracts are more contract work than open collaboration. The users/citizens are used for feedback and asked for acceptance. The shift towards embedment in the real-world and practical and non-technical or academic partners is new.

In LL2-city and LL4-CSO the focus on solutions is less pronounced and shows a higher degree of freedom in designing it. The LL activities yields a space for trying out solutions and opening up ways of thinking also in drastic ways. It is at the same time under the tension to show the feasibility of political plans. In incorporating diverse actors also from the unstructured civil society in the organisation and activities, they legitimate themselves and produce more or less actionable political programs i.e. climate adaptation or mobility transition. The notion of citizenship and self-determination are guiding the processes of in- and exclusion. Political questions are central in this environment, yet they are still externalized to a certain extent. The main focus still lies on questions of ability, e.g. how can a certain public space be rededicated, and will, e.g. what do citizens want in the rebuilding of the city and its traffic system. The resulting social contract can be described as *science with and by society*. "With" means the strong transdisciplinary collaboration between different actors (and science) for knowledge and innovation. "By" describes the (self)empowerment of the public conducting Living Lab projects and producing politically relevant knowledge and innovation for problem solving also with little to no academic partners. Here a form of tacit and practical knowledge for usage and redesign of city spaces is produced without a traditional scientific actor and enabling citizens to actively shape the LL and become part of research in a transformative manner. This goes along with relevant challenges for the management of innovation through LLs, e.g. the requirement to be set-up in a way that the empowerment of citizens is given a relevant space. Moreover, innovation management in this regard should put an emphasis on opportunities for stimulating social and collaborative innovations.

6 Conclusion

To better understand LLs as a means for collective problem-solving, it is important to analyse the formation and performing of social contracts therein. Doing so, the focus has to be laid on the power relation between the actors, in other words: the *constitution* of the respective LLs. The framework and idea to interpret LL as knowledge infrastructures and social contracting as an outcome of specific power relations between the actors in LL, which is performed in the created

knowledge infrastructures, showed success in unveiling and understanding the structuring, giving forms to the variety of social contracts and innovation angles in LLs. It could serve as an analytic tool for other cases and, if advanced, for assessment and (political) evaluation of these institutions or in their establishment process. As mentioned, the framework and insights from this comparative study can and should be used in assessing LLs both from a political and funding evaluation, as well as a criterion for impact and effectiveness studies of LLs. Also, ex-ante considerations, i.e. what expectations and possible LL structure are envisioned, possibly impacting the results and making it a more effective infrastructural tool to achieve certain goals.

In terms of limitations and future research, highly specific empirical data, especially from ethnography/participatory observation is needed, at best beginning with the first meetings of interested actors, to accurately trace the aspects of contracting in the meetings and proposal stage. This allows deeper insights and a more thorough analysis of the topics emerging in LL organisations and activities concerning their power structure and performative contracting. Further limitations of this study include the case dependency, which does not allow to frame generalisable types of contracting. For now, the main findings show a division between city and civil led institutions and case studies with a technology focus.

City and civil led institutions address citizenship and work in rather problem oriented ways, granting open ways of participation for interested actors outside the project. They practice a way of contracting that allows *science and innovation with and by* society. The cases are more concerned with political aspects of the Living Lab and use participation as a politically legitimate way to alter existing arrangements.

In the technical case studies, emphasis lies on project and managerial logics and the refinement of technical solutions and innovation. The LL projects focus on questions of technical ability and have closer boarders for participation and organisation. The resulting contract can be subsumed as *science and innovation in and for* society. These case studies focus on the epistemic and technical aspect of LLs for a scientifically sound transformation envisioned by politics outside their perimeter.

Both deal with established goals, yet the exact solution and agenda are defined in different manners as well as aspects of demonstrating possibilities and feasibilities with varying intensities. All show a strong transdisciplinary attempt yet the invited partners and inclusion into the helix differ. While LL2-city and LL4-CSO focus on civil actors and the unstructured society, LL1-university and LL3-industry focus on governmental and economic partners. In all cases, co-design and inclusion of partners outside of academia on the basis of different norms and guiding principles can be seen.

All in all, multiple social actors strive for a new contract between science and society and innovation, not least due to the societal challenges increasingly perceived as urgently requiring attention. However, LLs display a rather incremental change in the relationship between science and society. This indicates the possibly yet un(der)used opportunity for new social contracts amongst the actors. An impeding structural aspect for deploying a more reflexive and inclusive LL design and possibly accelerating the transition is the project structure of LLs. Especially in research the funding criteria generates path dependencies, pre-gives solutions and agendas and hinders a deeper reflexive engage with the real-world surrounding. These internal logics, solutionising pressure seldom harmonize with the necessary flexibility of Living Labs.

What should follow from the insights elaborated above and where to go from here? For establishing LLs, several points should be considered on a management level based on the insights from this study. First, it is important to name and reflect constellations of power. LLs as a different research infrastructure allow for new approaches and re-evaluation of implicit power relations. Especially for the leading institutions it can be of high relevance to assess asymmetries

and overcome potential forms of social contractings that might be unbeneficial for achieving the project goals. Geus et al. (2023) insights from a "transformative power lab" offer guidance for this process. Additionally, the field of science and technology studies in general stresses the importance of analysing the internal political characteristics of research approaches and methods, which are usually seen as neutral. Having a focus on them as an authoritative resource can assist opening the transdisciplinary perspective most LLs aim at. To realize these points, funding for non-academic and civil actors during the proposal state would be beneficial to ease the threshold of inclusion and allow a broader agenda to get formed. Further, understanding LLs as an research infrastructure and decoupling it from a unique experimental practice allows for long-term funding, more reflexive set-up and possibly multiple real-world experiments conducted through a single lab (Parodi, 2023), as is the case in the natural sciences, where LL takes its rhetorical inspiration.

Lastly, regionality plays a crucial role in two ways. First, a better embedding into and awareness of the regional innovation culture can lead to more robust and better knowledge and innovation. Second and intertwined with the first point, places with prior LL experience and appreciation shape the *power with* and the *specific local context* and thus ideas of social contracting. This can be beneficial if continued, but may also hinder differing constitutions. To highlight regional aspects, a comparative study between thematically similar LLs in different locations, combined with the aspects discussed in this paper, is desirable future research. Finally, and to fully acknowledge the interdependency of political and epistemic aspects and address them in a structured way, emerging and future LL organisations should establish (power) structures that combine aspects of both types of contracting I found in the case studies. This may yield better and more refined LL project outcomes, more tailored and embedded knowledge about problems and possible solutions, a political program and improved collaboration and coordination across societal spheres.

LLs can serve as spaces of (contrasting) descriptions and transformation of reality, negotiation of problems and required knowledge. In other words: breaking the distinction between politics and scientific facts and establish a place for Dingpolitik (Latour, 2011). These projects can form an arena in which the particular *thing* is in focus, approached from different angles. The fusion of different approaches is allowing to think things holistically and in a connected way instead of a fixed and divided one. The negotiation and establishment of knowledge infrastructures as described and analysed in this paper can lead to a better (self)reflexivity and assessment of Living Labs to balance the goals and strategies they individually pursuit with the democratic and normative aspects of a new social contract between science and society in finding solutions to grand societal challenges.

Acknowledgments

I first and foremost want to thank my colleague Julia Backhaus for giving valuable input and editing, as well as my supervisor Stefan Böschen for his constructive feedback. Additionally, thanks to the anonymous reviewers for their input and enhancing the quality of this paper. Last but not least, thanks to Anne Koppenburger for opening the topic of infrastructures to me, and the whole LLI/HumTec team for their support.

This paper was funded by the Measure 5 "Collaborate in Living Labs" under the Excellence Strategy of the Federal Government and the Länder.

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8 Appendix

Table 6. Framework for structural and power analysis of Living Labs, based on Schneidewind et al. (2018) and Fritz and Meinherz (2020).

Interpretative Schemes	Norms	Allocative Resources	Authoritative Resources
How are the key concepts defined and by whom or which method? Which criteria, norms or discourses guide the decisions of in/exclusion? How do ideas and norms shape the framing of issues and agendas? To what extent do the process and its results question established discourses, institutions and practices? Was the problem area or solution found or changed in the process?	Which actor holds credibility in what field and how is this established? How is the expert/lay divide defined and who draws the boundaries? To what norms, ideas, or standards do the participation formats allude? Which actor is legitimized to create real-world interventions?	How much money or time is available for the LL? How much civil society commitment is planned? What is the size and geographic scope of the LL?	Political Power/Power over Who decides who gets to participate and who influences this decision? Who defines the scope of the LL and draws the boundary between internal and external factors?
Specific local context/Power with What new project goals and understanding of problems emerge in the process? Which new collectives, discourses or practices emerge? How is the local culture regarding co-creation? How do actors from research and practice build bridges across different types of knowledge and learn collectively?			Research Approach/Methodology Who sets the agenda of the process? To what extent do structural conditions circumscribe the issues which enter the agenda? Which actors define the problem to be assessed and the research design? Which actors decide who is or is not invited to participate and set the terms and conditions for how participants interact?

Interpretative Schemes	Norms	Allocative Resources	Authoritative Resources
			Management Power/Power to How does the LL enhance the capacities of actors from research and/or practice to achieve their goals?

Biographies

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CRediT Statement: Conceptualization, Data curation, Formal analysis, Methodology, Writing - Original draft