93. Real-world labs and Living Labs

Abstract

Sustainability research has turned more experimental since the 2000s with an increasing number of transdisciplinary laboratories. The Real-world Labs as a specific Mode 3 research setting have tendential similarities with, and differences from the older Living Lab approach. In Real-world Labs, researchers and practice partners cooperatively initiate and conduct sustainability transformation experiments. Living Labs' multi-stakeholder and multi-method approach strongly relies on iterative methods in protected niches off the open mainstream focusing on technological development. Both operate in (geographically) defined experimental real-life contexts as hybrid science-society interface entities with reflexive learning elements, co-productional design ambitions and strive for transferability. Real-world Labs, as incubatory *institutions of change*, stand out for their normative frame (sustainability maxim), quest for societal impact, and strong transdisciplinarity. Living Labs excel at developing products and services for public or private benefit, with lesser regard for long-term consequences. Recently, boundaries between both became blurred either through increased integration of each other's characteristics or definitional vagueness.

Keywords

Real-world lab; Living lab; Transformative research; Transdisciplinarity; Sustainability research, Participation

Real-world labs

In the pursuit of accelerating and extending sustainability transformations, an experimental turn has occurred in sustainability research since the 2000s. Around the globe, more and more transdisciplinary laboratories are established in real-world contexts, which foregrounds experimentation for more sustainability (McCrory et al., 2022). However, in Germany, a specific form of transdisciplinary experimental lab was developed during this time: Real-world Labs (RWL, in German: *Reallabor*). They are places and incubators to develop and research sustainability solutions, or, in a nutshell, to experiment and examine desirable societal futures with scientific means. The concern for a good, humane life for all today and in the future and corresponding efforts towards sustainable development are key motivational drivers for RWLs. They approach these innovation and transformation processes from an inside perspective involving the researchers as part of the change gaining their knowledge from an actively participating perspective. As "institutions of change" RWLs are intended to support, research and accelerate the "Great Transformation" of settlements in particular (WBGU, 2016). Parallel to the conceptual debate, first proto-RWLs emerged, such as the *District Future – Urban Lab* (District Future, 2023) in the early 2010s. Meanwhile RWLs have developed into a mode-3 research format in their own right that methodically condenses and practically concretizes transformative sustainability research.

Etymologically, the term "Real-world Lab" merges *reality* and *laboratory* and thus points to an immanent epistemic tension between, on the one hand, the highly controlled environment of a laboratory serving as a stringent framework for the production of knowledge out of delimited experiments, and, on the other hand: the "real world", the non-academic everyday practices full of complexity and contingency. From a content and conceptual perspective, the recent notion of RWL still remains open to interpretation. However, a widely shared sense of what RWLs are has emerged in theoretical and practical discourses: RWL describes a transdisciplinary research and development facility and setting that serves to conduct experiments in a spatially delimited societal context, initiate transformation processes toward an increased sustainability, and support scientific and societal learning processes respectively (Parodi et al., 2017, p. 80).

Historically, they originate from transformative sustainability research. The concept modifies different older lab-ideas – including Living Labs – and dedicates them to sustainability transformation. Ideally, one would only speak of a RWL when all core characteristics (see Table 93.1, first column) are met. The development of RWLs as hybrid entities at the intersection of research and society ties in with different, partly convergent schools and currents in science and society (Parodi

et al., 2017) that build upon many strands of discourse and practice, some of them decades old (JPI Urban Europe, 2023) and whose combination bestows RWLs their novelty and originality. In general, they are in the tradition of those forces of inter- and transdisciplinarity that try to broaden, renew and reform research and science (Bergmann et al., 2021).

In order to achieve impact, RWLs must be based in everyday life settings and are therefore context-bound. This in turn makes it difficult for them (though not impossible) to generate transferable knowledge. For this, comparative cross-cutting research is needed. RWLs can be set to explore a wide range of issues, e.g., regenerative energy supply, socially responsible environmental protection, sustainable consumption, climate protection or the sustainable development of a city district. The crucial common aspects in how RWLs are realized is that researchers and (other) societal actors proceed transdisciplinarily and cooperatively, they learn from each other ideally since the early moment of co-designing the agenda, reflexively minimize risks, and jointly contribute to, or co-produce a culture of sustainable development (Bergmann et al., 2021).

Living Labs

Living Labs (LL) have a much longer history than RWLs, with forerunners in action research, the Scandinavian participatory design methods since the 1960s, social experimentation in Europe in the 1980s and the Smart Cities movement from the 1990s onward. Nowadays the term "Living Lab" is used for a huge variety of experimental settings for the co-production of knowledge especially in the field of human-technology interaction which hardly allows for a consistent, universally valid definition.

In their early phase, LLs were rooted in computing, especially in business-driven experimental electronic settings of human-computer-interaction, and are still today prone to strong ICT involvement. At first (phase 1), their very dense digital and technical instrumentation in artificial, controlled and isolated "techno-human ecosystems" aimed at developing and testing products and services in presence and with collaboration of dedicated users. Later experimentation (phase 2) occurred with less standardized methods and protracted duration outside the tight hull of ambient intelligence-supported home labs. Then (phase 3), the multi-stakeholder digitalized cities concept evolved mainly in the US, western Europe and Japan. It involves users, politics, and business and focuses on larger scale tasks such as city infrastructure and related data flows where technology functions as catalyst for users' innovative participation – much less vice versa. A veritable "global movement" of LLs arose, whose strongest drivers were big companies and the European Commission as well (Leminen & Westerlund, 2019).

These "classic" LLs appear, in the majority of cases, to be a scientific methodology and setting, strongly relying on iterative methods. They work in protected niches off the open mainstream with a focus on technological product development, innovation acceleration and upscaling, rather than on promoting a broader (urban and societal) transformation, and, typically, several or many of the following notions can be associated with classic LLs: production and consumption; technology; innovation; business case; value-chain; economic returns; research and development; marketing; roll-out; prototyping; utilizer; commercialization; public-private-people partnerships (4Ps), etc. The knowledge production in such LLs primarily serves science and business, i.e., (only) indirectly society. Their multi-stakeholder and multi-method approach contains co-creation and participatory elements, focusses in real-life environments on artefacts, and is user-centered, but generally lacks stronger overarching normative orientations (such as sustainability) and does normally not involve citizens in early agenda-setting activities. Elements of teaching and learning repeatedly accompanied LLs but technology and business issues have long predominated, and still do so in many cases today.

In the last decade "new" forms of LLs like *Urban Living Labs* or *Sustainability Transition Labs* have increasingly taken up aspects of sustainability and intensive participation, widening the range of LL approaches considerably (Zalokar & Vaittinen, 2020). In these more recent approaches, the focus on technology became (relatively) weaker and social aspects progressively more important.

Even though the LL concept has evolved over the decades becoming methodologically more differentiated and broadening in terms of content, still today LLs can be found in all

shades. For all of them five important characteristics apply: (a) active user involvement, (b) real-life setting, (c) multi-stakeholder and (d) multi-method approach, (e) co-creation (ENoLL, 2019).

RWLs and Living Labs in comparison

LLs and RWLs are part of a bundle of existing co-creative and experiment-oriented settings ("labs") and are closely related to each other. A strict definitional separation can be difficult in many cases, but the following comparison can illustrate *tendencies* that are shown in Table 93.1. Of course, in the recent past the lines between both (which had never been drawn too neatly anyway) became increasingly blurred because either RWLs are (out of convenience) subsumed under the internationally more widely known notion of LL, or because LLs assumed effectively characteristics of RWLs and vice versa. Some of these "new" LLs, in particular Urban LLs and Sustainability Transition Labs put their respective emphasis on urban or sustainability context. What remains: In LLs, technological topics and drivers continue to play a major role, whereas in RWLs, the focus is mostly on social and cultural aspects.

For RWLs a set of nine core characteristics can be formulated (Parodi et al., 2017; see Table 93.1), which can also be used to distinguish LLs from RWLs. While classic LLs resemble RWLs regarding characteristics 1, 2, 4, 6 and 8, they may differ as for the characteristics 3, 5, 7 and 9. Regarding the core characteristics Urban LL can be classified between the classic LLs and RWLs.

Both RWLs and LLs operate in real-world contexts at the interface of science and society. More commonalities between LLs and RWLs are: experimenting and co-design ambitions, a defined (geographical) context, reflexive learning, a strive for transferability, and an involvement of non-academic practice partners, such as city administration, companies, or NGOs. Furthermore, RWLs and LLs are not only producing knowledge but intervening in, and shaping society. Regarding the latter, they are even a kind of "political actors" outside the academic context (Seebacher et al., 2018), and in this respect, they are *trans-scientific*. This ambivalence does not imply that they are non-scientific; they simply do *not only* proceed scientifically. This also affects the role of the participating researchers which is sharpened by the dual objective and strong proximity of research and design. In addition to being the "honest broker" and "issue advocate" they potentially play the role of designer, mediator, and process organizer, and risk being overtaxed. To be successful and to include the different non-scientific actors both labs need an elaborated, bidirectional knowledge transfer with an addressee-specific (science) communication in non-technical jargon. Last but not least both labs aim at scientific and social or economic learning, and they form rich learning (and teaching) environments by bringing different actors, organizations and people together.

Beside these similarities there are also clear differences. RWLs and Urban LLs, other than classic LLs, also offer added value in terms of transdisciplinary procedures, societal transformation (impact), and the optional ability to serve as a long-term research infrastructure.

Probably most salient, the missing normative framing discerns (notably classic) LLs from RWLs. A prominent feature of RWLs is their sustainability maxim that all actions should be crosschecked with their plausible consequences for mankind and environment. Furthermore, RWLs deal much more with reforming existing everyday social practices, that obstruct gains toward climate protection and global justice. Classic LLs rather promote development of artefacts, services and eventually assets, which may directly generate income or wealth for cities, companies, and individuals, but whose long-term consequences may slip out of sight. Urban LLs take a middle position here (Voytenko et al., 2016; Scholl et al., 2022).

Democratization of science forms another ideal root of the RWLs – through an (coequal) participation of non-academic actors in the entire transdisciplinary process from agenda setting to co-design and co-production down to the utilization of the results. By linking the knowledge producing process to its legitimized subject – namely the citizens and a plethora of social actors – these grow into a new role as full partners in research. Participation on all levels (information, consultation, cooperation, collaboration, empowerment) is essential. Opposed to this, classic LLs mostly operate on the lower participatory levels (information, consultation and sometimes cooperation) but do rarely go beyond;

Table 93.1 *Comparison of constitutive characteristics of RWLs with generalised characteristics of classic LLs*

	Real-world Labs	**"Classic" Living Labs***
0	*Objectives (in general)*: social practices (in combination with technology), physical spaces; real-life setting	*Objectives (in general):* technology (in combination with social practices), physical spaces; real-life setting
1	*Research orientation*: (transformative) research for sustainability transformation, research & development, multi-method approach	*Research orientation:* prototyping, R&D (with less (scientific) research & more development), social fitting of innovation, multi-method approach
2	*Transformation*: direct contribution to societal change	*Innovation:* acceptance/acceptability of innovations
3	*Normativity and sustainability*: explicit pursuit of the guiding principle of sustainable development	*Normatively open:* does rather not follow a specific guiding principle (at most (technological) progress)
4	*Transdisciplinarity and participation*: Co-creation, participation and co-design as core principles, experimenting in, with and for society	*Participation*: Co-Creation, testing in society, co-designing products, user involvement, experimenting in (with and for) society
5	*Civil society oriented*: multi-stakeholder approach (public, private, people), with particular focus on civil society actors and citizens	*Economy oriented*: multi-stakeholder approach (public, private, people), with particular focus on business or innovation-networks
6	*Model character*: efforts made for implementation, transferability and upscaling	*Model character*: efforts made for implementation, transferability (and upscaling)
7	*Durability:* need for long duration to allow for sound scientific accompaniment of sustainability transformation processes (from several years to decades ideally)	*Duration:* duration corresponds to the subject of the lab (varies from daylong events to lifespans of several years)
8	*Laboratory character:* provision of specific open (social) spaces, epistemic settings and opportunities for joint experimentation	*Experiment and testing environment:* less open, serves as test setting for a specific innovation
9	*Learning and education:* iterative feedback, scientific and societal learning, condensed reflexive environments with high educational potential	*Learning:* iterative feedback, scientific and societal learning, reflexive environments but link to education is optional

Note: * "Classic LLs" refer to LLs in the manner of phase 1-3. Urban LLs or Sustainability Transition Labs could be characterized and located in between RWLs and classic LLs.
Source: Based on Parodi et al., 2023.

the participants primarily function as an echo chamber, not as full research partners. Neither an equal agenda setting nor democratizing of science are core issues of classic LLs. Instead, acceptance and acceptability of (technological) innovations play (still) a major role.

Whereas classic LLs usually provide innovation in a tighter time frame, a major, but mostly still untapped potential of RWLs is to make them become permanent infrastructures and *institutions of change* (e.g., District Future, 2023; see WBGU, 2016) to accompany and explore far-reaching social and cultural transformation processes for decades.

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