

RESEARCH

Open Access



Trialogical cooperation for urban transformation: key relations for enhancing transformative governance

Laura Brings^{1*}, Agnes Förster¹ and Matthias Wanner²

*Correspondence:
Brings@pt.rwth-aachen.de

¹ Chair of Planning Theory
and Urban Development, RWTH
Aachen University, Aachen,
Germany

² Wuppertal Institute for Climate,
Environment and Energy,
Wuppertal, Germany

Abstract

Urban transformations towards sustainability require cooperation among various stakeholders. There is an increasing amount of research on how to facilitate these cooperations, particularly regarding necessary governance modes and capacities. However, studies that specifically examine the cooperation among three key actor groups, or in short, the trialogical cooperation, are limited. This study focuses on the trialogical cooperation between city makers, city administrators, and transformative researchers, as these groups play a crucial role in implementing sustainability measures. Although many challenges related to multi-actor cooperation have been discussed in literature, they have not widely been systematically explored. Existing studies often concentrate on specific projects without adequately analyzing the perspectives of individual stakeholders. This article offers a broader view by providing insights into the perceptions of participants involved in this trialogical cooperation in projects throughout Germany. These perceptions were gathered through reflexive workshops and group discussions. As a result, a conceptual model to analyze key relations and factors influencing trialogical cooperation for urban sustainability was developed. This model is presented in this article and can be utilized to systematically examine various forms of multi-actor cooperation. We identify three key relations that significantly shape the studied trialogical cooperation: 1) the interaction between existing contexts and current forms of cooperation; 2) the mutual influence between individuals and institutions; and 3) the enhancement of collective and individual transformative capacities through reflexive learning. Through this study, we contribute to a deeper understanding of multi-level challenges within one of many (trialogical) cooperations for urban transformation towards sustainability.

Science highlights

- Perspectives on existing cooperation for urban sustainability transformation of 97 individuals from three spheres of actors in Germany: city maker, city administrators, transformative researchers.
- Insights into how self-perception differs from external perception.
- Introduction of a conceptual model for systemically studying (trialogical) transformative cooperation.



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

- Identification of three key relations that shape this specific cooperation: 1) the interaction between existing contexts and current forms of cooperation; 2) the mutual influence between individuals and institutions; and 3) the enhancement of collective and individual transformative capacities through reflexive learning.

Keywords: Trialogical cooperation, Urban sustainability transformation, City maker, City administration, Transformative researcher, Governance, Strategic cooperation, Individual perceptions, Reflexive learning

Policy and practice recommendations

- The three spheres of actors (city maker, researchers, public administrations) could potentially benefit from each other and build strong coalitions for transformation when mutual understanding is enabled.
- The use of reflexive approaches can generate understanding among actors and support transformative urban governance.
- Learning is enabled through existing project-based cooperation; however, challenges including short-term and unequal funding remain. These challenges hinder strategic cooperation.
- Structural (institutional) constraints lead to individual overwhelm in such cooperations.

Multi-actor cooperations and transformative urban governance

The challenges of urban transformation towards sustainability, such as climate change or social cohesion, are becoming increasingly urgent and complex. They require cooperation among multiple actors, including politicians, public administrations, researchers, and citizens (WBGU 2016; IPCC 2023). Research on cooperation for urban transformation is gaining momentum in the field of transitions research with focuses on various issues such as different forms of cooperation, capacities, and governance structures required for (urban) transformation (Nevens et al. 2013; Wolfram 2016; Schöpke et al. 2018; Frantzeskaki and Rok 2018; Medina-García et al., 2022).

As an emerging concept, transformative governance refers to the “formal and informal rules, rulemaking systems and actor networks at all levels of society that enable transformative change toward sustainability” (Allen et al. 2023, 1256). Studies on this concept have identified key capacities such as experimentation and reflexive learning (Bosomworth 2018). Wolfram (2019) emphasizes that future research should explore how multi-agency processes emerge and how they are influenced by specific institutions and spatial configurations. He further stresses the need for “transdisciplinary approaches that fully incorporate the views and insights of diverse urban stakeholders” (Wolfram 2019, 446). This article explores this research gap by studying the cooperation between city makers, transformative researchers and city administrators in the field of urban transformation toward sustainability. It analyses this one of a kind multi-agency process by interrogating relations between individuals, institutions, the urban context, and further framework conditions. The data supporting this contribution was collected in a transdisciplinary and experimental process through workshops at which individual perceptions were gathered and reflected upon together with all participants.

The trialogical cooperation between city makers, transformative researchers and city administrators

In the context of multi-actor processes and transformative governance, this article studies the cooperation of three actor groups in Germany involved in different urban transdisciplinary and transformative processes. Such processes have evolved rapidly in Germany and receive more attention from German and European funding institutions and programs (BMBF FONA-Strategy, JPI Urban Europe, Kolocek and Matzke 2022). This is related to the rise of transformative and transdisciplinary research (TTDR) as a research mode beyond traditional academic boundaries. TTDR is characterized by its contribution to solving complex, real-world, sustainability problems through transdisciplinary teams from research and practice. It focuses on enabling individuals and communities to act for transformative change by creating contexts and building capacities (Augenstein et al. 2024).

In this context of rising TTDR, cooperation between three actors – city makers, city administrators and transformative researchers – has become increasingly prominent in German cities. However, this specific constellation of actors has not widely been explored yet. Many studies on cooperation among different spheres of actors tend to focus broadly on multi-actor constellations (Fugmann et al. 2018, Medina-García et al., 2022). Some analyze cooperations from single perspectives (Hilger et al. 2018). When investigating trialogical cooperations specifically – meaning a cooperation between three different actor groups – prior studies have addressed the cooperation between politics, city administrations and city makers (Hüttl 2018) or cooperation between the public sector, private investors and citizens (e.g. project 3stadt2, BBSR n.d.). Limited attention has been given so far to the trialogical cooperation among city makers, city administrators, and transformative researchers. We therefore analyze this emerging form of cooperation in the context of urban transformation towards sustainability.

The trialogical cooperation between city makers, transformative researchers and public administrators is especially interesting as impulses for change are observable within the three spheres of actors. City makers are considered as part of the organized civil society. Beck et al. (2017, 2) describe city makers as a type of actor “that operates beyond financially strong, established or member-strong association structures in the form of flexible networks in a very practical, event-related and civil society-oriented manner” [own translation from German]. A professionalization of city makers is also notable, leading to even more attention to those actors; this trend runs in parallel to the recent rise in interest for transformative research, too. Transformative researchers are characterized by their active, on-site contribution to real-world problem solving. By actively involving various actors they aim to enhance change processes (Wuppertal Institut n.d.). However, this turn of research towards practice leads to discussions about the differentiation between disciplinary research and transformative research (e.g. within the working group LinkLab (Weiser et al. 2023), Kolocek and Matzke 2022). Another turn is observable within public administrations as they are confronted with multiple and complex transformation tasks. They make greater use of new communicative approaches and instruments. This implies a stronger orientation towards experiments and the strategic cooperation with other local actors (Wékel 2018). City administrators in this study

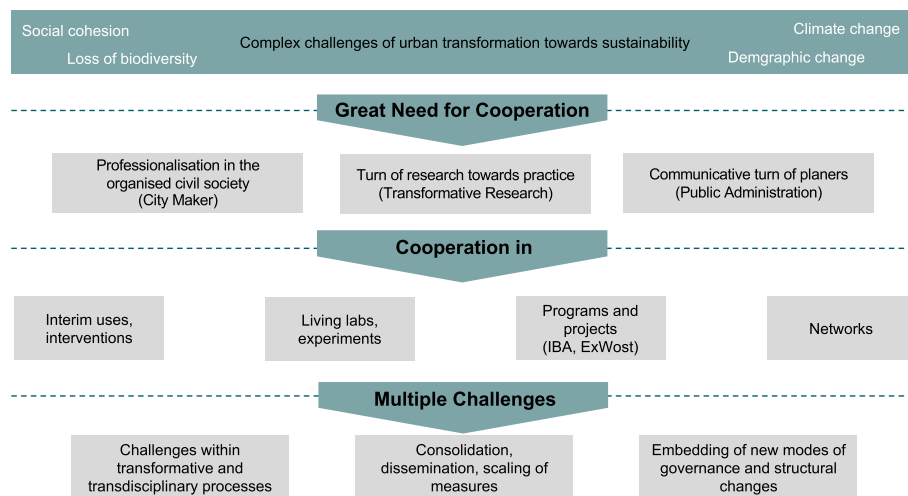


Fig. 1 Challenges within the triological cooperation

are understood as persons contributing actively to urban development within public administrations.

Most recently, this triological cooperation has occurred in various formats: in research and urban development projects, experiments, in interim uses, and networks (Wanner et al., 2022). Within these cooperations, the actors involved face multiple challenges 1) within transformative processes or projects, 2) in the consolidation, dissemination or scaling of knowledge and measures implemented in transformative processes, and 3) in the embedding of changes in the long-term through new modes of governance and structural changes (compare Fig. 1).

Challenges in and around transformative processes

Challenges within the transformative processes include conflicting communication strategies, insecurities about roles and tasks, as well as differing or even competing claims and expectations regarding timelines (Borner and Kraft 2018; Engels and Rogge 2018; Hilger et al. 2018; Gonser et al. 2019; Seydel et al. 2021; Wanner et al., 2022). The second major set of challenges involves consolidating, disseminating or scaling of knowledge and measures from transdisciplinary and transformative processes (von Wirth et al. 2019). Difficulties arise when trying to integrate individual measures into existing structures or legal frameworks. Funding structures typically do not support strategic and long-term development of these measures. Additionally, this short-term funding hinders the long-term involvement of key individuals as they depend on this funding. This again results in a loss of knowledge and transfer for consolidation processes (Beecroft et al. 2018; Gonser et al. 2019; Bergmann et al. 2021). The third category of challenges addresses new forms of governance and structural change. Structural (institutional) changes, both fundamental and incremental, have been widely discussed within different spheres of actors such as public administrations or research. Necessary changes within research institutions include improvements to incentive systems and communication with the public about research findings (Wittmayer and Hölscher 2017). In public administrations, strong sectoral and hierarchical challenges have been emphasized

(Zalas 2021; Raffer et al. 2023). Discussions about democratic legitimacy of these transformative processes are gaining momentum as new forms of governance are being tested (Schramm et al. 2018; Ehnert et al. 2019; von Wirth et al. 2019; Höcke and Schnur 2021). The need for new forms of urban governance has been emphasized (WBGU 2016) and a variety of forms, such as adaptive and reflexive governance can be found in literature (Allen et al. 2023). However, it remains unclear “what aspects of these governance arrangements might support or hinder transformation toward the SDGs” (Allen et al. 2023, 1263). Additionally, evaluations of projects and processes in terms of their impact on societal and scientific outcomes have only increased in recent years (Luederitz et al. 2017; Newig et al. 2019; Schäfer et al. 2020; Scholl and De Kraker 2021; Schäpke et al. 2024).

As shown, multiple challenges that have hindered strategic cooperation between actors until now have already been explored. This displays the difficulty of implementing new governance modes. The systemic relations and interdependencies between these three challenges have, to our knowledge, not been widely analyzed. Studying these relations might widen the scope for implementing new modes of governance for transformation towards sustainability. Additionally, (Bögel, et al., 2022) emphasize the importance of recognizing individuals in steering such transformations. Research on the role that key individuals — or intermediaries — play within them requires more attention (Ziervogel 2019; Schäpke 2018). The aim of the study is to shed light on the perspectives of such potential key individuals on their cooperation experiences. The underlying research questions are:

Which key relations within the trialogical cooperation can be observed that hinder and enhance transformative urban governance?

To assess this, we ask: What are the key perceptions that shape the trialogical cooperation of city makers, researchers and city administrators?

To address both questions, we conducted workshops and group discussions from which the content was qualitatively analysed. The results are structured as follows: First, we analyze differences and similarities in individual perceptions from a) the three spheres of actors; as well as the potentials and challenges for b) individual and institutional development, and c) a strategic cooperation. Second, summarizing the findings, we then present a conceptual model. With this, we explore and discuss the key relations in such multi-actor cooperations.

Multi-actor cooperations in transitions research

Key relations within multi-actor cooperations have been discussed in various fields of research, one of them being transitions research. Since the late 2000s transitions research has emerged as a major research field focused on understanding and navigating transformative (urban) dynamics. Recent debates in this field center around key aspects: first, transitions research focusses on actors and agency to understand roles and interactions in urban change (Egermann et al., 2024). This aspect also relates to discussions about institutional logics and the relation between institutions and individuals (Fuenfschilling and Truffer 2016). More broadly, it connects to the duality of structure and action introduced by Giddens in 1984 and is further discussed, for example, in institutional theory (Lowndes and Roberts 2013). Second, urban governance approaches for systemic change

are explored and addressed –through transformative and transdisciplinary approaches like transition management and urban experimentation. Third, urban transformative capacities for addressing and governing urban transitions are identified and researched on (Egermann et al., 2024). The next sections give a broad overview about existing findings relating to the three key aspects.

Individual and collective agency

In studies about agency, there tends to be a greater emphasis on collective agency rather than individual agency when it comes to generating change. (Bögel, et al., 2022, 172) note that: “[...] individualistic psychology has been criticized for overestimating the power of the individual and neglecting the structural constraints of human action [...]. Approaches based on a collective understanding of agency, in contrast, tend to neglect the roles of individuals and their motivations, which have critical implications for steering transitions.” Hence, studies focusing on both the collective and individual agency are needed. In a wider sense, research with regard to multi-level systems can help us understand agency. Recently, transitions research has begun to pay more attention to this, with some studies examining the relations between individuals and institutions. For instance, Fuenfschilling and Truffer (2016) analyze agency in term of its potential to change institutions. Augenstein et al. (2022) use the embedded agency perspective to analyze mechanisms of change in real-world labs at the individual, collective and societal level.

Institutional contexts and logics

Discussions about agency lead to inquiries regarding organizational or institutional contexts that shape — and can be shaped by — transformative action. Differing logics of action among actors significantly influence cooperation (Gonser et al. 2019, Loibl 2005, Waag 2012). Specific organizational cultures, forms, and the logics that different actor spheres follow are studied (Ehnert, et al., 2022, Selle 2005, Gonser et al. 2019). Gonser et al. (2019) emphasize that cooperation can generate both synergies and conflicts between institutions and actors in the subsystems. They argue that a transformative orientation of a project intensifies conflicts between different subsystems, for example, due to the increased risk of failure in experiments. The different subsystems and their inherent logics addressed in this article were examined in an earlier article co-authored by the authors alongside other experts. It highlighted how differing inherent logics can pose challenges for strategic cooperation (Wanner et al. 2022).

Transformative urban governance and capacities

Understanding factors that promote or inhibit transformative urban governance has recently received more attention in research. Transformative urban governance can be understood as the “formal and informal rules, rulemaking systems and actor networks at all levels of society that enable transformative change toward sustainability” (Allen et al. 2023, 1256). It builds upon adaptive and reflexive governance approaches emphasizing flexibility and reflexivity — particularly regarding rethinking and changing existing structures or institutions fundamentally and deliberately. Identified capacities essential for enhancing transformative governance include reflexive learning, experimentation, inclusion of diverse perspectives and knowledge, as well as decision making under

conditions of uncertainty (Chaffin et al. 2016; Bosomworth 2018; Visseren-Hamakers et al. 2021; Allen et al. 2023).

Concepts related to transformative governance capacities in specifically *urban* contexts have also been introduced. Wolfram (2016) points out ten key components of transformative urban governance. Among these components are inclusive and multi-form urban governance, experimentation and reflexivity, and social learning. Hölscher (2020) introduces a conceptual framework to explain and support capacities to achieve transformative (climate) governance. She understands governance capacity as: “an emergent property that is constantly mediated through the formal and informal collaboration and learning processes between multiple governance actors and how they interact with their organisational contexts” (Hölscher 2020, 51). These theoretical aspects set the ground for this study and will be reflected on in the discussion.

In the next sections, the cooperation between city makers, transformative researchers and city administrators is explored regarding the resulting learning processes and the interaction of individuals with their organizational contexts. From this we aim to learn about key relations for enhancing transformative urban governance.

Methods, data basis and analysis

We investigated key relations within the trialogical cooperation and their implications for enhancing urban transformative governance using an exploratory qualitative empirical approach. This research approach was applied as it allows to gain deeper understanding about social realities and internal perceptions. It is useful for research objects, which have not been studied widely (Eisewicht and Hitzler 2023).

Desk research to identify triaogical cooperations

The study began with desk research that generated a long-list of trialogical cooperations. From this list, we identified different forms of trialogical cooperation. Cooperation was defined based on Tribble (2023) as actors working together intending to achieve a common goal. We limited our scope to cooperations within German cities involving city makers, transformative researchers and city administrators, specifically targeting transformation of urban (public) spaces. This refined long-list was later supplemented with additional cooperations mentioned by our participants. We then analyzed this list according to several categories: spatial, temporal, and financial characteristics, labeled formats, thematic focuses and goals, as well as actor constellations (see Table 1). Two main types of cooperation were observed: 1) (structured) projects and 2) (loose) networks (see Table 1). The first is primarily concerned with joint action on specific transformation tasks, while the latter serves to set political agendas and facilitate knowledge transfer.

In projects, the cooperation was pre-defined by funding conditions and duration, as well as by their respective spatial focus – often at neighborhood or city level. They addressed specific transformation tasks, such as mobility transition or climate change. Each project has established objectives and specific steps that were agreed upon in advance or at project’s outset. Examples include projects funded by federal urban development programs such as the BMBF Zukunftsstadt funding or within the NSP

Table 1 Two basic forms of cooperation in dialogues and their characteristics

Format	Spatial characteristics	Temporal characteristics	Financial characteristics	Actor constellation	Primary focus	Examples
Project	Household Streets Neighborhood City Region	Defined duration (often 3 years)	Funding (different funding bodies and amounts)	Defined group with additional participants, can change during the process	Defined goals, joint action towards transformation task	Zukunftsstadt Dresden ACademie für kollaborative Stadtentwicklung Casa Schützenplatz Stuttgart
Network	City Region State	No fixed duration	No/informal funding or sponsoring	No fixed group, mostly one steering group	Political agenda setting, knowledge transfer	Netzwerk Bürgerbeteiligung (network for citizen participation) Netzwerk Reallabore der Nachhaltigkeit (Network real-world labs for sustainability) Netzwerk Immobilien (Network Immobilien, promoting real-estate as commons)

Post-Corona Stadt funding. In these cases, funding was precisely but not equally allocated among actors, who varied in number and type, aside from a fixed steering group.

The cooperation in networks tended to be more open and focused on particular tasks (e.g., Netzwerk Immobilien) or on specific groups of actors and their daily activities (e.g., Netzwerk Bürgerbeteiligung). Within these networks, working groups were formed, and regular meetings organized. Networks operated within cities or on larger scales. Some functioned informally without any funding (e.g., Netzwerk Reallabore der Nachhaltigkeit), while others secured financial support through sponsors, fees or donations (e.g., Netzwerk Bürgerbeteiligung).

The occasions for cooperation differed between the projects and networks. On one hand, political agenda-setting and the associated funding opportunities facilitated cooperation, particularly in projects. Crises, such as the Covid-19 pandemic, have prompted the creation of new funding sources and thus cooperation (e.g. funding Post-Corona Stadt). This trend is evident in many projects initiated by city administrations and research institutions. On the other hand, neglected (public) spaces in cities drove cooperation aimed at improving these areas. The development of visions for these spaces and the recognition of the need for additional actors to help realize these visions evoked cooperation. Examples include initiatives like Altstadtquartier Büchel in Aachen and Casa Schützenplatz in Stuttgart.

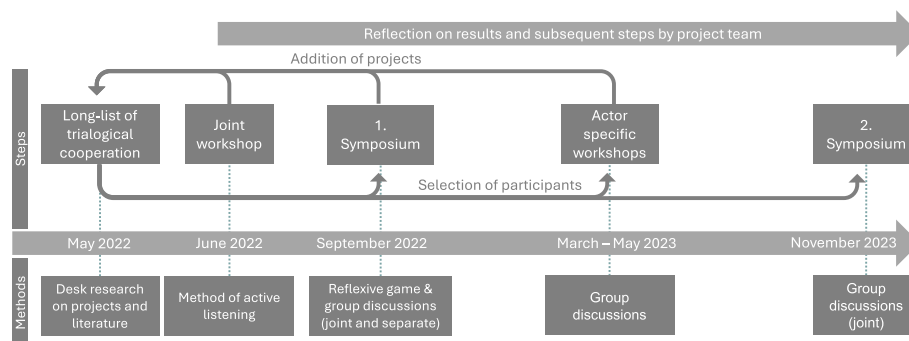


Fig. 2 Research approach

Group discussions and interactive workshops to gain subjective and collective insights

In addition to desk research, the project team set up a series of group discussions and interactive workshops from May 2022 to May 2023 (see Fig. 2). The project team was transdisciplinary itself as it consisted of two city makers, five transformative researchers, and two city administrators. After each workshop, the team collectively reflected on the results and decided on subsequent steps. The first workshop was held within a conference. Therefore, those participants were not selected by the project team. For the following symposia and workshops, participants from projects listed in the long-list were invited. To ensure effective discussions, the number of participants was limited based on the method applied; for example, group discussions aimed for five to ten participants. The projects team sought to include individuals with extensive experience in leading roles alongside early-careers to capture diverse viewpoints. Over this two-year process, a total of 97 people participated: 29 city administrators, 40 researchers and 28 city makers. Most participants worked in fields related to climate and environmental protection; others were involved in urban planning and housing, mobility, education, or culture.

The group discussions and workshops were designed with both an analytical interest and a normative aim. The latter was to actively encourage participants to reflect on their actions in cooperations with the other two actor groups. Thus, the research process integrated the two perspectives: exploring and shaping the conditions for cooperation and governance of urban transformation. For this, various methods were applied during the workshops and discussions. For instance, a reflexive game was used to facilitate self-perception and external perception among participants. Additionally, active listening techniques were used to enhance understanding among the three actor spheres. Group discussions served as a method to gain subjective insights into collective experiences in joint contexts (Liebig and Nentwig-Gesemann 2009). These discussions were held either within the separate actor group to promote open dialogue or with representatives from all spheres to jointly identify challenges and ideas. Guiding questions were formulated by the project team to steer these group discussions (examples see Table 2).

For data analysis, an inductive qualitative content analysis approach was applied (Mayring 2010). First, all data was transcribed and then inductively coded in MaxQDA. The initial coding focused to content-related elements, such as descriptions of actor spheres or challenges. The second round of coding concentrated on the distinction between

internal and external perceptions. These perceptions are presented in the in the next sections.

Individual perceptions of trialogical cooperations

In the workshops we conducted, the participants expressed different individual perceptions of the cooperation. Notably, self-perceptions differed from the external perceptions in several aspects. These differing perceptions are presented in the following chapters and answer research question one. The first section focuses on the perception of each actor sphere, while the second examines the perceived opportunities and challenges of cooperation for the individuals involved. The third section explores how the project-based cooperation described earlier is perceived.




Differing perceptions between the spheres of actors

The surveys of the individuals' perceptions of their respective and other spheres show both converging and diverging perceptions.

City administrations

Participants generally described city administrations as reliable and structured. Their strong influence on urban development and their ability to create a framework for cooperation was recognized. Participants highlighted their expertise in permitting and planning law issues, as well as their access to funding, data and public space. City-wide networks and human resources were also mentioned; however, city administrators themselves indicated that they often operate with insufficient staffing. City administrators also perceived themselves as having strong skills in facilitating participation processes and preparing policy proposals and decisions. The main challenges they identified included the dependence on political decisions (especially during election periods), formalization and bureaucracy, hierarchical structures, and the lack of interdepartmental cooperation. Formalization and bureaucracy, in particular, was indicated by both city makers and researchers as slowing down processes. City administrators expressed concern about other actors' lack of understanding regarding their work and organizational structures – a sentiment echoed by the others involved. Both city makers and researchers pointed out that city administrations often expect a high level of commitment from

Table 2 Examples of guiding questions and impressions of the methods applied in the workshops. Photos: (f.l.t.r.) Laura Brings, Agnes Förster, Svenja Noltemeyer

Method	Active listening	Reflexive game	Group discussions
Exemplary guiding questions	What are your experiences of trialogical cooperation so far? What generally went well /badly? What did you contribute?	Which resources, competencies, and characteristics can you contribute to the trialogical cooperation? Which limits do you see? Where do you see the biggest challenges and opportunities of trialogical cooperation?	Which roles do you take on in trialogical cooperation? What does the trialogical cooperation mean for you personally/ your team/ your actor sphere/ your cooperation with other actors?
Impressions			

them. At the same time, city administrators felt a greater need for expectation management. Researchers noted discrepancies in timelines and expected outcomes, along with a lack of understanding for research questions. They observed general overwhelm and internal disagreements within the city administration. In this context, city administrators reported difficulties in finding time for everyday tasks when cooperating with others. City makers emphasized that they experience an unequal level of cooperation and recognition of ideas from civil society when working together. All participants agreed that while city administrations are typically less open to new ideas, they can be very supportive when personal contact is established.

Transformative researchers

Transformative researchers were generally described as open to experimentation, neutral, objective, and independent. These characteristics contribute to their legitimacy in the eyes of third parties, which city makers found particularly beneficial. Individual researchers were described as curious and sometimes even activism-oriented in their approach. Their work is reflective, retrospective, and analytical; other actors perceived this as helpful but occasionally too theoretical and abstract. Participants highlighted their extensive (inter-)national networks, methods, and knowledge – for example about best practices. City administrations acknowledged the valuable texts produced by researchers, while city makers appreciated the understanding that researchers have for their needs. However, the visionary work of researchers was perceived as ambiguous. On one hand, new ideas and answers generated enthusiasm among city makers and city administrators; on the other hand, city administrators expressed concerns about raising expectations among third parties. City makers also raised issues regarding the potential for researchers to appropriate their ideas and present them as their own. There was disagreement about researchers' abilities to plan and implement processes. While researchers considered themselves capable initiators and managers who occasionally face communication challenges, representatives from other spheres emphasized these communication difficulties – particularly concerning the dissemination of results that often fell short. In terms of resources, research organizations reported to have sufficient human resources and the capacity to apply for large amounts of funding. However, this time-limited and financial reliance on funding led to perceptions of fluctuation and a lack of reliability among researchers. The universities' ability to involve students in cooperations was seen as an opportunity for change but also as potentially overwhelming for participants.

City makers

City makers described themselves as motivated, independent, flexible, creative, fast, and curious. Both researchers and city administrators appreciated their activist and proactive engagement as implementation partners but also perceived them as demanding and critical. City makers identified their strengths in developing visions, making connections, and building relationships. However, they felt that their will and ideas for change were hindered by a lack of legitimacy and power in decision-making. In this context, both city administrators and researchers noted that city makers could become easily frustrated, which requires careful management of expectations. The local networks

Table 3 Frequently mentioned perceived learning processes and challenges through and in cooperation processes

	Learning processes	Challenges
City makers	<ul style="list-style-type: none"> - Adapting communication and argumentation - Managing persisting on ideas and withdrawal for interest of project - Achieving legitimization through cooperation - Appreciating own freedom and flexibility 	<ul style="list-style-type: none"> - Cooperation leads to additional tasks - Intense effort in short timeframes - No remuneration - Lack of recognition for time and effort spent - Lack of continuity & vision - Insecurity about ownership of ideas
Transformative researcher	<ul style="list-style-type: none"> - Feeling of actively contributing to transformation - Recognizing failure as learning experience - Dealing with emotions, uncertainties, expectations - Perceiving self-efficiency - Appreciating own freedom and flexibility 	<ul style="list-style-type: none"> - Cooperation leads to additional tasks - Challenging coordination of tasks - Deferral of personal tasks (PhD) - Fear of staff overload - Difficulties in leaving team after project ends - Lack of recognition for time and effort spent - Expectation management
City administrators	<ul style="list-style-type: none"> - Advancing skills in systemic thinking - Learning project-oriented work - Perceiving self-efficiency 	<ul style="list-style-type: none"> - Cooperation leads to additional tasks - Challenging coordination of tasks - Lack of continuity & vision - Lack of recognition for time and effort spent - High pressure through approval logics - Fear about failure and making mistakes

and knowledge that city makers contribute were particularly valued for involving other actors in processes. While their contributions were appreciated, they were often not financially compensated. The lack of consideration in funding and the overall shortage of financial resources were identified as major challenges. Additionally, city makers faced challenges within their own sphere, including competition among themselves and a lack of acceptance among different actors.

Complements and constraints in trialogical cooperation

As shown, there are fundamental differences between the spheres of actors regarding their knowledge bases, networks, and competencies – and how they are perceived. We argue that the three spheres of actors could potentially benefit from each other and form strong coalitions for transformation. However, all spheres face challenges such as time constraints, limited human resources, expectations of commitment, and a lack of knowledge about each other. The absence of knowledge about each other can lead to differing perceptions and expectations, which poses a threat for (strategic) cooperation and thus to transformative urban governance. The next section gives deeper insights into the perceived challenges and opportunities for individuals in trialogical cooperation.

Trialogical cooperations as opportunities and challenges for individuals

In the study, we found numerous references to trialogical cooperation as environments for learning and development – particularly in identifying challenges and recognizing opportunities for individuals (compare Table 3).

Individual learning processes

The learning processes varied among the three spheres. City makers reported that they learned to adapt their communication and argumentation based on the specific actor sphere involved. They also emphasized that they learned to manage tensions between persisting with their ideas and withdrawal in the interest of the project. City administrators gained skills in systemic thinking and project-oriented work. Researchers perceived cooperation as an opportunity to actively contribute to urban transformation tasks. Failure within the processes was seen as a valuable learning experience. They learned how to deal with emotional ups and downs, uncertainties about outcomes and processes, and varying expectations. Both researchers and city administrators perceived self-efficiency within the cooperation, while city makers saw the legitimization of their own ideas through cooperation as a significant opportunity. Additionally, both city makers and researchers expressed that working with city administrations enhanced their appreciation for their own freedom and flexibility.

Challenges for individual development

However, the cooperation also poses challenges for individuals and their development. First, all actors identified the volume of additional tasks related to the cooperation as a challenge. City administrators found it difficult to coordinate everyday tasks with those related to the cooperation. Researchers faced similar issues; many chose to put other tasks – such as publications or PhD projects – on hold. This situation has led to high burnout rates in many research institutions and caused some PhD students to drop out. City makers highlighted that the intense effort required within short timeframes was challenging, especially as this effort is often not remunerated. Another concern shared by all participants was related to the end of projects and processes. Researchers expressed difficulties in leaving project teams and concerns with transitions and handovers when the project ended, while city makers and city administrators felt a lack of continuity and visions after project completion, leaving them feeling abandoned. A third challenge concerns institutional logics. All spheres of actors articulated frustration over the lack of recognition for time and effort spent on processes outside of their core tasks or roles in the respective institutions. City administrators perceived a high level of pressure due to approval logics that often needed explaining to other parties. Researchers felt an expectation to manage and initiate cooperation due to their funding arrangements. This relates to the fourth challenge: career risks. As previously mentioned, researchers often prioritized cooperation over scientific output, resulting in feelings of not doing justice to any sphere of actors. Consequently, researchers in management positions reported feeling guilty about sending staff into situations of overwhelm. City administrators expressed fears about making mistakes regarding hierarchical protocols or permitting experimental processes. Meanwhile, city makers worried about losing ownership of their own ideas during cooperations.

Project-based cooperation: an opportunity or a challenge for strategic cooperation?

As previously explained, the cooperation within projects is the most common form of cooperation. However, the question of how useful these projects are for future strategic cooperation for urban transformation towards sustainability is not widely discussed. In

our research, participants identified several opportunities and challenges for future strategic cooperation.

Projects helped to develop a common language and enhance understanding and trust among the different actor spheres. The increased knowledge about each actor and their respective institutions facilitated the development of expectation management. Additionally, various funding opportunities became clearer, enabling new alliances to form. Our study further revealed that adjustments were made within the actors' spheres as a result of their cooperation. City administrators modified task distributions, researchers adapted their funding proposals and reallocated resources for cooperation, and city makers recognized their role as political actors. This suggests that increasing knowledge about the spheres by reflecting on them could be an approach not only to address the differences and similarities in perception across the spheres but also to foster change within them.

Despite these advancements, numerous challenges remain. Local political will was identified as a major obstacle for implementing measures and processes, especially during election periods. Additionally, funding periods are often too short for strategic cooperation, raising concerns about short-termism. The resulting high staff turnover can hinder knowledge transfer, and unclear ownership complicates how ideas are positioned for funding. All actors struggle with limited resources and balancing individual goals with collective ones, often leading to overwhelm and insecurities.

Key relations in a multidimensional conceptual model

The above-mentioned potentials and challenges point towards multiple factors that influence the existing and future trialogical cooperation. To explore these more systematically, a conceptual model was developed by the authors. Thereby, three key relations were identified and are discussed in the following.

The conceptual model was developed based on the insights the authors gained during the workshops and group discussions. Initial reflections on this structure were developed beforehand by the authors in cooperation with a transdisciplinary team and published in an article (Wanner et al. 2022).

The conceptual model

The conceptual model connects four main levels: 1) the cooperation, 2) the individual, 3) the team and 3) the institutional level (see Fig. 3). The cooperation occurs within a specific urban context and is influenced by general conditions.

In the urban context, several actors work separately or collaboratively on a wide range of transformation tasks, such as adaptation to climate change. The trialogical cooperation is shaped by the urban context including the local participation culture, the local political situation, artifacts, or the resources, environments, and actors available locally. Additionally, general conditions – such as national political landscapes and available funding – also structure this cooperation. Importantly, both the general conditions and the urban context can be influenced by the cooperation that takes place within them. For instance, emerging local and national networks or the implementation of conceptual or physical measures can reshape these contexts. This interaction can therefore be visualized as a bidirectional vertical axis (red arrow). Along this axis, we can explore questions

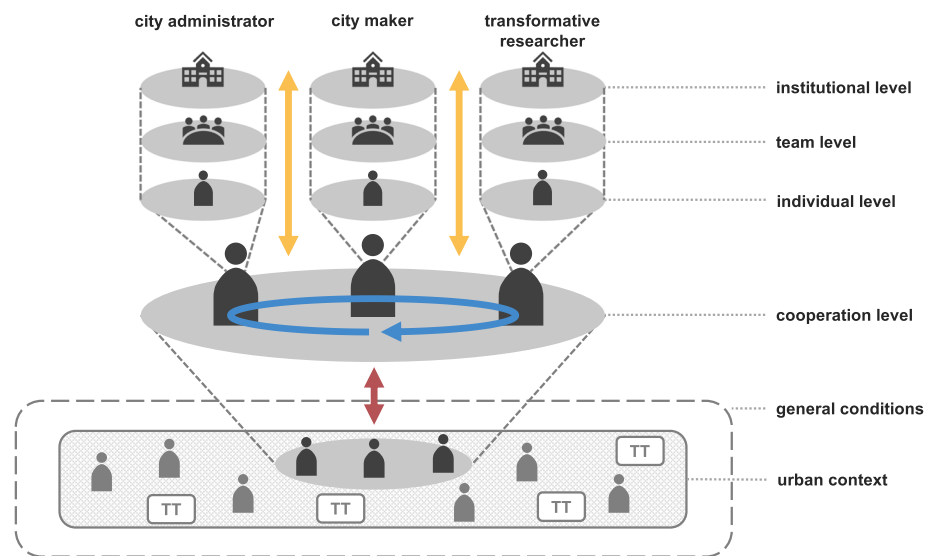


Fig. 3 Conceptual model developed by Laura Brings and Agnes Förster. This model shows the multi-level embedding of trialogical actors: the trialogical cooperation itself is influenced and influences a specific urban context with multiple actors and transformation tasks (TT) as well as general conditions. The individuals taking part in trialogical cooperation again are structured and at the same time structure the individual, team and institutional level

about the impact of cooperations on urban developments as well as about the influence of urban context factors on cooperation.

At the cooperation level, individuals from different actor spheres cooperate towards a common goal. We can introduce a horizontal axis (blue arrow) to analyze aspects such as effective forms of cooperation for transformation, power dynamics, actor constellations, and communication strategies within the cooperation.

A second vertical axis (yellow arrow) can be applied for examining individuals involved in this cooperation more closely. The underlying assumption is that individuals act based on their specific competencies, resources, and characteristics while at the same time being part of institutions that guide their action. Along this axis, we can investigate learning processes and structural adaptations within teams and institutions driven by individuals. We can also assess the impact of institutions on individuals and thus on cooperations.

As shown, many questions in relation to transformative cooperations can be systematically explored using the model. We believe that the model can serve as an analytical lens for investigating key factors and relations not only in this trialogue but also in any form of (transdisciplinary) cooperation for urban transformation towards sustainability.

Our study focused on identifying the key relations within trialogical cooperation that hinder and enhance transformative urban governance. The results revealed a wide range of factors, which relate to multiple levels. Along the three axes in the model, we were able to identify three key relations that seemed to be specifically important for this trialogical cooperation:

1. The interaction between existing contexts and current forms of cooperation.
2. The mutual influence between individuals and institutions.

3. The enhancement of collective and individual transformative capacities through reflexive learning.

These relations are discussed in the following sections.

Relation I: interaction between existing contexts and current forms of cooperation

The first relation is based on discussions regarding different forms of cooperation aimed at transformation towards urban sustainability. This relates to the first vertical axis (red arrow) in the model in terms of which forms are suitable for managing urban transformation and promoting urban change. It also connects to the horizontal axis (blue arrow) in terms of which forms of cooperation facilitate or hinder strategic cooperation.

Funded projects as opportunities and challenges for cooperation

In our study, participants perceived projects as both opportunities and challenges for cooperation. Funding was seen as legitimization and an incentive to cooperate. Through project-based cooperation, participants developed mutual understanding and established new networks – an aspect considered particularly important for transformative governance by Hölscher (2020). However, participants noted that time constraints, unequal compensation, and additional tasks hinder long-term cooperation. They also emphasized the need of flexibility in funding and experimentation clauses, which are influenced by the broader political landscape and the respective funding lines and legal frameworks. For strategic, experimental, and innovative cooperations, these concerns necessitate adjustments (Bergmann et al. 2021; Netzwerk Reallabore der Nachhaltigkeit 2023).

Projectification and incrementalism

There is a growing debate about incrementalism and projectification in urban transformation. Questions arise regarding how to integrate such projects or experiments within planning systems (Hutter and Wiechmann 2010; Torrens and Wirth 2021; Scholl and De Kraker 2021). Approaches like strategic planning are being further discussed to acknowledge flow, flexibility, and adaptation in planning and through that integrating projects in these planning systems (Wiechmann 2018). Recent discussions have called for a distinction between experiments and projects. In this context, Torrens and von Wirth (2021,14) highlight “the risk of projectification of urban change processes, which induces unambitious incrementalism, short-termism, lack of direction, lack of follow-up, and unmet learning promises.” They advocate for creating “hybrid spaces that mediate between projects and experiments and permanent organisations.” In our workshops, participants suggested establishing a strategic track alongside an operative, experimental track in city administrations – similar to practices in Rotterdam. Further research on already implemented strategic cooperative approaches could enhance understanding of how this might be realized in detail.

Further influencing factors

Beyond national funding frames and political will, other urban context factors significantly impact (strategic) cooperation. These factors are, for example, municipal budgets

(Ehnert et al. 2019), local participation cultures (Sterbenk and Braun 2022) or existing projects as well as conflicts (Selle 2005). In our study, participants highlighted the participation culture or ‘DNA’ of a city as a key factor influencing current and future cooperations. Other mentioned influencing factors included existing alliances and openness for forming new ones as well as available municipal funding for projects initiated by city makers – and its (uneven) distribution across civil society. Therefore, it may be valuable to pay closer attention to the urban context in which the cooperation takes place and how this influences strategic cooperation.

Relation II: mutual influence between individuals and institutions

The second relation focuses on individuals within a multi-level system. Following Giddens’ structuration theory (1984), we assume that individuals are part of a system where rules, norms, and institutions form a structuring duality with knowledgeable actors and their actions. This concept is illustrated in the model by the second vertical axis (yellow arrow), which indicates a bidirectional influence.

Navigating in multi-level systems

Our study revealed that navigation in one’s specific multi-level system is a challenging task. Participants expressed significant interest in reflecting on these systems, particularly on the institutions they operate within. Gonser et al. (2019) emphasize the importance of this reflection, especially regarding differing risk cultures and perceptions of success and failure, which can limit the scope of action in cooperations. Within these institutional frames, we observe the bidirectional structuration proposed by Giddens (1984): institutions provide a frame with certain resources, guiding principles, and boundaries that make cooperation necessary. The specific boundaries were indicated to hinder flexibility and mutual understanding when not communicated transparently. Gonser et al. (2019) confirm this perspective and highlight the potential of transdisciplinary (and transformative) research as a response to entrenched inflexible social systems. They further stress that only by exploring these boundaries synergies can be identified and existing structures questioned.

Individuals shaping institutions

Our study also demonstrated that individuals play an active role in shaping institutions by identifying challenges, adapting ways of working, and critically assessing existing structures. Examples include the adjustments in team structures and processes, rethinking how young researchers are promoted, and questioning of funding applications. These examples underscore the crucial role of individuals in leadership positions for driving transformation. Fuenfschilling and Truffer (2016) found that actors have the ability to create, maintain, or disrupt (institutional) structures. They state “that the scope of agency grows with the increase of institutional plurality within the regime. However, how actors engage in agency and what the effects on the regime are, is highly dependent on the type of institutional work applied.” (ibid., 310) Studying the types of institutional work applied in this triological cooperation could enhance our understanding of which approaches lead to change within institutions.

Reflecting for enhancing transformative urban governance

Reflecting on the structures in which individuals are embedded could serve as a pathway for generating change. Our work, for instance, shows that exchanging about institutional logics is vital for strategic cooperation as it fosters understanding, expectation management, and trust among participants. Furthermore, our analysis indicates that examining spheres from different perspectives reveals differences in perceptions that pose major challenges for future strategic cooperation. This aligns with transformative governance approaches defining reflexive learning as a key capacity for transformation (Bosomworth 2018; Allen et al. 2023). This leads us to explore the third relation: which individual and collective capacities are necessary for governing of urban transformation towards sustainability.

Relation III: enhancement of collective and individual transformative capacities through reflexive learning

In recent years, transformative capacities have been a focal point of discussion and have been researched, for example, by Wolfram (2016) and Hölscher (2020). Hölscher introduces a conceptual framework to explain and support the capacities necessary for achieving transformative climate governance. She distinguishes between stewarding, unlocking, transformative, and orchestrating capacities. From a discursive–institutional perspective, Bosomworth (2018) identifies reflexive learning, inclusion of diverse perspectives, experimentation, and decision making under conditions of uncertainty as essential capacities for transformative governance.

Developed transformative capacities

Examining Hölscher's work on capacities revealed that participants in our study mentioned aspects relating to all four types: networking and adapting language can be identified as stewarding capacities. Discussion about current boundaries within institutional frames is one example for developed unlocking capacities. In terms of orchestrating capacities, participants noted the establishment of spaces for knowledge exchange in trialogical cooperation, the mediation between interests, and informal networking. The successful implementation of measures and adaptations in internal structures fall into the category of transformative capacities (compare Table 4).

Regarding the capacities for transformative governance suggested by Bosomworth (2018), we also observed enhancements resulting from trialogical cooperation. The inclusion of diverse perspectives was facilitated by the various networks associated with each sphere of actors. Experimentation was particularly supported through project frameworks that legitimize experimental action. Both researchers and city administrators emphasized their growing capacity decision-making under conditions of uncertainty – an area where city administrators often lacked experience with incremental developments. Reflexive learning emerged from trialogical cooperation, for example, in rethinking and adapting internal structures. Our study indicates that many suggested capacities for transformative governance were indeed developed through trialogical cooperation. However, questions remain on how to further support this capacity building.

Table 4 Indicators of enhanced transformative capacities based on Hölscher (2020) and Bosomworth (2018)

	Capacities for transformative governance	Examples from our results
Hölscher (2020)	Stewarding capacity	Networking, adapting language
	Unlocking capacity	Reflecting on existing institutional boundaries
	Orchestrating capacity	Establishment of spaces for knowledge exchange, mediation of interests
	Transformative capacity	Implementation of measures, adaptation of internal (institutional) structures
Bosomworth (2018)	Inclusion of diverse perspectives	Various networks of actors activated
	Experimentation	Legitimization through project frameworks
	Decision-making under conditions of uncertainty	Learning about uncertainties and how to deal with these
	Reflexive learning	Rethinking of internal structures

Projects as social learning spaces with room for improvement

We found that projects provide a resonance space for addressing boundaries: during cooperation, participants encounter numerous challenges related to institutional and individual constraints such as timelines or expectations. These challenges can lead to individual learning, which in turn may result in adaptations in team and institutional structures. However, they can also generate conflicts both within and beyond projects. Consequently, we call for an altered consideration of the ethical frameworks and responsibilities that arise when working transdisciplinarily. These entail a reflection about expectation management, power constellations, sharing of resources and communication principles. Additionally, recognizing the potential overwhelm on individuals within project settings is crucial. We believe that trialogical cooperation in projects can enhance capacity building when consciously dealing with boundaries at both institutional and individual levels – but how can this be achieved?

A study by Castán Broto et al. (2019) reflects on the components identified in literature that contribute to the emergence of transformative capacity as a systemic property within urban settings. They conclude that “strategies prioritizing social learning and reflexive action may be a means to foster other components of transformative capacity” (Castán Broto et al. 2019, 460). This notion aligns with further literature about transformative and social learning in relation to reflexive governance (Loorbach, 2010). As demonstrated, the trialogical cooperation can serve as a social learning environment where capacities can be built by reflexive action. In our study we used reflexive and structuring approaches to gain and generate understanding about each sphere of actors and underlying challenges in their cooperation. In a protected space, we used reflexive methods, such as games and active listening to promote self-reflection among participants while fostering mutual understanding. Participants highlighted the importance of honest reflections on challenges and limits along with exchanges beyond project boundaries. We therefore propose that such protected spaces for honest exchange can enhance social learning and subsequently build capacities for transformative urban governance. As this is surely not only our approach, it would be beneficial to analyze similar approaches elsewhere along with their outcomes regarding transformative capacities.

Conclusion and outlook

This article explores systemic relations within the trialogical cooperation between city makers, city administrators and transformative researchers and the implications this has for enhancing urban transformative governance. Factors that influence this trialogical cooperation span across various levels. Funding was highlighted as a significant influence on cooperation, affecting project duration, the (lack of) strategic orientation of projects, and the (unequal) distribution of resources among actors. This funding is shaped by both state-wide and local political contexts. Other influential factors within the urban context include the local participation cultures or existing alliances. Within the cooperations, differing expectations, time constraints and especially a lack of mutual understanding are important factors. Creating opportunities for joint reflection on these boundaries appears to foster cooperation. These opportunities are enhanced through already existing cooperations, which also enable innovation within institutions. However, the success of these reflective practices depends on the openness of individuals – particularly those in leadership positions – to engage in critical reflection and embrace change.

Dual embedding of individuals

Based on individual perceptions of cooperations, we have shown how individuals navigate within these cooperations and the challenges they encounter related to their own institutions, project-based cooperation, and their individual actions. These findings raise further questions about the dual embedding of individuals: the systemic embedding in institutions versus the embedding of individuals in real-world cooperations within an urban context. Within this dual embedding, individuals face both challenges and opportunities in cooperation. This is prompting concerns about potential overwhelm. Transformative researchers must balance research and practice; city administrators need to navigate between hierarchies and sectors while adhering to legal frameworks and experimentation; city makers must reconcile their internal interests with collective and trialogical goals – all while operating within slow-to-change funding and institutional structures. Throughout our study, we encountered many committed individuals who emphasized the learning opportunities and self-efficiency within their cooperations; however high rates of burnout and overload remain prevalent. We argue that more attention should be directed toward addressing systemic barriers within each actors' sphere. Tackling these barriers could facilitate systemic change, leading to increased cooperation possibilities and heightened motivation among individuals. As noted earlier, cooperation and motivation are especially important for urban transformations towards sustainability.

Future directions

Our findings also prompt broader consideration regarding trialogical cooperation: what happens beyond a single trialogue? To date, trialogical cooperations have mostly been implemented time-limited and without clear strategic orientation. Many cooperations occur simultaneously with little overarching guidance. Therefore, we argue that a mediating level of organization is necessary – one grounded in transformative governance principles. This mediating level should focus on strategic alignment of approaches for tackling transformation tasks while incorporating cooperative experimentation and

reflexive learning. Emphasis should be placed on translating results into institutional structures and broader framework conditions. It could include physical spaces for encounter, networking activities, as well as new policies within institutions to enhance cooperation. Further research combined with real-world experimentation is needed to explore how these approaches can be implemented and to define what transformative governance may look like in practice.

As our study is based on subjective rather than representative perceptions from individuals, additional research can provide a more diverse and comprehensive overview of this specific cooperation along with its implications for individuals. By introducing the conceptual model, we invite other researchers to analyze different (dialogical) cooperations to uncover systemic challenges and key relations for urban transformation towards sustainability.

Abbreviation

TTDR Transformative and transdisciplinary research

Acknowledgements

We would like to thank Markus Egermann, Heike Köckler, Isabel Strehle, Stefanie Weitenberg, Christian Hampe and Svenja Noltemeyer for the two years of fruitful discussions and empowering collaboration. We also would like to thank all the participants of our workshops for their time and openness.

Authors' contributions

All authors conceptualized the process and contributed resources to the process. LB and AF acquired the funding and were responsible for the design of the methodology. They also created the conceptual model. LB was responsible for the project administration, investigation, data curation as well as the formal analysis and visualization. She wrote the original draft, while AF and MW reviewed and edited the writing and supervised LB.

Funding

Open Access funding enabled and organized by Projekt DEAL. Funded by the Federal Ministry of Education and Research (BMBF) and the Ministry of Culture and Science of the German State of North Rhine-Westphalia (MKW) under the Excellence Strategy of the Federal Government and the Länder.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

All research participants provided written and/or verbal consent to participate in the research project.

Competing interests

The authors declare no competing interests.

Received: 27 August 2024 Accepted: 6 July 2025

Published online: 04 August 2025

References

- Allen C, Malekpour S, Mintrom M. Cross-scale, cross-level and multi-actor governance of transformations toward the Sustainable Development Goals: A review of common challenges and solutions. *Sustain Dev.* 2023;31:1250–67. <https://doi.org/10.1002/sd.2495>.
- Augenstein K, Bögel PM, Levin-Keitel M, Trenks H. Wie entfalten Reallabore Wirkung für die Transformation? Eine "embedded-agency perspective" zur Analyse von Wirkmechanismen in Reallaboren. *Gaia.* 2022;31:207–14. <https://doi.org/10.14512/gaia.31.4.4>.
- Augenstein K, Lam DPM, Horcea-Milcu AI, Bernert P, Charli-Joseph L, Cockburn J, Kampfmann T, Pereira LM, Sellberg MM. Five priorities to advance transformative transdisciplinary research. *Current Opinion in Environmental Sustainability.* 2024;68: 101438. <https://doi.org/10.1016/j.cosust.2024.101438>.
- BBSR (n.d.) 3stadt2. Neue Kooperationsformen in der Stadtentwicklung. https://www.bbsr.bund.de/BBSR/DE/forschung/programme/exwost/Forschungsfelder/2004undFrueher/3stadt2/01_Start.html. Accessed 29 May 2025.
- Beck S, Kriemann M, Luchmann C. Stadtmacherinnen und Stadtmacher. Berlin: Vhw-Bundesverband für Wohnen und Stadtentwicklung; 2017.

- Beecroft R, Trenks H, Rhodius R, Benighaus C, Parodi O. Reallabore als Rahmen transformativer und transdisziplinärer Forschung: Ziele und Designprinzipien. In: Defila R, Di Giulio A (eds) *Transdisziplinär und transformativ forschen*. Springer Fachmedien Wiesbaden, Wiesbaden. 2018. https://doi.org/10.1007/978-3-658-21530-9_4.
- Bergmann M, Schäpke N, Marg O, et al. Transdisciplinary sustainability research in real-world labs: success factors and methods for change. *Sustain Sci*. 2021;16:541–64. <https://doi.org/10.1007/s11625-020-00886-8>.
- Bögel PM, Augenstein K, Levin-Keitel M, Upham P. An interdisciplinary perspective on scaling in transitions: Connecting actors and space. *Environ Innov Soc Transit*. 2022;42:170–83. <https://doi.org/10.1016/j.eist.2021.12.009>.
- Borner J, Kraft AH. Konzeptpapier zum Reallaboransatz. Arbeitspapier im Rahmen von ENavi. 2018. http://komob.de/wp-content/uploads/2018/08/ENavi_Reallabore_Borner-Kraft.pdf.
- Bosomworth K. A discursive–institutional perspective on transformative governance: A case from a fire management policy sector. *Environ Policy Gov*. 2018;28:415–25. <https://doi.org/10.1002/eet.1806>.
- Castán Broto V, Trencher G, Iwaszuk E, Westman L. Transformative capacity and local action for urban sustainability. *Ambio*. 2019;48:449–62. <https://doi.org/10.1007/s13280-018-1086-z>.
- Chaffin BC, Garmestani AS, Gunderson LH, et al. Transformative Environmental Governance. *Annu Rev Environ Resour*. 2016;41:399–423. <https://doi.org/10.1146/annurev-environ-110615-085817>.
- Egermann M, Ehnert F, Wolfram M, Frantzeskaki N. Urban Sustainability Transitions Research. Cambridge Open Engage. 2024. <https://doi.org/10.33774/coe-2024-xk5r2>.
- Ehnert F, Egermann M, Betsch A. The role of niche and regime intermediaries in building partnerships for urban transitions towards sustainability. *J Environ Policy Plan*. 2022;24:137–59. <https://doi.org/10.1080/1523908X.2021.1981266>.
- Ehnert F, Egermann M, Höcke C. Neue Partnerschaften in der nachhaltigen Stadtentwicklung? Kooperationsansätze zwischen Transition-Town-Initiativen und Kommunen. *vhv FWS* 2019;5:265–268.
- Eisewicht P, Hitzler R. Qualitative Forschungsdesigns in einer methodenpluralen Forschungslandschaft. In: Donlic J (ed.) *Qualitative Methoden in der Forschungspraxis*. Verlag Barbara Budrich, Opladen, Berlin, Toronto. 2023. <https://doi.org/10.2307/jj.3102554.4>.
- Engels F, Rogge J-C. Tensions and Trade-offs in Real-World Laboratories - The Participants' Perspective. *Gaia*. 2018;27:28–31. <https://doi.org/10.14512/gaia.27.51.8>.
- Frantzeskaki N, Rok A. Co-producing urban sustainability transitions knowledge with community, policy and science. *Environ Innov Soc Trans*. 2018;29:47–51. <https://doi.org/10.1016/j.eist.2018.08.001>.
- Fuensschilling L, Truffer B. The interplay of institutions, actors and technologies in socio-technical systems — An analysis of transformations in the Australian urban water sector. *Technol Forecast Soc Chang*. 2016;103:298–312. <https://doi.org/10.1016/j.techfore.2015.11.023>.
- Fugmann F, Ginski S, Selle K, Thissen F. Multilaterale Kommunikation in Prozessen der Stadtentwicklung. Querauswertung von 50 Praxisbeispielen. Aachen. 2018.
- Giddens A. *The Constitution of Society*. University of California Press. Berkeley and Los Angeles. 1984.
- Gonser M, Riel J, Eckart J, Erl T, Häußler E. Kommunale Akteure verstehen: Komplexe Entscheidungswege in Kommunen beachten. In: Defila R, Di Giulio A (eds) *Transdisziplinär und transformativ forschen*, Band 2. Springer Fachmedien Wiesbaden, Wiesbaden. 2019. https://doi.org/10.1007/978-3-658-27135-0_3.
- Hilger A, Rose M, Wanner M. Changing Faces - Factors Influencing the Roles of Researchers in Real-World Laboratories. *Gaia*. 2018;27:138–45. <https://doi.org/10.14512/gaia.27.1.9>.
- Höcke C, Schnur O. Große Transformation, urbane Resilienz und nachhaltige Stadt. *vhv werkSTADT* 2021:57. Berlin.
- Hölscher K. Capacities for Transformative Climate Governance: A Conceptual Framework. In: Hölscher K, Frantzeskaki N (eds) *Transformative Climate Governance*. Springer International Publishing, Cham. 2020 https://doi.org/10.1007/978-3-030-49040-9_2.
- Hutter G, Wiechmann T. *Strategische Planung: zur Rolle der Planung in der Strategieentwicklung für Städte und Regionen*. Fachgebiet Stadtumbau, Stadterneuerung, Kassel: Univ; 2010.
- Hüttl T. *Verwaltung trifft Beteiligung. Zwischen Amt und Bürgerinnen und Bürgern: Krisen und Chancen*. Heinrich-Böll-Stiftung. 2018. https://www.boell.de/sites/default/files/e-paper_verwaltung-trifft-beteiligung.pdf.
- Intergovernmental Panel on Climate Change (IPCC) (ed) *Urban Systems and Other Settlements*. In: *Climate Change 2022 - Mitigation of Climate Change: Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge. 2023.
- Kolosek M, Matzke FL. Die Geschichte transformativer Forschung. *pnd - rethinking planning* 2022(1):27–42. <https://doi.org/10.18154/RWTH-2022-05183>.
- Liebig B, Nentwig-Gesemann I. Gruppendiskussion. In: Kühl S, Strodtholz P, Taffertshofer A (eds) *Handbuch Methoden der Organisationsforschung*. VS Verlag für Sozialwissenschaften, Wiesbaden. 2009.
- Loibl MC. *Spannungen in Forschungsteams*. Verl. für Systemische Forschung im Carl-Auer-Verlag. Heidelberg. 2005.
- Loorbach D. *Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework*. *Governance*. 2010;23:161–83. <https://doi.org/10.1111/j.1468-0491.2009.01471.x>.
- Lowndes V, Roberts M. *Why Institutions Matter: The New Institutionalism in Political Science*. London: Red Globe Press; 2013.
- Luederitz C, Schäpke N, Wiek A, et al. Learning through evaluation – A tentative evaluative scheme for sustainability transition experiments. *J Clean Prod*. 2017;169:61–76. <https://doi.org/10.1016/j.jclepro.2016.09.005>.
- Mayring, P. *Qualitative Inhaltsanalyse. Grundlagen und Techniken*. Beltz Juventa, Weinheim and Basel. 2010.
- Medina-García C, Nagarajan S, Castillo-Vysokolan L, et al. Innovative Multi-Actor Collaborations as Collective Actors and Institutionalized Spaces. The Case of Food Governance Transformation in Leuven (Belgium). *Front Sustain Food Syst*. 2022;5:788934. <https://doi.org/10.3389/fsufs.2021.788934>.
- Netzwerk Reallabore der Nachhaltigkeit. Stellungnahme des Netzwerks „Reallabore der Nachhaltigkeit“ zur Initiative des Bundesministeriums für Wirtschaft und Klimaschutz (BMWK) für ein Reallabore-Gesetz. 2023.
- Nevens F, Frantzeskaki N, Gorissen L, Loorbach D. Urban Transition Labs: co-creating transformative action for sustainable cities. *J Clean Prod*. 2013;50:111–22. <https://doi.org/10.1016/j.jclepro.2012.12.001>.

- Newig J, Jahn S, Lang DJ, Kahle J, Bergmann M. Linking modes of research to their scientific and societal outcomes. Evidence from 81 sustainability-oriented research projects. *Environ Sci Policy*. 2019;101:147–55. <https://doi.org/10.1016/j.envsci.2019.08.008>.
- Raffer C, Buchmann F, Schneider S. Erfolgreiche Nachhaltigkeitstransformation in der Kommunalverwaltung: Organizational change im öffentlichen Sektor – inhaltliche Dimensionen, Hürden und Erfolgsbedingungen. 2023. https://doi.org/10.34744/difu-impulse_2023-8.
- Schäfer M, Lux A, Bergmann M. Special issue. Transdisciplinary Sustainability Research – Linking research processes and outputs to societal effects. 2020. <https://doi.org/10.1016/j.envsci.2020.02.018>.
- Schäpke N. Linking Transitions to Sustainability: Individual Agency, Normativity and Transdisciplinary Collaborations in Transition Management. Leuphana Universität Lüneburg. 2018.
- Schäpke N, Stelzer F, Caniglia G, et al. Jointly Experimenting for Transformation? Shaping Real-World Laboratories by Comparing Them. *GAIA - Ecological Perspectives for Science and Society*. 2018;27:85–96. <https://doi.org/10.14512/gaia.27.51.16>.
- Schäpke N, Wagner F, Beecroft R, Rhodius R, Laborgne P, Wanner M, Parodi O. Impacts of real-world labs in sustainability transformations: Forms of impacts, creation strategies, challenges, and methodological advances. *GAIA - Ecological Perspectives for Science and Society*. 2024;33:4–9. <https://doi.org/10.14512/gaia.33.51.2>.
- Scholl C, De Kraker J. Urban Planning by Experiment: Practices, Outcomes, and Impacts. *Urban Planning*. 2021;6:156–60. <https://doi.org/10.17645/up.v6i1.4248>.
- Schramm E, Kerber H, Trapp JH, Zimmermann M, Winker M. Novel urban water systems in Germany: governance structures to encourage transformation. *Urban Water Journal*. 2018;15:534–43. <https://doi.org/10.1080/1573062X.2017.1293694>.
- Selle K. Planen. Steuern. Entwickeln. Über den Beitrag öffentlicher Akteure zur Entwicklung von Stadt und Land. Dortmunder Vertrieb für Bau- und Planungsliteratur, Dortmund. 2005.
- Seydel H, Gliemann K, Stark S, Herlo B. Erzählen im Reallabor. Ein Beitrag zur konzeptionellen Ausgestaltung partizipativer Methoden der gemeinsamen Wissensproduktion durch Erzählräume im Reallabor. *Raumforsch Raumordn*. 2021;79:351–65. <https://doi.org/10.14512/rur.46>.
- Sterbenk S, Braun J. Ko-Kreative Entwicklung von Leitlinien für Bürgerbeteiligung durch Wissenschaft, Verwaltung und Zivilgesellschaft. eNewsletter Netzwerk Bürgerbeteiligung 02/2022.
- Torrens J, von Wirth T. Experimentation or projectification of urban change? A critical appraisal and three steps forward. *Urban Transformations*. 2021;3:8. <https://doi.org/10.1186/s42854-021-00025-1>.
- Tribble R. Kooperation und Koproduktion in der Stadtentwicklung: Civic-Public-Partnerships. *vhv FWS* 2023;1:49–54.
- Visseren-Hamakers IJ, Razzaque J, McElwee P, et al. Transformative governance of biodiversity: insights for sustainable development. *Current Opinion in Environmental Sustainability*. 2021;53:20–8. <https://doi.org/10.1016/j.cosust.2021.06.002>.
- von Wirth T, Fuenfschilling L, Frantzeskaki N, Coenen L. Impacts of urban living labs on sustainability transitions: mechanisms and strategies for systemic change through experimentation. *Eur Plan Stud*. 2019;27:229–57. <https://doi.org/10.1080/09654313.2018.1504895>.
- Waag. Inter- und transdisziplinäre (Nachhaltigkeits-)Forschung in Wissenschaft und Gesellschaft. *artec-paper Nr.* 181. 2012.
- Wanner M, Förster A, Brings L, et al. Aufruf zum Dialog für räumliche Transformation : Von der Projektpartnerschaft zum strategischen Lern- und Handlungsfeld. *pnd - rethinking planning* 2022;(1):228–52. <https://doi.org/10.18154/RWTH-2022-05190>.
- Weiser A, Wanner M, Stelzer F, Lang DJ, Berger H, Förster A, Liedtke C, Micklitz HW, Niewöhner J, Parodi O, Potthast T, Schneider F, Sörgel F, Zieh M, Ziemer G. Exploring fruitful links between real-world laboratory and disciplinary research: Introduction of the DKN Future Earth working group LinkLab. In: *GAIA* 2023;32(3):335–337. <https://doi.org/10.14512/gaia.32.3.13>.
- Wékel J. Stadtentwicklungsplanung. In: *ARL – Akademie für Raumforschung und Landesplanung* (ed) *Handwörterbuch der Stadt- und Raumentwicklung*. Hannover. 2018.
- Wiechmann T. Strategische Planung. In: *ARL – Akademie für Raumforschung und Landesplanung* (ed) *Handwörterbuch der Stadt- und Raumentwicklung*. Hannover. 2018.
- Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WBGU). *Der Umzug der Menschheit: Die transformative Kraft der Städte: Hauptgutachten*. Berlin: Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen; 2016.
- Wittmayer JM, Hölscher K. *Transformationsforschung*. Dessau-Roßlau. 2017.
- Wolfram M. Conceptualizing urban transformative capacity: A framework for research and policy. *Cities*. 2016;51:121–30. <https://doi.org/10.1016/j.cities.2015.11.011>.
- Wolfram M. Urban transformative capacity: From concept to practice. *Ambio*. 2019;48:437–48. <https://doi.org/10.1007/s13280-019-01169-y>.
- Wuppertal Institut (n. d.) *Transformative Research*. <https://wupperinst.org/en/research/transformative-research>. Accessed 05 Feb 2025.
- Zalas L. Mehr Gestalten als Verwalten: Administrative AkteureInnen als GestalterInnen multilateraler Kommunikationsprozesse in integrierter Stadtentwicklung. Dissertation, RWTH Aachen University. 2021. <https://doi.org/10.18154/RWTH-2021-05115>.
- Ziervogel G. Building transformative capacity for adaptation planning and implementation that works for the urban poor: Insights from South Africa. *Ambio*. 2019;48:494–506. <https://doi.org/10.1007/s13280-018-1141-9>.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.