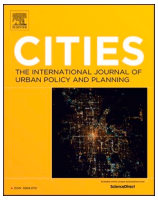
Cities 153 (2024) 105301

Contents lists available at ScienceDirect

Cities

journal homepage: www.elsevier.com/locate/cities



Governance for urban sustainability through real-world experimentation – Introducing an evaluation framework for transformative research involving public actors

Teresa Kampfmann [a,*], Philip Bernert [a,c], Daniel J. Lang [a,b], Stefanie Drautz [a]

[a] Institute for Sustainable Development and Learning, Leuphana University Lüneburg, Lüneburg, Germany
[b] Institute for Technology Assessment and Systems Analysis (ITAS), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany
[c] Research Institute for Sustainability - Helmholtz Centre Potsdam (RIFS), Potsdam, Germany

ARTICLE INFO

Keywords:
Real-world laboratories
Real-world experiments
Governance
Transdisciplinary sustainability research
Urban sustainable development

ABSTRACT

Transformative transdisciplinary research settings such as real-word laboratories (RwLs) provide infrastructures for collaboratively testing sustainability solutions in cities. Existing evaluations have focused on learning through experimentation and the tested interventions. Here, we provide an additional focus on the collaboration mechanisms established in real-world experiments. Through the involvement of political-administrative actors, university actors, and civil society actors, real-world experiments can function as initiators for governance networks that drive urban sustainable development, potentially beyond the formal end of real-world experiments. We therefore propose a framework that encompasses governance and transdisciplinary approaches, which can be used to evaluate real-world experiments as new modes of urban governance. The framework was applied to retrospectively evaluate a real-world experiment conducted within a RwL in a German city. We argue that while the framework serves as an evaluative scheme for assessing and comparing real-world experiments, it could also be used to evaluate RwLs as well as transdisciplinary research projects, by emphasizing the governance arrangements formed in those settings. Including this governance perspective expands the debate surrounding the impacts of transdisciplinary sustainability projects.

1. Introduction

The role of cities in a global sustainability transformation is increasingly acknowledged (Berisha et al., 2022; Nilssen & Hanssen, 2022). While urban environments face a multitude of challenges, they are also spaces in which promising new sustainable living arrangements can be developed (Wiedmann & Allen, 2021; Wolfram & Frantzeskaki, 2016). In this context, the field of sustainability science has brought forward a variety of innovative action-oriented approaches that aim to generate robust knowledge regarding the design and effectiveness of urban sustainability solution approaches (Frantzeskaki, 2022). Novel, promising examples of such research settings are Real-world laboratories (RwLs) (Schäpke et al., 2018; Wanner et al., 2018), and similar 'sustainability-oriented labs in real-world contexts' (McCrory et al., 2020), such as urban living labs (Bulkeley et al., 2019). These transformative research environments create settings for transdisciplinary collaboration and experimentation (Huning et al., 2021; Schneidewind et al., 2018). By integrating knowledge from a variety of scientific and societal bodies, their goal is to develop solution options to confront 'wicked' societal problems (Lang et al., 2012). Sustainability interventions in the form of real-world experiments are collaboratively developed, trialed, and evaluated in a specific context with the involvement of civil society (Parodi et al., 2016). RwLs are jointly established research settings, in which scientific actors and members from other societal sectors work together to confront real-world problems through experimentation (Hahne, 2021). Considered as one format of transdisciplinary research (Bergmann et al., 2021), the role of science actors as co-leaders of RwLs is a requirement (Defila & Di Giulio, 2020; Kanning et al., 2021; Parodi et al., 2021; Seebacher et al., 2018; Wagner, 2017). However, the specific shape of these transdisciplinary constellations does not follow a blueprint schematic, but is highly context dependent, and influenced by numerous socio-political and cultural conditions (Belcher et al., 2016; Lam et al., 2021).

As 'development hubs', universities play a key role in educating

* Corresponding author.
E-mail address: teresa.kampfmann@leuphana.de (T. Kampfmann).

https://doi.org/10.1016/j.cities.2024.105301
Received 31 January 2023; Received in revised form 5 July 2024; Accepted 12 July 2024
Available online 20 July 2024

'decision-makers of tomorrow in both public and private sectors' (Hansen & Lehmann, 2006, 822). Their involvement in sustainability endeavors is considered crucial (Loorbach, 2022). The background contexts of the other actors involved in RwLs are more vague. Frequently, the actors that conduct RwLs with universities represent civil society and city administrations (Kanning et al., 2021; Räuchle, 2021). In this sense, local governments provide an environment in which public sustainability issues can be addressed collaboratively by actors from different institutional backgrounds (Brink et al., 2018; Clement et al., 2022). The collaboration established in RwLs between city administration members, civil society and science actors (e.g., Engels & Walz, 2018) fits common definitions of governance, such as that advocated by Lange et al. (2013, 406), who define governance as 'a process of—more or less institutionalized—interaction between public and/or private entities ultimately aiming at the realization of collective goals'. This also fits the widely shared assumption that experimentation is an innovative form of urban governance (Ehnert, 2022; Frantzeskaki et al., 2018; Hölscher et al., 2019; Kivimaa et al., 2017; Kohler et al., 2021; van der Heijden, 2018).

We, the authors of this paper, were part of a real-world experiment conducted by a city administration, university, and civil society actors in Lüneburg, Germany. Although there are existing approaches for the evaluation of real-world experiments (Lüderitz et al., 2017; Williams & Robinson, 2020), to the best of our knowledge there is no analytical tool to assess the governance processes established throughout real-world experiments. We argue that a focus on the governance arrangements formed within real-world experiments is beneficial in several ways. First, an evaluative framework focusing on governance practices would widen the view on experiments beyond developing sustainability solution options (Caniglia et al., 2017) and providing spaces for learning (Parodi, 2019). Secondly, such a framework would contribute to a better understanding of the nexus between governance and experiments, considering that a systematic understanding of this relationship is still missing (Huitema et al., 2018; Laakso et al., 2017). Third, the currently underrepresented political dimension of real-world experiments, especially as they affect cities and communities (Ehnert, 2022; Voß & Simons, 2018), would be critically addressed. Furthermore, the formal power of political-administrative actors in real-world experiment constellations would be acknowledged (Jones & Evans, 2006; Kronsell & Mukhtar-Landgren, 2018; Torrens & von Wirth, 2021).

Accordingly, this article introduces an evaluation framework to capture governance processes established in real-world experiments. It has been developed based on theories and models introduced by governance and transdisciplinarity scholars, therefore we first introduce the concepts that were integrated into the framework. We then present the analytical framework and provide methodological examples of its application. For illustrative purposes, we apply the framework to a real-world experiment case study. We show how the framework helped to uncover specific forms of collaborative governance that were developed throughout the experiment. In the discussion, the framework is critically examined, and further contexts in which the framework could be used are suggested. In conclusion, we assess how our analytical framework contributes to new insights in the field of urban planning policies.

2. Towards the evaluation of governance arrangements in real-world experiments

This section first introduces concepts from RwL research, governance, and transdisciplinary discourses. These were used to develop the framework to evaluate experiments from a governance perspective. This framework will be introduced in chapter 3.

2.1. Defining the phases of real-world experiments

For both the development and application of the framework, we draw on the different phases established throughout real-world experiments. The differentiation between such phases is considered difficult, as they do not evolve in a linear manner (Roebke et al., 2022). However, several existing approaches identify different phases of real-world experiments. Fingerle (2019) differentiates three phases for both RwLs and real-world experiments: (1) co-design, (2) co-production, and (3) co-evaluation. During the (1) co-design phase, the transdisciplinary team jointly agrees on an identifiable problem, applies thematic and spatial restrictions, and generates ideas for interventions. This is followed by phase (2) co-production, in which interventions to be trialed are finalized. They are implemented involving reflection opportunities and adjustments. In the final Co-evaluation phase (3), results are recorded, jointly interpreted and transferred. Puttrowait et al., 2018 distinguish between the phases in a similar way, but introduced an additional phase to develop their real-world experiment collaboratively: 1) identification phase, in which central actors are identified and ideas for interventions are jointly developed, 2) implementation planning phase of the intervention(s), 3) implementation of the real-world experiment and its interventions together with their evaluation, and 4) assessment. Fingerle (2019) and Puttrowait et al. (2018) thus offer two options to distinguish between the phases of real-world experiments. Accordingly, we argue that applying the evaluation framework to specific phases holds two benefits. Firstly, an evaluation focusing on the individual phases of experiments is compact and feasible. Secondly, changes in governance mechanisms formed throughout the experiment are captured. In the section'Illustrative application' below, we outline how we identified the phases of the exemplar real-world experiment, based on the work of Puttrowait et al. (2018).

2.2. Modes of governance

In the field of governance, work often focuses on the collaboration between different institutions, with one institution being a state actor (Peters & Pierre, 2012; Wolfram et al., 2019). Lange et al. (2013, 406) define governance 'as a process of - more or less institutionalized - interaction between public and/or private entities aiming at the realization of collective goals'. Following these authors, we locate our work and the understanding of the term governance as described by Frantzeskaki et al. (2023, 243): 'Governance is about the different processes in which policies, plans, and legislation are negotiated, discussed, contested, formulated, and implemented, and how they gain legitimacy and deal with accountability. It is thus about how various actors and their different interests are brought together in a dialectic space, and how their diverse expertise and knowledge are included in strategic and operational activities of steering towards commonly desirable outcomes'. To highlight the nuances of governance and established collaboration mechanisms, Hysing (2009) introduced five modes of governing along three dimensions: instrument and styles, public and private partnership, and policy levels. For the evaluation framework introduced in this article, we adapted Hysing's differentiation between governing modes regarding the second dimension, **public and private partnership**. Accordingly, we draw on the network character of governance arrangements. Hysing (2009) proposed five grades in the ways the partnership between political and non-political actors (understood as a broad range of societal bodies, such as organizations, companies, researchers, and civil society), are shaped (Fig. 1), reaching from the ideal-types of government to governance on the continuum. Through the ideal-type government, monocentric, hierarchically organized political institutions are seen as the prime governors of society. Non-political actors have clearly defined roles: to participate through elections and lobbying (pluralism), or through highly-institutionalized public–private governing arrangements (left side of the continuum in Fig. 1). On the other side of the continuum (right side in Fig. 1), collaboration, deliberation, and interaction between public and private actors is in the foreground. Private actors are more deeply integrated into the policy process. Instead of a governing structure based on institutionalized and hierarchical interactions between public and

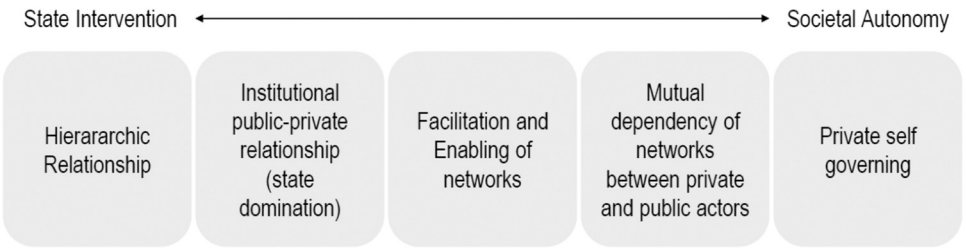


Fig. 1. Modes of Governing regarding public-private relationships (Hysing, 2009, modified).

private actors, networks based on resource interdependency and trust characterize the relationships between political and non-political actors. In these networks, the capacity of a state agency to steer is limited. Thus, non-political and voluntary actors perform self-governing.

A variety of approaches define governance by emphasizing the collective decision-making process (Doberstein, 2016; Wang & Ran, 2021). For the framework, we therefore derive the specific governance mode for real-world experiments by identifying and assessing the most important decisions that were made in the individual phases of the experiment. Based on how political and non-political actors shaped these decisions, the mode of governance according to Hysing (2009) is detected. It has to be determined whether forms of governance are present in the experimental phase at all, or whether a 'traditional' form of government with unilateral power from the side of the political actors is reproduced. If the political actors had sole decision-making power and control, the chances of a hierarchical relationship in the sense of government are high. At the other pole of the continuum, self-governing would mean that non-political actors made the decision, with state actors functioning as enablers from a distance. Between those poles there are three gradations, where state actors decreasingly, and non-state actors increasingly, shape decisions.

2.3. Actor constellations in transdisciplinary research settings

Transdisciplinarity is generally described as a research mode where knowledge is produced not only through academia but in the collaborative processes between scientific and non-scientific stakeholders (Rigolot, 2020). Transdisciplinary research projects begin with and focus on 'wicked' real-world problems. These problems are therefore not (only) part of scientific debate, but also affect people outside academia - individuals, and communities - and at the same time relate to unsolved scientific questions. To address these issues, transdisciplinary teams develop solution options that provide insights that are transferable into both scientific and practical discourses and action (Lang et al., 2012; Wada et al., 2021).

Scholz and Steiner (2015) distinguish (idealized and simplified) three types of actor groups engaged in transdisciplinary projects: Actors from the scientific community, legitimized decision-makers, and the public at large (identified stakeholders, e.g., those affected by a real-world problem). Odume et al., 2021 name this type of constellation a transdisciplinary *'science-policy-society helix'* (Fig. 2). Actors from governmental bodies, research institutions such as universities, and people from civil society join a transdisciplinary research project and form the 'science-policy-society helix'.

In addition to identifying the groups of actors involved in transdisciplinary research projects, some literature also examines the intensity of the participation of non-scientific actors (Elzinga, 2008; Mayrhofer, 2018; Sonnberger & Lindner, 2021). Viewing non-scientific actors as one group tends to underestimate the influence of government agencies through their formal decision-making power (Kronsell & Mukhtar-Landgren, 2018). Scholz and Steiner (2015) and Odume et al. (2021) provide approaches in which the group of non-university actors is divided into both political-administrative and civil society actors.

Drawing on previous work, investigating actors in transdisciplinary research settings, it is central for application of the framework to identify which actors are participating in the real-world experiment phases and to which actor group they can be allocated, using the science-policy-society helix. Accordingly, a subdivision is made between actors drawn from city administration (policy), university (science) and civil society (society).

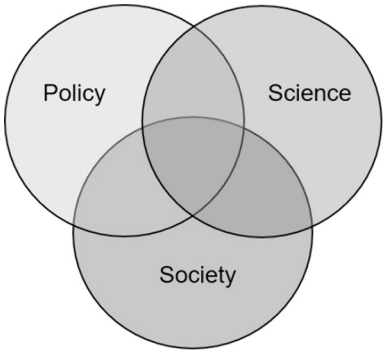


Fig. 2. 'Science-policy-society helix' within transdisciplinary projects (Odume et al., 2021, modified).

2.4. Participation in governance processes

Newig (2011) discussed the concept of participation in governance processes. Participation of non-state actors in governance process occurs differently in practice, and one way to describe the extent of participation is through the assessment of the participation process along five criteria (Table 1).

According to Newig and Kvarda (2012), the following conditions must be fulfilled to speak of participation at all. The first necessary feature is that the decisions made are applicable for a larger group of people (public realm). The second is co-determination, meaning that people in charge of decisions do not make them on a regular basis. The three remaining criteria - cooperation, sharing of power and representation - vary in the extent they are met (Newig, 2011). These five criteria support more detailed description of the participation of non-state actors

Table 1
Features of participation in governance processes (Newig & Kvarda, 2012, modified).

Core Element	Short Description
Cooperation	Joint problem solving, consensus building within the decision-making process.
Public Realm	Decisions made in the participation process apply to a larger group of people and imply rules for future behavior.
Co-Determination	Participation of groups of people in decision-making, who do not routinely make such decisions.
Sharing of Power	Participation implies a transfer of power to the non-political groups of people involved.
Representation	Circle of people involved sufficiently represents those with a legitimate concern.

in governance arrangements in real-world experiments.

3. Introducing a framework to evaluate real-world experiments from a governance perspective

Based on these theoretical foundations regarding modes of governance, transdisciplinary actor constellations and participation in governance processes, we developed a three-step evaluation framework. The framework offers a set of criteria for evaluating real-world experiments from a governance-orientated perspective, focusing on collaboration.

The framework is designed for the evaluation of real-world experiments that involve actors from city administrations, university/academia, and members of civil society, and requires a sufficient availability of data. Sufficient data in this case means that for each phase of the experiment there are documents available that contain passages about the decisions made and the actors involved. The framework should be applied by researchers involved in the experiment to allow for mutual reflection and sensemaking of the working phases and sequence of actions.

As stated above, the framework is applied to the individual phases of a real-world experiment, noting that distinguishing the different phases in real-world experiments is highly context-specific: an identification phase, implementation planning phase, implementation phase, and evaluation phase (Fingerle, 2019; Puttrowait et al., 2018; Trenks et al., 2018).

For the analysis of the governance networks established in real-world experiments, the framework provides the following steps for each phase of the real-world experiment: 1) *Determine* the mode of governance and clarify whether governance is present at all, 2) *Identify* the actor groups involved, 3) *Assess* how and to what extent science and/or society actors participatorily shaped the experiment phase and respective outcomes (Fig. 3) from a governance perspective.

The experiment-related documents used for the application of the framework is grouped according to the phases of the real-world experiment. Then the first step is to determine the mode of partnership between political-administrative actors and the other stakeholders involved in the phase of the real-world experiment. This first step should be based on the most important decisions that were made in each phase. To what extent were these decisions determined by political-administrative actors? If these decisions have been made entirely by political-administrative actors, there is a high probability that there is a hierarchical relationship with the political-administrative actors in power (referring to hierarchic relationship in step 1 in Fig. 3). In this case, usually no further steps for the specific experiment phase are required, as these top-down power relations reflect neither governance arrangements nor transdisciplinarity.

If one of the other four governance modes provided in step 1 is applicable (institutional public-private relationship (state domination), facilitation and enabling of networks, mutual dependency of networks between private and public actors and private self-governing) then the focus in step 2 will be on the actor groups involved in the experimental phase. This step aims to describe who represents the groups of state actors, science and civil society. This is followed by the third and final step. Step 3 examines the extent of participation of non-political actors in the specific phase in more detail. The governance arrangements established in the real-world experiment are described based on five elements of participation (public realm, co-determination, cooperation, sharing of power, representation). In some cases, it is suitable to examine participation intensities for the groups of civil society and science within the same phase of the real-world experiment, but in other cases, it is advisable for only one of the two groups, e.g., if only science or civil society actors had a certain degree of influence in the governance setting.

Data for the analysis is existing material, such as minutes of real-world experiment meetings, emails, transcripts of workshops, and

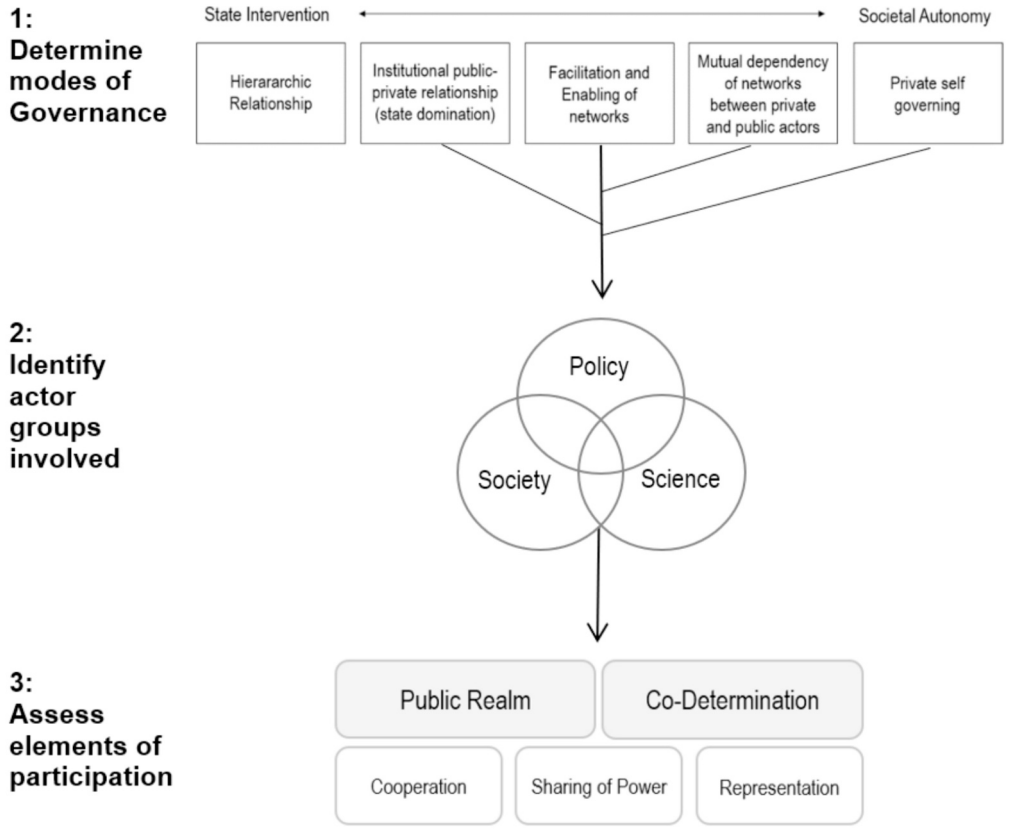


Fig. 3. Framework for evaluating governance networks in real-world experiments.

publicly available data such as the experiment's own online presentation and the presentation of the experiment in public discourse (e.g. local newspapers). This material is analyzed by deductive codes developed through the framework.

Deductive content analyses of the material based on the framework is carried out; ideally through several coders for intercoder reliability. Once all the phases of the real-world experiment have been worked through, the results for the different phases become comparable, to show how the governance networks developed over time.

4. Illustrative application

In the following, we exemplify the application of the framework using a case study to evaluate a real-world experiment within the RwL project *Zukunftsstadt Lüneburg 2030+* located in the medium-sized Hanseatic city of Lüneburg, Germany.

The RwL was established in 2020. Since then, 15 real-world experiments have been carried out, addressing the 17 Sustainable Development Goals. The RwL is managed jointly by members from the local university and city administration, as well as from civil society (Lüneburg 2030a, n.d.). An office was provided for representing the RwL in the city center. This gives the RwL a physical address (Parodi et al., 2016), where the workplaces of the RwL members, who are employed by the city administration, are also located. Within the framework of the RwL, transdisciplinary cooperation between the city administration, the university and civil society was institutionalized. For the duration of the RwL, 10 part-time project positions were created in the city administration and university.

Out of the 15 experiments of the RwL Zukunftsstadt Lüneburg 2030+, the experiment Favorite Places was regarded as the most suitable case study for an exemplary post-hoc application of the framework because it met the requirements of involvement of municipal actors, sufficient data for an illustrative application, and the involvement of the authors as transdisciplinary researchers in the original experiment.

The focus of *Favorite Places* was the joint, temporary redesign of public spaces in the city center of Lüneburg. The real-world experiment explored options to address SDG 11, *'make cities and human settlements inclusive, safe, resilient and sustainable'* (UN, 2023) in the local context. One of the places redesigned in the experiment was the public square in front of the theater in Lüneburg, in summer 2022. Actors from the university, city administration as well as (directly affected) members from civil society jointly worked together. As a working group, they decided what interventions were trialed, that is, what temporary measures were implemented on the theater square and how these changes were evaluated.

We used data that was easily accessible to us due to our involvement in the RwL and/or in the real-world experiment. We used documents (n = 20) encompassing minutes, endorsements, and authorization for alternative use of the 'Place', as well as publicly available sources derived from websites. In this way, we applied the framework to already existing documents (as described above).

As a first step, we used the documents to distinguish between the phases of the experiment *Favorite Places* (emphasis on theater square). The documents were grouped into, (i) the identification phase, in which the basis for the experiment was laid, (ii) the implementation planning phase, in which the experiment's interventions were planned, (iii) implementation, and (iv) the intervention evaluation phase (Appendix A). As a next step, we applied the framework to each phase of the real-world experiment, through deductively coding the document groups aligned to the four phases.

4.1. Applying the framework to the real-world experiment's four phases

4.1.1. Identification phase

As described above, the real-world experiment analyzed in the following sections was established in the context of the RwL *Lüneburg 2030+*. A transdisciplinary steering group was formed to co-develop the RwL (Bernert et al., 2016), and actively shaped its work. The steering group was composed of members of the local university and city administration, as well as civil society actors, and usually met once per month. From this steering group, a working group for the real-world experiment *Favorite Places* was established, formed with members from the city administration, university and civil society actors.

The transdisciplinary working group met several times in order to, 1) identify specific public places in the city where experimental participative redesign could be tested, 2) discuss methods for the collection of ideas for redesign measures, and 3) clarify responsibilities.

The working group agreed upon three sites on which the experiment should be conducted. All three were squares which were publicly accessible and centrally located in the city of Lüneburg (Fig. 4). These squares have not previously been used as places to rest, but rather as places to transit.

We applied the framework to the documents grouped in the identification phase of the experiment. As first step, we assessed the mode of governance formed throughout this phase. The main decision made was agreement on the specific sites on which the experiment should take place. Of the three squares that were agreed upon, members from city administration were strong advocates for one of them. The two other places were proposed by non-state actors, who knew suitable locations from their private contacts outside the RwL setting. As these locations were identified based on involvement in social networks outside the lab, the governance arrangement formed in this real-world experiment identification phase mostly matches **facilitation and enabling of networks**.

In the working group, members of all three societal sectors (city administration, university, civil society) were involved. Table 2 provides an overview of the stakeholders representing the three actor groups, and is our response to step 2 of the framework.

The final step of the application of the framework for this identification phase is to assess participation in this governance process in more detail. The criterion 'public realm' is met because the most important decision made applies to a considerable number of people who live in the city and use the squares, whether on a regular or non-regular basis. The aspect 'co-determination' implies that people who are not usually involved in such decisions act as co-decision makers. Here, civil society members as well as researchers from the university were actively involved in the decision-making process. Normally, the design of such areas is the responsibility of the city administration resp. political

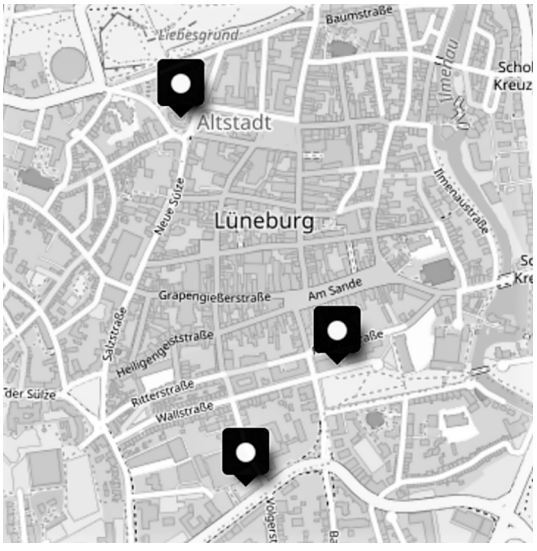


Fig. 4. The three squares in Lüneburg chosen in the real-world experiment Favorite Places, based on OSM 2022.

Table 2
Overview of actors during Identification Phase.

Actor Group	Actors in Identification Phase
Society	Civil Actors engaged in the RwL (involved in steering group)
Science	Members of the RwL (employed at university)
Policy	Members of the RwL (employed at city administration)

decision-makers. A joint problem-solving approach was evident throughout the working group meetings, with voices from all non-political actors being actively considered (cooperation). The working group jointly agreed on the specific squares in the city serving as test spaces (surrender of power). However, in this identification phase of the experiment, people directly affected by the decision on the specific squares (for example because they live there) were not part of the discussions and decision, therefore, the aspect of representation was not met.

4.1.2. Implementation planning phase

As three specific squares were identified, subgroups were formed, each focusing on one square. In this exemplary analysis we focus on the real-world experiment conducted in the theater square. The cornerstone of this phase was the establishment of contact between the university members of the experiment working group and the responsible persons from the theater. The main decision in this phase was agreement on redesign measures that should be tried out on the theater square. For this purpose, ideas were publicly collected on-site, followed by workshops with members from the university, theater and city administration. There were two other meetings as well as several informal exchanges. All people that were attached to the square and engaged with the place on a regular basis (e.g., because they work there) were actively invited to get involved. The main decision on redesign measures that should be implemented was mostly made by non-state actors, but city administration also played a crucial role. Members of the city administration, responsible for urban green spaces and parks (and not employed as members of the RwL project team), were involved in this process. They pointed out what they considered to be practical in means of law and regulation. Based on this working constellation, an agreement on ideas about the square was made. Accordingly, the relationship in this phase can be classified as **mutual dependency of networks between private and public actors**.

As part of a seminar, students from the university, together with members from the theater and the city administration, held an event to collect ideas from the public for the square on-site. The ideas (both written and drawn) were recorded by the students on printed maps and small cards. By adopting this performative citizen participation method by Mackrodt and Helbrecht (2013), a low-threshold offer was created to participate and share ideas.

During the event, more than 300 ideas were collected. It was suggested to redesign the space by establishing green areas, in some cases in connection to biodiversity. The suggestion to provide more seating areas was the second most mentioned proposal, followed by gastronomic offers, sports- and/or playgrounds and outdoor events. The ideas collected formed the basis for a subsequent workshop, to which employees from the theater, members of the working group and employees from the city council responsible for urban green spaces and parks were invited. Members from the university led the preparation and moderation of the workshop. In the workshop, the collected ideas were ranked, additional ideas were identified and a timeline for the experiment was defined. As a result, workshop participants agreed on ideas that should be tested for redesigning the space.

Applying the second step of the framework, we derive that a society-science-policy helix in the sense of Odume et al. (2021) could be seen, but that the composition within the individual groups changed compared to the prior identification phase (Table 3).

With the inclusion of theater employees, all participation elements were addressed in this implementation planning phase. The people who were most affected by the changes to the place were integrated into the decision-making process: people who were employed at the theater were actively invited to the workshop, as well as to the following meetings. They actively shaped the decision of which ideas should be tested for improving the square (not in their working hours but in their spare time). People who were interested but may not be affected by immediate proximity were invited to share their ideas and express reservations during the performative citizen participation event on-site. The time period of the experiment on the theater square was determined by the university as well as civil society members, which meets co-determination. The space is open to the public, and accordingly the decisions made in this phase hold in the sense of public realm effects for a (potentially) large amount of people. Additionally, sharing of power as well as cooperation, in the sense that there was mutual agreement on which measures should be trialed as interventions, became evident throughout the workshop and subsequent working group meetings.

Table 3
Overview of actors during Implementation Planning Phase.

Actor Group	Actors in Implementation Planning Phase
Society	Members from the local theater, civil society actors engaged in the RwL process, participants of the performative citizen participation event on-site
Science	Members of the real-world lab (employed at the university), undergraduate students
Policy	Members of the real-world lab (employed by the city administration, employees of the city administration not directly attached to the RwL project

4.1.3. Implementation phase

In the implementation phase, the ideas that had been mutually agreed were put into on-site redesign measures. Civil society actors from the theater built benches, including one that also served as stage for open air events. With the help of a gardener, existing green spaces were transformed into more biodiverse ones. Furthermore, trees in planters were rented and placed in the square for the duration of the experiment to demonstrate what impact green can generate for the reduction of heat-island effects (Fleckenstein et al., 2022), as well as for aesthetic reasons. Last, free cultural outdoor events were agreed and organized by the non-state actors. During the events, gastronomic services were offered. Accordingly, based on the documents representing this phase, we identified passages representing the governance mode **private self-governing**. The most important decisions regarding the square design, contracting and event arrangements were made by non-state actors. Non-political actors obtained the necessary approvals that were needed for interference with the public space. They solicited offers from multiple service providers. The meetings on-site (for example with the gardener) and auxiliary work, as well as watering the green areas, were organized by the members from the theater without the involvement of city administration members. City administration representatives facilitated this kind of self-organization from a distance (Hysing, 2009) by providing city maps, accompanying public relations work, and also signed official approvals.

In this working group constellation (Table 4), members of civil

Table 4
Overview of actors during Implementation Phase.

Actor Group	Actors in Implementation Phase
Society	Members from the local theater, (service providers)
Science	Members of the real-world lab (employed by the university)
Policy	Members of the real-world lab (employed by the city administration), employees of the city administration not directly attached to the RwL project

society and science took ownership of nearly all tasks. They negotiated and met with service providers. Due to the commitment of the theater employees in their spare time, green spaces and trees could be preserved. Invitation and supervision of artists who performed at the events were also responsibilities fulfilled by civil society members from the theater. Accordingly, all aspects of participation in governance processes are fulfilled to a high degree during the implementation phase. Through the application of the framework, a shift regarding a surrender of power between the phases is identifiable.

4.1.4. Evaluation phase of the intervention

During the implementation phase, the different measures were tested, framed as place-based interventions, and evaluations were conducted regularly. The methodological evaluative approach consisted of participatory observation, surveys, and participatory photo interviews (modified approach based on Kolb, 2008). The evaluation was conducted by members of the university before, during and after the interventions on-site. Although all actor groups involved were fully aware of the evaluation, members from the university took all decisions regarding the methodological design of the evaluation. The responsibility for evaluating the experiment's interventions lay with the researchers. This is often the case in RwL evaluation. (Holewik, 2022).

Another reason for the dominance of university members in this phase was the heavy workload and limited time the theater members had, because of their influential role throughout the collaboration (Gramberger et al., 2015). Due to the high number of small-scale decisions, the relatively small group of civil society actors (about 10 people) were highly occupied.

Evaluation findings were forwarded to the theater administration and the city department for urban green spaces and parks. The results of the evaluation are not binding. Even if certain tested measures have proven to be particularly popular, this does not mean that they will be established in the long term. Either way, few measures still continue to exist on the square.

Based on the documents included in this fourth and final evaluation phase of the experiment, no governance mode could be derived, as no state actors were involved. Accordingly, the framework could not be assessed.

4.2. Governance arrangements established throughout the real-world experiment

In the previous sections, we applied the framework to four phases of the real-world experiment, offering an actor-centered and process-oriented qualitative evaluation. In three of the phases, identification, implementation planning and implementation phase, governance arrangements between the three actor groups were built and evolved. Non-political actors had increasing influence regarding the redesign of the public square (Table 5).

In the identification phase of the experiment, power was distributed relatively equally among the three actor groups. The decision about the squares to be experimented on was made together. However, actors directly affected by possible changes in the square became increasingly involved. The application of the framework showed that the three groups forming the experiment were no self-contained homogeneous groups. Respective compositions changed between the phases. Therefore, it is crucial to describe each actor group precisely for each phase. Further, we identified how governance arrangements changed and developed. During the two subsequent phases implementation planning and implementation, civil society actors were instrumental in determining the ideas to be tried out, and were highly involved in the actual implementation of the interventions on-site. The real-world experiment offered the context in which governance arrangements were formed. Civil society actors were largely autonomous in deciding which measures should be tested in public and for how long. University members took responsibility for administrative tasks. Only through the

Table 5
Overview of governance established throughout the real-world experiment Favorite Places.

Governance Mode	Actor Groups Involved	Participation of non-state actors
Phase 1: Identification		
Facilitation and enabling of networks	Civil Society Actors from the RwL's steering group, RwL team members both employed at university as well as city administration	**Public realm** – decision on squares as test spaces affects citizens' living surroundings; **co-determination** - civil society members as well as members from university were actively involved in the decision-making process which is normally the responsibility of the city administration and political decision-makers; **cooperation** - joint problem-solving approach was evident throughout the working group meetings; **sharing of power** - jointly agreed on the specific squares in the city serving as test spaces; **representation** – not applicable
Phase 2: Implementation Planning		
Mutual dependency of networks between private and public actors	Civil Society actors as members from the local theater, civil society actors engaged in the RwL process, participants in the performative participation on-site, RwL members employed at university, undergraduate students, RwL members from city administration, employees from city administration (parks department)	**Public realm** – decision on measures to be trialed that will reshape the square; **co-determination** – civil society/university actors highly influenced decisions regarding physical appearance of the square as well as the period; **cooperation** and **sharing of power** established through workshops and meetings as decisions were made together, performative participation on-site was open to everybody; **representation** - members of the theater who were mostly affected shaped the process and decisions significantly.
Phase 3: Implementation		
Private Self-Governing	Members from the local theater, (Service Providers), RwL members employed at university, RwL members employed at city administration, employees from city administration (parks department)	**Public realm** – decisions on how measures will be implemented and how the place will change exactly; **co-determination** – meeting with service providers & contracts shaped by non-political actors; **cooperation** and **sharing of power** - through empowering non-political actors in taking responsibilities, political actors as enablers for the other actors, **representation** – members of the theater who were mostly affected decided how to implement measures to a high degree.

commitment of civil society actors events for enlivening the space could be offered, and measures such as trees and biodiverse green spaces were preserved. The implementation of the real-world experiment did not start as a bottom-up initiative initiated by civil society, but the opportunities that were made available to civil society actors to drive the experiment and interventions were utilized. In this real-world experiment, governance constellations were formed in which groups of civil society actors gained increasing decision-making power, while at the same time members of the city administration acted as enablers for self-governing from a distance.

5. Discussion

In this article we have proposed a framework to capture governance arrangements formed within real-world experiments. Urban governance as well as science institutions are considered to play crucial roles in advancing sustainable development worldwide (Dick, 2016; Keeler et al., 2019; Schneider et al., 2023; Smith & Wiek, 2012). In RwLs and associated experiments both premises are connected. While being implemented jointly between science, political-administrative and civil society actors, real-world experiments offer opportunities for initiating governance arrangements. So far, this possibility has received little attention in literature. With the framework introduced here, we aimed to close this research gap. In the following, we first discuss how the framework benefits other research endeavors by offering transparent evaluation criteria for capturing governance-related aspects in multiple contexts. Further, we present learnings we derived from the application of the framework to our case study.

5.1. A framework to capture governance processes in various settings

While the idea for the framework originated from our experiences as transdisciplinary researchers involved in a real-world experiment, we argue that the framework is usable in multiple contexts. It offers a transparent set of criteria to capture how governance networks unfold, and therefore it could also be applied to assess RwLs and transdisciplinary projects where political-administrative actors are involved. The framework offers ways to approach actor constellations within the groups of science, policy, and civil society more precisely, considering that they are not self-contained homogeneous groups. Respective compositions can change. The framework emphasizes this possibility and provides a transparent and theory-based set of criteria for evaluating different contexts where public authorities are involved in these settings. It provides ways to assess the political nature of such formats. The framework also addresses the criticism that the criteria for case studies are too vague (Adler et al., 2018).

RwLs normally consist of multiple experiments, and through the use of the framework, several real-world experiments within one RwL can be compared along pre-defined criteria. In this way, comparisons and derivations are possible within one RwL, even if the real-world experiments have diverse thematic scopes. While we have only applied the evaluation framework to one real-world experiment within a RwL, further research could further test the framework and apply it to multiple real-world experiments within one RwL. In order to validate or further adapt the framework, a subsequent application is needed. Further, the framework is also applicable to transdisciplinary research projects, which are increasingly conducted in many countries all over the world to establish science-society-policy interactions (Schneider et al., 2023). The framework offers criteria for evaluating these science-society-policy interactions as governance practices formed throughout transdisciplinary research. The framework consists of a rigorous set of criteria that contribute to transdisciplinary case study research (Adler et al., 2018). Last, the framework is applicable for ‘second generation experiments’ (Grin 2020). Grin used this phrase to describe experiments that are initiated and shaped by local governments. The framework is applicable to an increasing number of experiments in sustainability science and related fields such as planning studies (Eneqvist & Karvonen, 2021) and climate governance research (Bulkeley, 2023), that are established for ‘testing new and unconventional ways of dealing with societal issues in real-world settings’ (Suitner & Krisch, 2023, 3).

While the chances associated with experiments and projects that are conducted transdisciplinary between state and non-state actors have been highlighted, these transdisciplinary settings imply ‘open, plural and democratic politics, with central roles not just for policy, but also for mobilization, critique and political challenge’ (Scoones et al., 2020, 69). The establishment of such projects as well the following application of the introduced evaluation tool is not possible everywhere but depends on the prerequisites introduced by Scoones et al. (2020) as well as ‘the political, cultural and social contexts of a city in both national and urban settings’ (Lnenicka et al., 2024).

5.2. Learnings from the application of the framework to our case study

As we can see, the framework does not aim to capture impacts resulting from the real-world experiment. Neither can it be used to evaluate trialed interventions within the experiment. A comprehensive evaluation of real-world experiments encompasses approaches to evaluating interventions, which is highly context-specific and relies on their thematic scope. In the case study experiment Favorite Places, an evaluation of the interventions was conducted independently from the application of the framework. By focusing on the modes of collaboration developed in the experiment, there is less pressure on the tested intervention(s). Even if the intervention was less successful or could not be tested to the extent intended, the framework can still be applied (as long as the main requirement of cooperation between state and non-state actors is met).

Due to the character of transdisciplinary research and its iterative process, it is complicated to distinguish between the phases of a real-world experiment. Although we provided insight from existing literature that fits our case study, the differentiation of the individual phases is highly context-specific. Future application of the framework could also provide insights into how governance networks might be formed during the evaluation phase of an experiment, which we could not further assess in our exemplary analysis. Further, we did not consider phases established within transdisciplinary research projects or urban experiments that we suggest as other potential contexts for the framework’s application.

Based on its illustrative application we provided first insights into how to make use of already existing data. This data body was not generated based on the framework. However, in future applications, a second group of material could include intentionally developed documents that are generated based on the framework. These might be used to, e.g., deductively develop questions for interviews with actors in experiments. The criteria shown in the framework could also inform guidelines for (participatory) observations of real-world experiment group meetings. While we cannot yet give empirical insight on how to *design such* data collection based on the framework, through a planned application of the framework from the beginning of an experiment, a better database could be created. For us, this was not possible, as the experiences during the real-world experiment formed the initial trigger for us to conceptualize the framework. Accordingly, its application could only be made after the experiment, drawing on existing data.

The application of the framework was a meaningful exercise for reflecting on the governance arrangements formed throughout the case study experiment. The analytical framework captures a specific evaluative aspect, applying actor-specific and process-oriented perspectives. Through its application, governance networks and their development throughout real-world experiments are captured.

6. Conclusion

In this article we presented and illustratively applied an analytical

framework for evaluating governance practices developed in real-world experiments. By applying the framework, we observed how different types of governance networks emerged during a real-world experiment. Using the framework to evaluate real-world experiments highlights their potential for creating new governance practices in cities. Investigating experiments and transdisciplinary research settings through governance theories also adds insights to the field of participatory urban planning. Citizens should have the right to participate in decision-making processes that directly affect their living conditions (Geekiyanage et al., 2021; Nop & Thornton, 2020). As reservations on public participation in urban planning exist both for urban planners as well as civil society actors (Åström, 2020; Li et al., 2020), transdisciplinary research formats such as RwLs as well as (real-world) experiments can serve as windows of opportunity for these groups to come into contact with one another. Here, the short-term character of experiments (Torrens & von Wirth, 2021) is a crucial characteristic, as neither group needs to make long-term commitments. Real-world experiments hold the possibility to function as contact initiators between non-political and city administration actors, conducting joint actions serving civil society members' interests (Méreiné Berki et al., 2017). These contacts could facilitate further co-planning processes in which not only the 'usual suspects' participate (Lang et al., 2012). Interesting foci of further research could be how the involved civil society actors perceive urban planning processes following their experience in the experimental governance network, and whether and how the governance arrangements formed in (real-world) experiments and transdisciplinary research projects continue beyond their formal ending.

Funding

This work was supported by the German Federal Ministry of Education and Research [13ZS0058B].

CRediT authorship contribution statement

Teresa Kampfmann: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Philip Bernert:** Writing – review & editing, Methodology, Conceptualization. **Daniel J. Lang:** Writing – review & editing, Methodology, Conceptualization. **Stefanie Drautz:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Appendix A. Overview of documents included in the framework-based exemplary analysis

Date	Availability	Type	Applied to phase
07/09/2021	Non-Public	Minutes RwL steering group	Identification
24/11/2021	Non-Public	Minutes experiment working group	Identification
01/12/2021	Non-Public	Minutes experiment working group	Identification
13/12/2021	Non-Public	Minutes experiment working group	Identification
17/01/2022	Non-Public	Minutes experiment working group	Identification
21/02/2022	Non-Public	Minutes experiment group- theater	Implementation Planning
26/02/2022	Non-Public	Documentation on publicly collected ideas	Implementation Planning
28/04/2022	Non-Public	Minutes experiment group – theater	Implementation Planning
13/05/2022	Non-Public	Minutes experiment group – theater	Implementation Planning
n.d.	Public	RwL website (Lüneburg, 2030b)	Implementation Planning
18/05/2022	Non-Public	Application for alternative use	Implementation Planning
01/06/2022	Non-Public	Authorization for alternative use	Implementation
12/06/2022	Non-Public	Endorsement	Implementation
13/06/2022	Non-Public	Endorsement	Implementation
14/06/2022	Non-Public	Endorsement	Implementation
25/06/2022	Non-Public	Endorsement	Implementation
n.d.	Public	Theater Website (Theater Lüneburg, n.d)	Implementation
29/06/2022	Public	Leuphana Website (Leuphana, 2022)	Implementation
n.d.	Public	RwL Website (Lüneburg, 2030c)	Evaluation of the Intervention
21/03/2023	Non-Public	Master Thesis	Evaluation of the Intervention

References

Adler, C., et al. (2018). Conceptualizing the transfer of knowledge across cases in transdisciplinary research. *Sustainability Science, 13*(1), 179–190. https://doi.org/10.1007/s11625-017-0444-2

Åström, J. (2020). Participatory urban planning: What would make planners trust the citizens? *Urban Planning, 5*(2), 84–93. https://doi.org/10.17645/up.v5i2.3021

Belcher, B. M., et al. (2016). Defining and assessing research quality in a transdisciplinary context. *Research Evaluation, 25*(1), 1–17. https://doi.org/10.1093/reseval/rvv025

Bergmann, M., et al. (2021). Transdisciplinary sustainability research in real-world labs: Success factors and methods for change. *Sustainability Science, 16*(2), 541–564. https://doi.org/10.1007/s11625-020-00886-8

Berisha, E., Caprioli, C., & Cotella, G. (2022). Unpacking SDG target 11.a: What is it about and how to measure its progress? *City and Environment Interactions, 14*, Article 100080. https://doi.org/10.1016/j.cacint.2022.100080

Bernert, P., et al. (2016). Towards a real-world laboratory: A transdisciplinary case study from Lüneburg. *GAIA - Ecological Perspectives for Science and Society, 25*(4), 253–259. https://doi.org/10.14512/gaia.25.4.7

Brink, E., et al. (2018). On the road to "research municipalities": Analysing transdisciplinarity in municipal ecosystem services and adaptation planning. *Sustainability Science, 13*(3), 765–784. https://doi.org/10.1007/s11625-017-0499-0

Bulkeley, H. (2023). The condition of urban climate experimentation. *Sustainability: Science, Practice and Policy, 19*(1). https://doi.org/10.1080/15487733.2023.2188726

Bulkeley, H., et al. (2019). Urban living laboratories: Conducting the experimental city? *European Urban and Regional Studies, 26*(4), 317–335. https://doi.org/10.1177/0969776418787222

Caniglia, G., et al. (2017). Experiments and evidence in sustainability science: A typology. *Journal of Cleaner Production, 169*, 39–47. https://doi.org/10.1016/j.jclepro.2017.05.164

Clement, J., et al. (2022). Factors for collaboration amongst smart city stakeholders: A local government perspective. *Government Information Quarterly, 39*(4). https://doi.org/10.1016/j.giq.2022.101746

Defila, R., & Di Giulio, A. (2020). Science policy recommendations for funding real-world laboratories and comparable formats. *GAIA - Ecological Perspectives for Science and Society, 29*(1), 63–65. https://doi.org/10.14512/gaia.29.1.14

Dick, E. (2016). 'Urban governance for sustainable global development: From the SDGs to the New Urban Agenda'. Briefing paper no.8/2016, Deutsches Institut für Entwicklungspolitik. Available at: http://hdl.handle.net/10419/199772.

Doberstein, C. (2016). Designing collaborative governance decision-making in search of a 'collaborative advantage'. *Public Management Review, 18*(6), 819–841. https://doi.org/10.1080/14719037.2015.1045019

Ehnert, F. (2022). Review of research into urban experimentation in the fields of sustainability transitions and environmental governance. *European Planning Studies, 31*(1), 76–102. https://doi.org/10.1080/09654313.2022.2070424

Elzinga, A. (2008). Participation. In G. H. Hadorn, et al. (Eds.), *Handbook of transdisciplinary research* (pp. 345–359). Dordrecht: Springer Netherlands.

Eneqvist, E., & Karvonen, A. (2021). Experimental governance and urban planning futures: Five strategic functions for municipalities in local innovation. *Urban Planning, 6*(1), 183–194. https://doi.org/10.17645/up.v6i1.3396

Engels, A., & Walz, K. (2018). Dealing with multi-perspectivity in real-world laboratories: Experiences from the transdisciplinary research project urban transformation laboratories. *GAIA-Ecological Perspectives for Science and Society, 27*(1), 39–45. https://doi.org/10.14512/gaia.27.S1.10

Fingerle, B. (2019) Real-world laboratories: Research infrastructures for open innovation and citizen science. Available at: https://www.zbw-mediatalk.eu/2019/07/real-world-laboratories-research-infrastructures-for-open-innovation-and-citizen-science/ (Accessed: 30 January 2023).

Fleckenstein, C., et al. (2022). Trees in planters—A case study of time-related aspects. *Land, 11*(8), 1289. https://doi.org/10.3390/land11081289

Frantzeskaki, N. (2022). Bringing transition management to cities: Building skills for transformative urban governance. *Sustainability, 14*(2), 650. https://doi.org/10.3390/su14020650

Frantzeskaki, N., van Steenbergen, F., & Stedman, R. C. (2018). Sense of place and experimentation in urban sustainability transitions: The Resilience Lab in Carnisse, Rotterdam, the Netherlands. *Sustainability Science, 13*(4), 1045–1059. https://doi.org/10.1007/s11625-018-0562-5

Frantzeskaki, N., et al. (2023). Governance of and with nature-based solutions in cities. In T. McPhearson, N. Kabisch, & N. Frantzeskaki (Eds.), *Nature-based solutions for cities* (pp. 241–258). Edward Elgar Publishing.

Geekiyanage, D., Fernando, T., & Keraminiyage, K. (2021). Mapping participatory methods in the urban development process: A systematic review and case-based evidence analysis. *Sustainability, 13*(16), 8992. https://doi.org/10.3390/su13168992

Gramberger, M., et al. (2015). Stakeholder integrated research (STIR): A new approach tested in climate change adaptation research. *Climatic Change, 128*(3–4), 201–214. https://doi.org/10.1007/s10584-014-1225-x

Hahne, U. (2021). Interventionen in Prozessen der Stadt- und Regionalentwicklung. Anmerkungen zum Format Reallabore der Nachhaltigkeit aus planungswissenschaftlicher Sicht. *Raumforschung und Raumordnung | Spatial Research and Planning, 79*(4), 306–321. https://doi.org/10.14512/rur.54

Hansen, J. A., & Lehmann, M. (2006). Agents of change: Universities as development hubs. *Journal of Cleaner Production, 14*(9–11), 820–829. https://doi.org/10.1016/j.jclepro.2005.11.048

van der Heijden, J. (2018). City and subnational governance. In A. Jordan, et al. (Eds.), *Governing climate change* (pp. 81–96). Cambridge University Press.

Holewik, C. (2022). *Evaluation in Reallaboren - Hintergrundpapier*. Arbeitsbericht des Forschungsprojekts Innoredux.

Hölscher, K., Frantzeskaki, N., & Loorbach, D. (2019). Steering transformations under climate change: Capacities for transformative climate governance and the case of Rotterdam, the Netherlands. *Regional Environmental Change, 19*(3), 791–805. https://doi.org/10.1007/s10113-018-1329-3

Huitema, D., et al. (2018). Policy experimentation: Core concepts, political dynamics, governance and impacts. *Policy Sciences, 51*(2), 143–159. https://doi.org/10.1007/s11077-018-9321-9

Huning, S., Räuchle, C., & Fuchs, M. (2021). Designing real-world laboratories for sustainable urban transformation: Addressing ambiguous roles and expectations in transdisciplinary teams. *Sustainability Science, 16*(5), 1595–1607. https://doi.org/10.1007/s11625-021-00985-0

Hysing, E. (2009). From government to governance? A comparison of environmental governing in Swedish forestry and transport. *Governance, 22*(4), 647–672. https://doi.org/10.1111/j.1468-0491.2009.01457.x

Jones, P., & Evans, J. (2006). Urban regeneration, governance and the state: Exploring notions of distance and proximity. *Urban Studies, 43*(9), 1491–1509. https://doi.org/10.1080/00420980600749951

Kanning, H., et al. (2021). Real-world laboratories initiated by practitioner stakeholders for sustainable land management—Characteristics and challenges using the example of Energieavantgarde Anhalt. In T. Weith, et al. (Eds.), *Sustainable land management in a European context. (Human-environment interactions)* (pp. 207–226). Cham: Springer International Publishing.

Keeler, L. W., et al. (2019). Building actor-centric transformative capacity through city-university partnerships. *Ambio, 48*(5), 529–538. https://doi.org/10.1007/s13280-018-1117-9

Kivimaa, P., et al. (2017). Experiments in climate governance – A systematic review of research on energy and built environment transitions. *Journal of Cleaner Production, 169*, 17–29. https://doi.org/10.1016/j.jclepro.2017.01.027

Kohler, M., et al. (2021). Thinking urban transformation through elsewhere: A conversation between real-world labs in São Paulo and Hamburg on governance and practical action. *Sustainability, 13*(22), 12811. https://doi.org/10.3390/su132212811

Kolb, B. (2008). Involving, sharing, analysing—Potential of the participatory photo interview'. Forum qualitative Sozialforschung/forum: Qualitative social research. *Visual Methods, 9*(3). https://doi.org/10.17169/fqs-9.3.1155 (2008).

Kronsell, A., & Mukhtar-Landgren, D. (2018). Experimental governance: The role of municipalities in urban living labs. *European Planning Studies, 26*(5), 988–1007. https://doi.org/10.1080/09654313.2018.1435631

Laakso, S., Berg, A., & Annala, M. (2017). Dynamics of experimental governance: A meta-study of functions and uses of climate governance experiments. *Journal of Cleaner Production, 169*, 8–16. https://doi.org/10.1016/j.jclepro.2017.04.140

Lam, D. P. M., et al. (2021). Transdisciplinary research: Towards an integrative perspective. *GAIA - Ecological Perspectives for Science and Society, 30*(4), 243–249. https://doi.org/10.14512/gaia.30.4.7

Lang, D. J., et al. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science, 7*(S1), 25–43. https://doi.org/10.1007/s11625-011-0149-x

Lange, P., et al. (2013). Governing towards sustainability—Conceptualizing modes of governance. *Journal of Environmental Policy & Planning, 15*(3), 403–425. https://doi.org/10.1080/1523908X.2013.769414

Leuphana. (2022). Transdisziplinarität in Aktion: Lüneburger Theatervorplatz wird zum ersten neuen "Lieblingsplatz". Available at https://www.leuphana.de/universitaet/termine/archiv/ansicht/2022/06/29/transdisziplinaritaet-in-aktion-lueneburger-theatervorplatz-wird-zum-ersten-neuen-lieblingsplatz.html.

Li, W., et al. (2020). Analysis of citizens' motivation and participation intention in urban planning. *Cities, 106*, Article 102921. https://doi.org/10.1016/j.cities.2020.102921

Lnenicka, M., et al. (2024). Sustainable open data ecosystems in smart cities: A platform theory-based analysis of 19 European cities. *Cities, 148*, Article 104851.

Loorbach, D. A. (2022). Designing radical transitions: A plea for a new governance culture to empower deep transformative change. *City, Territory and Architecture, 9*(1). https://doi.org/10.1186/s40410-022-00176-z

Lüderitz, C., et al. (2017). Learning through evaluation—A tentative evaluative scheme for sustainability transition experiments. *Journal of Cleaner Production, 169*, 61–76. https://doi.org/10.1016/j.jclepro.2016.09.005

Lüneburg 2030a (n.d.) Was ist die Zukunftsstadt? Available at: https://www.lueneburg2030.de/was-ist-die-zukunftsstadt/ (Accessed: 30 January 2023).

Lüneburg 2030b (n.d.) Lieblingsort Theatervorplatz. Available at https://www.lueneburg2030.de/theater/ (Accessed 24 Feburary 2024).

Lüneburg 2030c (n.d.) Lieblingsplätze (Interview). Available at https://www.lueneburg2030.de/lieblingsplaetze-neu/ (Accessed 24 February 2024).

Mackrodt, U., & Helbrecht, I. (2013). 'Performative Bürgerbeteiligung als neue Form kooperativer Freiraumplanung', disP - The. *Planning Review, 49*(4), 14–24. https://doi.org/10.1080/02513625.2013.892782

Mayrhofer, R. (2018). Co-creating community gardens on untapped terrain – Lessons from a transdisciplinary planning and participation process in the context of municipal housing in Vienna. *Local Environment, 23*(12), 1207–1224. https://doi.org/10.1080/13549839.2018.1541345

McCrory, G., et al. (2020). Sustainability-oriented labs in real-world contexts: An exploratory review. *Journal of Cleaner Production, 277*, Article 123202. https://doi.org/10.1016/j.jclepro.2020.123202

Méreiné Berki, B., et al. (2017). The role of social capital and interpersonal relations in the alleviation of extreme poverty and spatial segregation of Romani people in Szeged. *Journal of Urban and Regional Analysis, 9*(1). https://doi.org/10.37043/JURA.2017.9.1.2

Newig, J. (2011). Partizipation und neue Formen der Governance. In M. Groß (Ed.), *Handbuch Umweltsoziologie* (pp. 485–502). Wiesbaden: VS Verlag für Sozialwissenschaften.

Newig, J., & Kvarda, E. (2012). Participation in environmental governance: Legitimate and effective? In K. Hogl, et al. (Eds.), *Environmental governance: The challenge of legitimacy and effectiveness* (pp. 29–45). Cheltenham: Edward Elgar.

Nilssen, M., & Hanssen, G. S. (2022). Institutional innovation for more involving urban transformations: Comparing Danish and Dutch experiences. *Cities, 131*, Article 103845. https://doi.org/10.1016/j.cities.2022.103845

Nop, S., & Thornton, A. (2020). Community participation in contemporary urban planning in Cambodia: The examples of Khmuonh and Kouk Roka neighbourhoods in Phnom Penh. *Cities, 103*, Article 102770. https://doi.org/10.1016/j.cities.2020.102770

Odume, O. N., et al. (2021). Pathways, contextual and cross-scale dynamics of science-policy-society interactions in transdisciplinary research in African cities. *Environmental Science & Policy, 125*, 116–125. https://doi.org/10.1016/j.envsci.2021.08.014

Parodi, O. (2019). Wider eine Engführung des Reallabor-Konzepts. *Ökologisches Wirtschaften - Fachzeitschrift, 2*, 8–9. https://doi.org/10.14512/OEW340208

Parodi, O., et al. (2016). Von "Aktionsforschung" bis "Zielkonflikte". *TATuP - Zeitschrift für Technikfolgenabschätzung in Theorie und Praxis, 25*(3), 9–18. https://doi.org/10.14512/tatup.25.3.9

Parodi, O., et al. (2021). Wer partizipiert woran - und mit welchen Folgen? Erkenntnisse aus der transdisziplinären und transformativen Forschung. In R. Lindner, et al. (Eds.), *Gesellschaftliche Transformationen* (pp. 199–218). Nomos Verlagsgesellschaft mbH & Co. KG.

Peters, B. G., & Pierre, J. (2012). Urban governance. In K. Mossberger, & P. John (Eds.), *The Oxford handbook of urban politics* (pp. 71–86). Oxford: Oxford University Press.

Puttrowait, E., et al. (2018). Der Weg zum Realexperiment – Schlüsselakteure identifizieren, Kooperationsstrukturen aufbauen, Projektideen auswählen. In A. Di Giulio, & R. Defila (Eds.), *Transdisziplinär und transformativ forschen* (pp. 195–232). Wiesbaden: Springer Fachmedien Wiesbaden.

Räuchle, C. (2021). Social encounter by experiment? Potentials and pitfalls of real-world labs for urban planning. *Urban Planning, 6*(1), 208–220. https://doi.org/10.17645/up.v6i1.3475

Rigolot, C. (2020). Transdisciplinarity as a discipline and a way of being: Complementarities and creative tensions. *Humanities and Social Sciences Communications, 7*(1). https://doi.org/10.1057/s41599-020-00598-5

Roebke, L., Grillitsch, M., & Coenen, L. (2022). Assessing change agency in urban experiments for sustainability transitions. *Environmental Innovation and Societal Transitions, 45*, 214–227. https://doi.org/10.1016/j.eist.2022.10.007

Schäpke, N., et al. (2018). Jointly experimenting for transformation? Shaping real-world laboratories by comparing them. *GAIA - Ecological Perspectives for Science and Society, 27*(1), 85–96. https://doi.org/10.14512/gaia.27.S1.16

Schneider, F., et al. (2023). Fostering transdisciplinary research for sustainability in the Global South: Pathways to impact for funding programmes. *Humanities and Social Sciences Communications, 10*(1). https://doi.org/10.1057/s41599-023-02138-3

Schneidewind, U., et al. (2018). Structure matters: Real-world laboratories as a new type of large-scale research infrastructure: A framework inspired by Giddens' structuration theory. *GAIA - Ecological Perspectives for Science and Society, 27*(1), 12–17. https://doi.org/10.14512/gaia.27.S1.5

Scholz, R. W., & Steiner, G. (2015). The real type and ideal type of transdisciplinary processes: Part I—Theoretical foundations. *Sustainability Science, 10*(4), 527–544. https://doi.org/10.1007/s11625-015-0326-4

Scoones, I., et al. (2020). Transformations to sustainability: Combining structural, systemic and enabling approaches. *Current Opinion in Environmental Sustainability, 42*, 65–75. https://doi.org/10.1016/j.cosust.2019.12.004

Seebacher, A., Alcántara, S., & Quint, A. (2018). Akteure in Reallaboren - Reallabore als Akteure. In R. Defila, & A. Di Giulio (Eds.), *Transdisziplinär und transformativ forschen* (pp. 155–159). Wiesbaden: Springer Fachmedien Wiesbaden.

Smith, R., & Wiek, A. (2012). Achievements and opportunities in initiating governance for urban sustainability. *Environment and Planning. C, Government & Policy, 30*(3), 429–447. https://doi.org/10.1068/c10158

Sonnberger, M., & Lindner, D. (2021). Participation in real-world laboratories in a new light?! Closing the gap between co-creative and deliberative participation. *Raumforschung und Raumordnung | Spatial Research and Planning, 79*(4), 424–437. https://doi.org/10.14512/rur.27

Suitner, J., & Krisch, A. (2023). Navigating context in experiments: The "real," the roots, the rationale. *European Urban and Regional Studies*. https://doi.org/10.1177/09697764231205218

Theater Lüneburg (n.d.) 'Auftakt Theatervorplatz wird zum Lieblingsplatz', Available at https://www.theater-lueneburg.de/pressefotos/auftakt-theatervorplatz-wird-zum-lieblingsplatz/ (Accessed 24 February 2024).

Torrens, J., & von Wirth, T. (2021). Experimentation or projectification of urban change? A critical appraisal and three steps forward. *Urban Transformations, 3*(1), 8. https://doi.org/10.1186/s42854-021-00025-1

Trenks, H., et al. (2018). Mit einer Realexperimentreihe Impulse für soziale Innovationen setzen – Realexperimente initiieren, begleiten und beforschen. In A. Di Giulio, & R. Defila (Eds.), *Transdisziplinär und transformativ forschen* (pp. 233–268). Wiesbaden: Springer Fachmedien Wiesbaden.

UN. (2023). Goal 11. Available at: https://sdgs.un.org/goals/goal11 (Accessed: 28 January 2023).

Voß, J.-P., & Simons, A. (2018). A novel understanding of experimentation in governance: Co-producing innovations between "lab" and "field". *Policy Sciences, 51*(2), 213–229. https://doi.org/10.1007/s11077-018-9313-9

Wada, M., et al. (2021). Addressing real-world problems through transdisciplinary working. In A. Sixsmith, et al. (Eds.), *Knowledge, innovation, and impact. (International perspectives on social policy, administration, and practice)* (pp. 121–129). Cham: Springer International Publishing.

Wagner, F. (2017). Reallabore als kreative Arenen der Transformation zu einer Kultur der Nachhaltigkeit. In J.-L. Reinermann, & F. Behr (Eds.), *Die Experimentalstadt* (pp. 79–94). Wiesbaden: Springer Fachmedien Wiesbaden.

Wang, H., & Ran, B. (2021). Network governance and collaborative governance: A thematic analysis on their similarities, differences, and entanglements. *Public Management Review*, 1–25. https://doi.org/10.1080/14719037.2021.2011389

Wanner, M., et al. (2018). 'Towards a cyclical concept of real-world laboratories', disP - the. *Planning Review, 54*(2), 94–114. https://doi.org/10.1080/02513625.2018.1487651

Wiedmann, T., & Allen, C. (2021). City footprints and SDGs provide untapped potential for assessing city sustainability. *Nature Communications, 12*(1), 3758. https://doi.org/10.1038/s41467-021-23968-2

Williams, S., & Robinson, J. (2020). Measuring sustainability: An evaluation framework for sustainability transition experiments. *Environmental Science & Policy, 103*, 58–66. https://doi.org/10.1016/j.envsci.2019.10.012

Wolfram, M., & Frantzeskaki, N. (2016). Cities and systemic change for sustainability: Prevailing epistemologies and an emerging research agenda. *Sustainability, 8*(2), 144. https://doi.org/10.3390/su8020144

Wolfram, M., et al. (2019). Learning in urban climate governance: Concepts, key issues and challenges. *Journal of Environmental Policy & Planning, 21*(1), 1–15. https://doi.org/10.1080/1523908X.2018.1558848