Urban BaWü-Labs: Challenges and Solutions when Expanding the Real-World Lab Infrastructure

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Cities are locations with both a high environmental impact and constant dynamic development, thus providing excellent opportunities to research and experiment with sustainability transformations (Evans et al. 2016, König 2013). As such, they are the target of multiple upcoming research programs (e.g., the German program Zukunftsfstadt, EU Horizon 2020 call on smart and sustainable cities). Recognizing this, the state of Baden-Württemberg (BaWü) has expanded its pioneering real-world lab research infrastructure and set up seven urban real-world labs, focusing on cities as spaces to experiment with transformation (see box 1). The urban real-world labs cover diverse topics, ranging from participatory city planning and sustainable mobility to sustainable energy in addition to refugee integration and education. With this development, BaWü is now home to 14 comprehensive real-world labs, together representing one of the largest assemblages of transformative lab research settings Europe-wide (for more examples see Schäpke et al. 2017).

Inter-Colloquium on Urban Real-World Labs
Participants from the urban labs convened with experts from sustainability and transformation sciences to discuss some of the challenges and possible solutions to urban real-world lab research. To facilitate learning between labs and to augment the empirical basis of discussions, practitioners from pre-existing real-world labs participated as well (for an overview see Schäpke et al. 2015). This notice is written as part of the accompanying research to the real-world labs (Wagner et al. 2016), which hosted the event together with the funding Baden-Württemberg Ministry for Science, Research and Arts (MWK).

Theresa Bauer, Minister of Science, Research and Arts in Baden-Württemberg, began the inter-colloquium by reasserting the importance of the real-world labs and BaWü’s continued commitment to this field of research. The main program of the event allowed for exchange and learning for progressing urban real-world lab research, combing three perspectives:

1. James Evans and Andrew Karvonen presented an overview on European developments.

2. Members of the urban BaWü-labs provided case specific conceptual and empirical insights, presenting on achievements and obstacles encountered in their work.

3. External experts hosted topical workshops which approached challenges and solutions in specific areas. These included:
   - space, scale and time as key dimensions of configuring urban real-world labs (speakers: Kathleen De Flander, Andrew Karvonen),
   - possibilities and challenges of transdisciplinary research in practice: focusing the role of research in real-world labs (Michael Stauffacher, Florian Kell),
   - transformative research: approaches, challenges and experiences (Maja Göpel, Timo von Wirth),
   - experiments, labs and projects: intervention and collaboration in participatory research (Martina Schäfer, Guido Caniglia), and
Core Challenges and Solution Options for Real-world Lab Research

To close, a fishbowl discussion invited participants to link perspectives and to draw overarching conclusions. These are presented in the form of eight core challenges and a number of (highlighted) solution options. Insights are related to the discourse on real-world labs and transdisciplinary research to reflect the broader state of debate.

1. **Assuring continuity** of real-world lab research and the balance of different time requirements for each lab, such as the long-term horizons of transformative processes and short(er)-term funding or between science and practice. This confirms earlier BaWü-lab examinations (e.g., Wagner et al. 2016, West et al. 2017) and repercussions in research-policy debates (WBGU 2016).

   Stretch funding periods, for example, by including a funded pre-proposal stage or grant prolonged funding for institutionalizing successful real-world labs; embed lab projects in larger fund-raising and structural development activities.

2. **Assuring (long-term) participation** of practice partners and the meaningful co-production of lab activities and results — a common challenge in real-world labs (Rhodius et al. 2016) and transdisciplinary research in general (Lang et al. 2012).

   Assure representation of practice partners’ goals in project setup; start participation of stakeholders early, co-develop funding proposal with practice partners and co-apply; set incentives for and acknowledge participation; build on intermediary persons linking to project partners; manage expectations by clarifying aims and limitations of labs; be concrete and allow action; draw on expertise on transdisciplinary collaboration.

**BOX 1: BaWü-Labs in the Funding Line Reallabore Stadt (Urban Real-World Labs)**

- **Realabbare Schnorhof** develops and tests a demand-based, digitally supported public transport system (led by the German Aerospace Center).
- **Go Karlruhe** analyzes options and develops methods for realizing a more pedestrian-friendly city (led by Karlsruhe University of Applied Sciences).
- **Energelabor Tubingen** collaboratively investigates pathways for generating 50 percent of the local energy supply from renewable sources (led by the University of Tübingen).
- **Stadt:quartiere 4.0** engages citizen participation in city planning via digital procedures and simulations to convert neighborhoods to real-world labs of change (led by the University of Stuttgart).
- **Stadt-Raum-Bildung** investigates how to shape educational landscapes that allow individualized and cooperative forms of learning and convert schools into catalysts for urban societies (led by SRH University Heidelberg).
- **Reallabor Asyl** investigates social and economic integration of refugees, via language acquisition, job training and social support (led by Heidelberg University of Education).
- **BUCA:log** tests autonomous vehicles in urban supply to reduce traffic during the national garden show in 2019 (led by Heilbronn University).

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3. Establishing the lab as a concrete space within the city, so that relevant real-world processes are captured and a space for interaction of stakeholders is created, as discussed in the real-world lab discourse (Parodi et al. 2016).

   Become visible in a concrete place with a symbolic meaning to stakeholders; define the limits of the real-world lab research along relevant geographical, administrative, and cultural entities; provide and maintain a clear aim and focus, particularly in the case of large real-world labs.

4. Unleashing the transformative potential of real-world labs through scaling up and transferring innovations and lab processes, although lab research is marked by its specific context. A challenge broadly discussed in real-world labs, in addition to transdisciplinary science (De Flander et al. 2014, Wissen Hayek et al. 2015).

   Identify and use characteristics of the urban context to allow transfer of insights to similar contexts, integrate into policies or spread insights via embedding in (smaller or larger scale) educational activities.

5. Cognitive integration of knowledge in transdisciplinary collaboration, hindered by complex, scientific language or lacking acknowledgement of integration tasks, a task frequently encountered in transdisciplinary work (Bergmann et al. 2012, pp. 112ff).

   Develop common products (e.g., a glossary or collected questions) as mandatory tasks of real-world labs.

6. Balance competing demands of scientific discipline and (practical) real-world lab research, particularly in early career scientific work (PhD writing) and beyond, as described for real-world lab research (West et al. 2017).

   Conscious choice of supervisor; be explicit and have a clear agreement on demands; attain work to demands of future career (be it practical or more scientific).

7. Unclear expectations that are conflicting with the rather unconventional roles of researchers in real-world labs — a common challenge in real-world labs (Wanner et al. forthcoming) and beyond (Wittmayer and Schäpe 2014).
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The majority of these challenges is not specific to the urban context, but apply to real-world lab research in general. Some are real-world lab specific (e.g., challenge 3 and 8), while others occur in transdis- ciplinary research more broadly. This calls for mutual learning based on differentiated views on real-world labs as a particular form of transdisciplinary research (Jahn and Keil 2016, Rückert-John and Schäfer 2017, Ukowitz 2017).

Further development of real-world labs as research settings requires synthetic learning from empirical experiences as well as conceptual discussions. Upcoming activities include a public conference on the BaWü-labs in April 2018 as well as a GAIA special issue on real-world labs to be released in 2018.

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