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ORIGINAL ARTICLE

Navigating four junctions: a framework to design context- and format-sensitive transdisciplinary research

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Abstract

Transdisciplinary research (TDR) is increasingly recognized as an essential approach for addressing complex challenges, particularly in sustainability science. While existing research has explored both the contextual embeddedness of TDR and the diverse formats and methods that structure its processes, the dynamic interplay between these elements is still underexamined. This paper investigates the mutual interdependencies of context as well as research formats and methods in TDR by working with the concept of junctions—critical points where contextual factors and methodological choices co-evolve and shape research processes. In particular, we ask: Which junctions can we identify where active design choices can be made throughout the research process and directed toward specific outcomes? Drawing on qualitative data from interviews and workshops, we identify four junctions: adaptivity, hierarchy, inclusiveness, and trust. Our findings demonstrate that these junctions are not static, but dynamic spaces where researchers and practice partners continuously reflect and adjust their approaches in response to evolving contextual settings and methodological demands. The four junctions constitute active points of reflection in which research processes can iteratively be re-designed or adapted to specific circumstances. By conceptualising junctions as a spectrum of interactions, we offer a novel analytical framework that enhances understanding of how context-sensitive TDR can be designed and implemented by the choice and adaptation of formats and methods. This framework offers practical and analytical guidance, including reflective questions derived from our analysis, as well as insights into transferability and scaling across diverse research contexts to foster rigorous, effective, inclusive, and transformative transdisciplinary collaborations.

Keywords Context · Methods for transdisciplinary research · Knowledge co-production · Transformation · Collaboration · Sustainability

Introduction

Transdisciplinary research (TDR) has become a crucial research practice to addressing complex challenges, particularly within sustainability science (Lang et al. 2012). It integrates diverse knowledge types and perspectives to co-produce actionable knowledge that can drive transformative change (Caniglia et al. 2020). While TDR aims for an inclusive and equitable process of co-learning among relevant actors, it is important to consider the context factors of a research project when designing a TDR process (Cockburn et al. 2020; Lam et al. 2021; Pärli 2024). For example, a recent study on success factors of TDR (Bergmann et al. 2021) identifies sufficient financial and time resources as well as a process design tailored to the needs of practitioners as key factors. While such general aspects of the context-related design of a TDR project have been well

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examined, there is little research on how formats and methods can be selected and used in a context-sensitive manner.

We see that understanding the interplay between context, formats and methods is one of the keys to designing meaningful and effective TDR processes (Lam et al. 2021). Therefore, in this article, we examine the dynamic interactions between context and formats in a structured manner by using the term 'junctions' (Pregernig et al. 2018) as a central analytical approach and asking the following question: Which junctions can we identify where active design choices can be made throughout the research process and directed toward specific outcomes? Our aim is not only to gain a better understanding of the interplay between context, format and methods, but also to derive recommendations for TDR researchers in the form of reflective questions at the end of the article.

Additionally, TDR processes are not only shaped by contextual conditions and design choices, but also by how researchers and practitioners continuously engage in reflexive and reflective practices throughout a project. Building on recent work in sustainability-oriented TDR, we understand reflexivity as the ongoing, critical examination of one's own assumptions, positionalities and role in shaping problem framings, actor constellations and knowledge integration, and reflection as more structured, often episodic moments in which project members jointly take stock of aims, formats and emerging effects in order to adapt the process. Lazurko et al. (2025), Schäfer et al. (2024) and von Seggern et al. (2023) show that such reflexive and reflective practices are essential to navigate tensions between scientific and practice-oriented expectations, to negotiate responsibilities, and to continuously re-align formats and methods with changing contextual demands in TDR. Drawing on these insights, we argue that the careful, context-sensitive selection and use of formats and methods must be accompanied by both reflexive and reflective work on the part of individual researchers, within the team, and in collaboration with social actors, so that junctions in the research process become active sites of learning and re-orientation.

The following section provides insights on the conceptual and theoretical background we have built on (context, formats/methods, and the idea of junctions). We then present the methodological approach used in this article, followed by the results, which are divided into a general description of the four junctions and an illustration in two case studies. Finally, we discuss our contributions, highlight limitations, and suggest areas for future research.

Conceptual background

Phases of TDR

Scholars commonly describe TDR through the following three overlapping phases: team building and problem framing (co-design), co-creation of solution-oriented transferable knowledge (co-production), and re-integration and application of the created knowledge (co-integration) (Lang et al. 2012; Pohl and Hirsch Hadorn 2007). Complementing this, other studies (i.e., Lawrence et al. 2022; Mbah et al. 2025) add a continuous co-evaluation phase to emphasise reflection throughout the process. Horcea-Milcu et al. (2022) introduce a preliminary phase 0 focused on establishing collaboration through context-understanding and trust-building among actors which in our understanding is included within the co-design phase. Thus, in the following we use the four phases of co-design, co-production, co-integration and co-evaluation to structure the TDR process.

Understanding context as well as formats and methods in TDR

Crucially, TDR aims to generate both societal and scientific impacts within specific contexts, which requires the application of formats and methods that enable effective knowledge integration and learning processes (Fig. 1, Lam et al. 2021).

Context in TDR is not merely a backdrop but an active component influencing knowledge production and interpretation of results and effects (Lux et al. 2019; Tolksdorf et al. 2025). This reveals a twofold contextuality: First, in case-specific mutual learning processes; second, in re-integrating findings to generate transferable results (Lam et al. 2021).

Context is multifaceted, involving diverse interacting factors (Cockburn et al. 2020). Tolksdorf et al. (2025) distinguish context factors within three dimensions: *temporal/spatial dimension*, *outer dimension*, *and inner dimension*. The *temporal* and *spatial* context factors describe the historical and geographical setting in which the research is embedded in Atallah (2016), Meyer and Vilsmaier (2020), Pade-Khene et al. (2013). *Outer* context factors include project-external conditions—political, legal, power, or socio-cultural structures (Atallah 2016; Chouinard and Milley 2016; Folke et al. 2016; Fritz and Binder 2020; Pärli et al. 2024). Lastly, *inner* context factors emerge from within the project itself, influencing the research process directly—such as team composition and the integration of knowledge systems (Adler and Shani 2001; Margules et al. 2020; Pärli et al. 2024; Thomas et al. 2022).

Because context is dynamic, it requires ongoing reflexivity to respond to changes (Tolksdorf et al. 2025). A strong contextual awareness is crucial for designing and

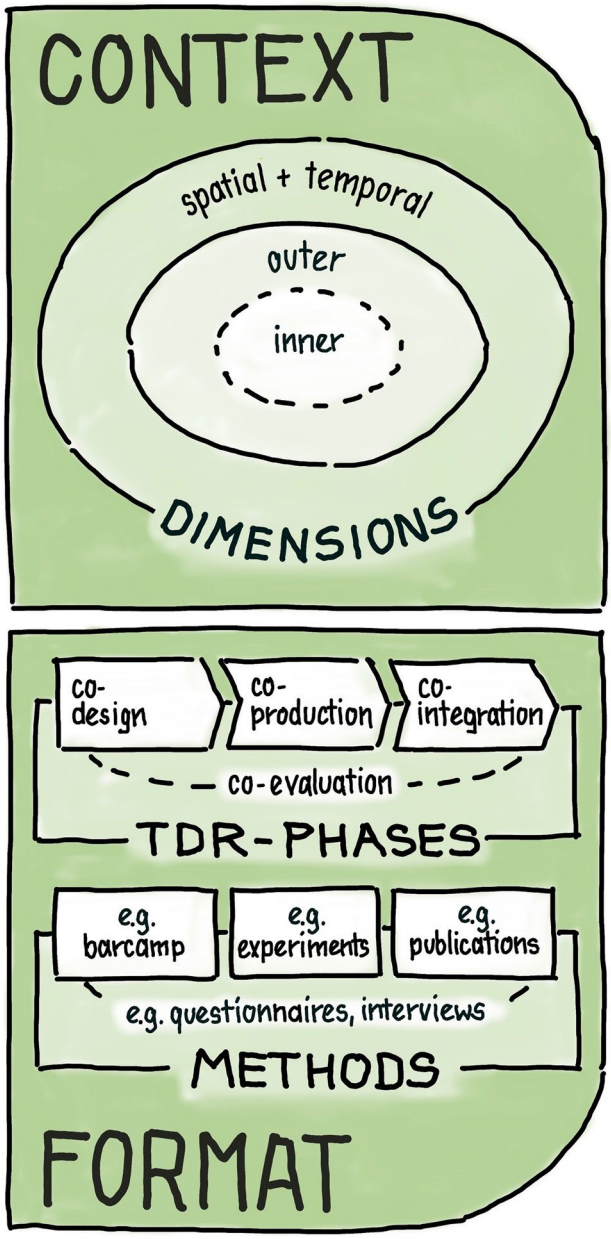

Fig. 1 Context as well as format and method in transdisciplinary research (TDR)

implementing TDR, as the success of such projects often depends on understanding the specific settings in which they take place. Crucially, context does not function in isolation but interacts with the respective project structures and processes. The design of participatory structures and methodological choices shape how context is addressed—and vice versa—ultimately influencing how knowledge is co-produced and what outcomes emerge (Jahn et al. 2012; Lang et al. 2012). While this refers on the one hand to concrete and structured formats and methods such as real-word labs or scenario-method, it also involves aspects of personal attitudes and behaviour. Both aspects have proven to be relevant in our analysis. We will focus on formats and methods to make a structural contribution to the design of transdisciplinary processes.

Formats provide the framework for a TDR process and form the structure for cooperation between science and society (Lam et al. 2021). In contrast to the term "method", we can speak of a "format" when at least two of the above mentioned four TDR phases are systematically encompassed by a set of methods or combinations of methods and the associated tools, like real-world laboratories (Mbah et al. 2025, see Fig. 1). In each chosen format, different methods are used, which have generally not been developed specifically for transdisciplinary projects but have been developed and tested in areas such as development cooperation, citizen participation or in disciplinary contexts, like scenario- or visioning-workshops and actor analysis. Methods can vary and come from different disciplines and often use instruments and techniques (tools) that are used, for example, for visualisation or collection of data, like mind mapping or graphic recording.

Understanding the concept and role of junctions

Pregernig et al. (2018) introduced the idea of "design junctions" as a social space where actors negotiate expectations, competencies, resources, normative and methodological requirements within real-world laboratories. Building on this, we expand this notion into a broader model for identifying and analysing junctions in transdisciplinary projects. This may help researchers adapting formats and methods in reference to contextual challenges effectively and improve collaboration and outcomes of TDR.

In our research, we understand junctions as a spectrum of interactions: at one end, context shapes the choice and adaptation of formats and methods; at the other, methods and formats can influence or lead to a re-definition of the research context. For example, introducing a new participatory format might shift power relations or change how local knowledge is valued. We thus define junctions as dynamic spaces where researchers and practice partners continuously negotiate the fit between context and methodology. These negotiation processes often become particularly visible when tensions, constraints, or mismatches arise between contextual conditions and methodological choices.

By framing junctions as a spectrum, we capture the nuanced, often bidirectional relationship between context on the one side and formats and methods on the other side. Accordingly, analysing junctions also reveals challenges and frictions that emerge within the research process. Unlike simple intersections, junctions not only identify where but also how context as well as formats and methods interact

and allow for active, iterative design decisions throughout the research process. This framework enables more systematic analysis and enhances TDR's societal and scientific impact by guiding context-sensitive, transformative TDR.

Materials and methods

Data collection

This study draws on empirical interview and workshop data collected within the project tdAcademy between 2020 and 2025 (Appendix A, B). The project expands and consolidates the knowledge base of transdisciplinary research, enables practitioners to participate, and promotes an internationally networked community. The tdAcademy encompasses two project phases: (1) investigations that examined either the contextual conditions or formats and methods separately, and (2) research that explored the intersections between context as well as formats and methods based on the data collected in the first phase (Fig. 2).

From a context perspective, data in the first project phase was gathered through qualitative interviews with researchers from 17 transdisciplinary case studies (IC01-17) in various countries, including several in Europe, as well as some in Asia, Africa and North and South America. The sampling strategy involved selecting a small number of 'information-rich' cases (Patton 1990) expected to provide particularly relevant insights into the role of context. Cases were included if they (1) followed a transdisciplinary research approach (Lang et al. 2012), (2) addressed sustainability-related challenges across ecological, social, or economic dimensions, and (3) had already completed at least one full cycle of a transdisciplinary research process (Lang et al. 2012). Semi-structured interviews were conducted with researchers directly involved in the projects. The interview guide included open questions on project settings, the researchers' roles, transdisciplinary processes, project outcomes, stakeholder engagement, methodological choices, and contextual factors shaping these processes. Interviews were conducted online and lasted approximately 90 min on average. They were recorded and transcribed. Further details about the approach have been described as part of the research design in Tolksdorf et al. (2025). These interviews provided in-depth insights into how different context factors shape the individual TDR processes, influencing project design, engagement, knowledge integration, method selection or adaptation.

From a format and methods perspective, a comprehensive literature review was conducted in the first project phase in 2020 and supplemented in 2025 to get an overview of the formats and methods applied in transdisciplinary research. This included literature that dealt in the broadest sense with newer formats and methodological approaches in transdisciplinary research and that was published mainly in Europe, but also in the USA, Canada and Australia. Based on this literature review, ten formats were identified that were mentioned particularly frequently, and five of these ten were selected for closer examination due to their particularly innovative nature. We defined these formats as innovative if they were either newly developed within a transdisciplinary context such as Real-world Laboratories (Bergmann et al. 2021), Ten Steps (Pohl et al. 2017) and Transmente (Kleihauer and Führ 2019), or integrated into transdisciplinary research after originating from another field such as arts-based formats (Heinrichs and Hoernemann 2023) and Theory of Change (Deutsch et al. 2021). As a result, a profile sheet was developed that explains the essential characteristics of each format, which subsequently served as the basis for discussing the chosen formats in workshops and for developing interview guidelines.

Based on that, between 2021 and 2023, five online workshops (WSF1-5) with researchers and practice partners were conducted. Participants were recruited through advertising on the relevant transdisciplinary networks (td-net, ITD Alliance, tdAcademy) and by specifically engaging

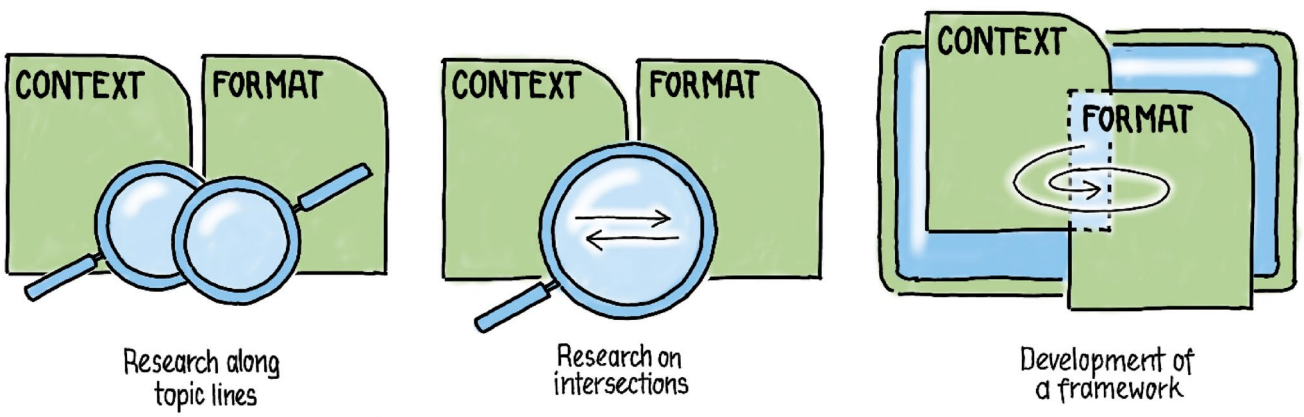

Fig. 2 Process of data collection and analysis within two project phases: topic lines and the intersections in-between

stakeholders from the public sector, the business community and the political sphere. Some of the workshops were incorporated into conferences such as the International Transdisciplinarity Conference 2021 (ITD21) or the Darmstadt Transformation Days 2021 and 2022. The workshops were attended by 30 to 50 people. Three workshops discussed the role and shape of innovative formats in different transformative research settings in general, while one focussed on real-world laboratories and another one on the perspective of practice partners in TDR. During these workshops, the central role of methods within the different formats became clear. We have therefore selected three formats for a Master's thesis in order to examine the methodological combinations used in them in detail: Theory of Change, arts-based formats or Ten Steps, omitting 'Real-world Labs'—a format that had already been covered in detail in our workshops—and 'Transmente', a format that has hardly been used to date. Altogether, six interviews (IF01-06) were conducted with project leaders and practice partners experienced within one of the three formats (Jäkel 2025).

Two additional workshops (WSI1-2) took place within the second project phase, which centred specifically on the intersection between context as well as formats and methods. One brought together international researchers interested or working in the field of TDR. The other one was held during a conference on participatory research and TDR. Both aimed to facilitate knowledge exchange and reflect on the identified junctions derived from an initial analysis of the previously collected data. These workshops offered real-time reflections and debate, adding depth to our understanding of how these junctions operate in practice. The analysis provided additional nuances that were incorporated into the final interpretation of the junctions. Table 1 provides an overview of all the analysed data.

Data analysis

The analysis followed a structured, multi-step approach to systematically examine the intersections between context as well as formats and methods (Miles et al. 2014). In the first step, we conducted a structured mapping exercise to characterise the relationships between the contextual dimensions as well as formats and methods. The data basis for that first step was derived from the first project phase. This resulted in the development of a context-format matrix, which served as a preliminary analytical map highlighting potential relationships between contextual dimensions and methodological approaches. Through an iterative review of this matrix, four central junctions were identified deductively.

In a second step, we conducted an in-depth qualitative analysis to explore how the junctions manifest in TDR projects. For this purpose, we revisited the interview and workshop data, included the workshop data of the second project phase, and analysed them through systematic coding using the software MAXQDA (Kuckartz and Rädiker 2019). We examined how interviewees or workshop participants described challenges, adaptations, and interactions between context as well as formats and methods within each junction. This enabled us to validate or refine our initial conceptualisation of these intersections. We then developed sub-codes inductively along the material. Finally, we clustered the sub-codes thematically in order to bundle the findings in a meaningful way (Lungu 2022). The code system thus grew steadily with new aspects emerging. (Appendix C - Codebook)

The material was coded by one researcher for each case, and the results were iteratively reviewed, discussed and revised by a group of three researchers from the project team (Nowell et al. 2017). This process led to the development of a comprehensive framework, which we present in "Navigating the junctions".

Case studies

We tested our approach by selecting two concrete case studies (TDR projects) from our dataset, as they represent two very different types of formats; (1) the "Rural-Urban Nexus: Establishing a Nutrient Loop to Improve City Region Food System Resilience" (RUNRES) project using the Ten Steps format, and (2) the "Co-Creating Change research and teaching project" (Co-CreArt) project as example of an

Table 1 Overview of data

Data source	Project phase	Purpose	Participants/cases	Abbreviation
17 Qualitative Interviews	Phase 1: Context	Understand how contextual factors shape TDR processes and dynamics	TDR researchers from 13 countries across various sustainability topics	IC01-17
5 Thematic Workshops	Phase 1: Formats and methods	Jointly reflect on format structures and compare application in practice	TDR researchers and practice partners with experience across sectors and countries	WSF1-5
6 Expert Interviews	Phase 1: Formats and methods	Analyse how methods are chosen and adapted within specific formats	Project leaders and practice partners using formats like ToC, Ten Steps, Art-Based Lab	IF01-06
2 Reflective Workshops	Phase 2	Deepen analysis of context–format interplay and validate emerging categories	International TDR researchers	WSI1-2

arts-based format (Jäkel 2025). The two formats represented by the case studies differ in terms of their openness to unexpected results, the inclusion of different target groups, and whether they work with a fixed set of methods or are open to very different methods.

The RUNRES-project is coordinated by the Swiss Federal Institute of Technology Zurich (ETH Zurich) and funded by the Swiss Agency for Development and Cooperation (SDC). RUNRES aims at strengthening the resilience of food and waste systems in four regions of sub-Saharan Africa: the Democratic Republic of Congo, Ethiopia, Rwanda and South Africa. The project experiences described in this paper relate to the pilot phase of RUNRES (2019–2023).

The format Ten Steps applied in this case is an example for a systematically structured approach with a defined set of methods. The sequence of the ten steps helps to develop a coherent process design and a framework for reflecting on the process (Pohl et al. 2017). The format is structured in three main stages (Pohl et al. 2017): (1) matching research question and societal knowledge demand, (2) identifying disciplines and societal actors to involve and planning who, when and how to involve, and (3) reflecting about the impact. A lot of different methods are embedded in these three stages, such as e.g., a role-play named actor constellation to explore the relevance of actors for the research (Pohl 2020) (in stage 1) or the give-and-take-matrix to establish links between different societal actors, researchers or subprojects (Stauffacher 2021; for more methods see www.transdisciplinarity.ch/toolbox) (in stage 2).

The Co-CreArt-project in Salzburg is run by the Mozarteum University Salzburg in cooperation with Paris Lodron University Salzburg and Salzburg University of Applied Sciences and is based at the Interuniversity Centre for Science and Art. It combines artistic practice with scientific research. The aim of the project is to develop a co-creative learning laboratory which uses artistic and scientific experiments as well as educational formats to raise awareness among children and young people about topics such as sustainable construction, living and climate-friendly mobility. The project is funded by the Climate and Energy Fund and administered by the Austrian Research Promotion Agency.

In general, arts-based formats stimulate the redesign of social practices with their interventions and are particularly suitable for integrating emotional-intuitive knowledge (Heinrichs and Hoernemann 2023). Compared to other transdisciplinary formats, arts-based formats are often characterised by less fixed method portfolios (Heinrichs and Hoernemann 2023). The aim of arts-based formats is often to create experimental situations that provoke irritation among participants. The primary focus is not on designing concrete solutions, but on stimulating new perspectives and behavioural and attitudinal changes. Arts-based formats often have a broad participation approach, meaning that they often intervene in public spaces, open to integrate all interested at a specific place and time. The methods include, for example, working with intuitive expressions of a complex problem by using e.g., films, artistic artefacts like installations or drawings, theatre, poems and stories. (Mbah et al. 2025)

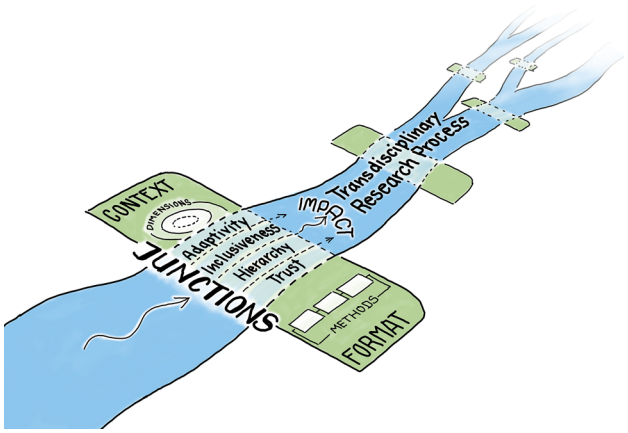

Fig. 3 Four junctions within a transdisciplinary research process (TDR)

Navigating the junctions

Our data analysis reveals recurring patterns summarised into four key junctions: adaptivity, hierarchy, inclusiveness, and trust (Fig. 3). Each junction represents not only a point where context intersects with format and methods, but also a dynamic spectrum that enables active influence on the TDR process. This framework provides concrete guidance on selecting, adapting, and embedding formats and methods in a context-sensitive way. In the following sections, we explore each junction in detail, outlining its features, common challenges, and implications. Based on this analysis, we identify key requirements for a reflective and reflexive research design and derive methodological recommendations.

Adaptivity

We use the term adaptivity to express the fact that the methodological design of a TDR process must be oriented towards the respective context and the associated challenges. Context factors such as political framework conditions or spatial circumstances are specific to each project. At the same time, contextual factors can change over the course of a project, e.g., due to changes in the constellation of actors, sudden political changes or other external influences

such as the COVID pandemic. Accordingly, methodological approaches cannot be imposed in a template-like manner but require an iterative, context-sensitive approach. Thus, continuous reflection on the context and the suitability of the format and methods are central elements of TDR. Our data analysis reveals two main topics that require attention in the area of adaptivity: Assessing available knowledge on local conditions and dealing with changing conditions.

Assessing available knowledge on local conditions

As a prerequisite for a process-promoting design, the interviewees agree on the necessity of being open to local culture and history, as well as the needs of the practice partners and the local conditions (IF01, IF04, WSI1; see codes in Table 1). However, they identify hindrances to do so. Often, the limited time available prevents researchers from sufficiently understanding local conditions: "We're only in the region for a few months a year, so it wasn't a constant exchange with the same people over long periods of time. I think that hinders the research" (IC09). Given the limited time of researchers as well as their often-limited knowledge of specific local conditions (WSF3), the interviewees from research emphasise the role of practice partners. It is "really extremely important to work with a partner who […] knows the needs, the requirements, the concerns of the actors with whom you go into these workshops" (IF03, translated). A time frame is needed that allows the researchers to spend sufficient time directly on site in order to make contacts, immerse themselves in the circumstances and to find suitable spaces for activities on site (IF01): "You have to find the way in which the actors want to do research with you, want to work with you" (IC05).

Additionally, when choosing formats and methods, considering the local conditions can help gain acceptance and interest and thus encourage participation: "the rural area and the composition of the practice partners […] [have] influenced the fact that no 'hip' things were used" (IC15, translated). Nevertheless, the choice of format also depends on societal trends and the requirements of the funding body. In one case study, for example, the funding body explicitly required the use of the format Theory of Change, which was not considered useful by the project consortium and, due to the project plan and changing participants, was therefore used in a very slimmed-down form (IF01).

The interviews and workshops of the first project phase emphasise the implementation of a systematic context analysis at the start of the project for strengthening the understanding of local conditions (IF03, WSF4). In addition to the analysis of framework conditions, focus group discussions and ethnographic methods are mentioned, which can range from participatory observation and interviews to media work including photos, maps, or movies (IF02, IF05, IF06). These methods can be integrated into different types of formats. At the same time, some formats allow to examine local conditions more closely. Theory of Change, for example, explores actors' underlying assumptions, revealing the actions and opinions that shape the process (IF03). The Ten Steps format focuses on the intersection of local context and key actors—both directly involved or merely influential—to design a research process aligned with those specific context conditions and actors (IF04).

The interviewees emphasize that the selected methods and formats must in turn be adapted to the practice partners (e.g., IF04). But nonetheless it is also emphasised that the right balance between openness for the actors and determination of the research program is important: "I think we could have had more interesting results if we had had a tighter framework for what we wanted from them" (IF05).

Dealing with changing conditions

Conditions can change e.g., due to political developments, as illustrated by an interviewee working on a case in Mongolia. They described the impact of a government change: "Everything we have done in the project in terms of preparatory work, perhaps also trust [has] been cut off, and it's like being set to zero again" (IC11, translated). Crises can also complicate TDR processes, as another interviewee reflected: "[The COVID pandemic] just threw a spanner in the works, […] the number of practical activities that were possible at all, […] the capacity it took to steer and readjust" (IC07). However, crises can also have enabling effects. In the case of the war in Ukraine, for example, one project gained momentum due to heightened interest in energy issues (IF03). Lastly, changes in project team composition may present further challenges. Due to constantly new familiarization and introduction processes, projects may lose time for in-depth work, which is difficult to make up for methodologically.

Continuous reflection on the project management and in the team as well as the documentation of the process and the results are described as methodological approaches for being able to react adequately to such changes during the process (IC16). A formative evaluation (Christ and Kember 2018) conducted through accompanying research can reflect developments to the project team and enable them to adjust the process. At the same time, flexible supporting conditions are needed to have enough time for these reflection processes on the one hand and the scope for change on the other. Overall, the personal willingness to learn is essential: "I think we did and learned and tried to learn at the same time. Because things have changed so quickly that we have had to adapt to the changes" (IC04).

Hierarchy

An essential characteristic of TDR is the collaboration between science and practice (Lang et al. 2012). Imbalances of resource-based power—whether in the research team itself or beyond—can lead to conflicts in such collaborations, in transdisciplinary projects in general, but especially in North-South collaborations (Tolksdorf et al. 2025). The terms "North" or "Global North" generally refer to economically developed, industrialised countries with greater political and economic influence, while the "South" or "Global South" denote less-developed regions, often characterised by lower income levels, limited resources, and a history of marginalisation (Chitadze 2019). Our data analysis indicates that the choice of formats and methods throughout the research process can, to some extent, help address hierarchical imbalances and conflicts by making them transparent, and in some cases, even contribute to overcoming them. However, these choices must also be made with an awareness of the hierarchical structures within and outside the team. In the following, the origins and handling of these hierarchical structures are explained.

Hierarchies within the team

The analysis of the various TDR projects emphasises the role of internal hierarchies in the team. A distinction is made between three types of hierarchies within the team: one concerns the integration of team members, the second concerns the integration of TDR principles in the collaboration between different disciplines, and the third one the integration of science and practice. The former arises from diverse causes linked to the availability of resources, such as time (WSF2), money (IC02, IC06, WSF2), expertise and knowledge (IF05) or language skills (IF01, IC16). They allow research team members to express themselves and shape the project to different degrees which affects the ownership of those involved in the project, leading to unequal levels of commitment (IF01, IC03). These resource-based internal hierarchies play a particularly important role in research collaborations between the Global North and South and are rooted in structural inequalities, including differences in working conditions (IC08, IC09) and societal recognition (IC11). For example, in one case it was observed that researchers from Germany could express themselves more eloquently because of their language skills, while partners from countries such as Madagascar were disadvantaged when English was used as the working language (IC16).

Based on our analysis, we identified several methodological approaches to counteract these hierarchies within the research team. To be aware of and be able to deal with the above-mentioned different resources of involved actors, an analysis of actors at the beginning of the TDR project can help to make structural inequalities transparent (WSF2). Beside such approaches, which promote a kind of analytical communication between the actors at the beginning of a project, continuous communication and reflection is required throughout the entire project. As examples for such communication approaches to foster an inclusive and collaborative environment and overcome differences within the team, respondents mentioned approaches such as regular exchanges (IF01, IC17), reflection sessions (IC08) or the use of tools, e.g., an AI application to simplify texts (WSI1).

In addition to the question of resources, tensions between expectations of disciplinary research and TDR can also lead to hierarchies within the team or in the perceived relevance of different research modes (e.g., IC02, IC05, IC06). In some cases, TDR is not seen as equal to disciplinary research, but must be legitimised to other team members, as stated in one of the interviews: "[…] it was actually very difficult to make the nature of this [transdisciplinary] work clear, […] also to make the nature of the results clear" (IF06, translated).

Lastly, interviewees report on the challenges of integrating science and practice equally into projects and transferring responsibility (IF01, IC03). To counterbalance a disparity between science and practice, it is e.g., suggested to designate a responsible person on the practice side (WSF2).

Hierarchies outside the team

'External' hierarchies, particularly political and institutional, were identified as significant factors influencing TDR. Hierarchical political systems and culturally embedded local power structures can impede civil society engagement and collaboration with political actors. Similarly, institutional structures, which remain oriented towards disciplinary science, present structural barriers for TDR. For instance, TDR's process-oriented nature can result in limited investment in scientific outputs, thereby falling short of meeting conventional academic standards for publication (IC07). This tension between process and product highlight institutional misalignment with TDR objectives.

Scientific hierarchies also affect global research collaboration. Respondents noted that funding and publication opportunities are concentrated in countries such as Germany or the United States, while countries like Ecuador or South Africa have limited or no access which in turn determines participation (IC02, IC06, IC09, IC16, WSI1). As one interviewee put it: "[M]any funding instruments […] inherently [create] a power imbalance in the project" (IC09). Research guidelines can further entrench power imbalances by assigning differentiated roles to team members from the Global North and South (IC11, IC16). Not

only in international collaborations, but also in a TDR project within one country, in this case Germany, financial constraints can restrict access and participation (IC09). Practice partners often receive minimal or no compensation, which limits their sustained engagement (IF01, WSF2).

Notably, the data reveal no specific format or methodological approach that can effectively impact these external hierarchies. The only strategies mentioned include enhancing visibility of project outcomes through public communication and shifting collaboration to different political levels (WSF1, IF01, IC04, IC09). These responses might also underscore the limitations of TDR in transforming entrenched external structures. One respondent explained: "As a researcher […] writing a grant, you could decide not to apply for that program. […] But once you have decided on this program, you can't change it." (I09) We will tap into this area of limited influence again later in the discussion.

Responses to hierarchical constraints generally take two forms: reflection and public communication. Reflective practices are crucial for identifying and acknowledging existing power asymmetries and are the first step to addressing them (IC16). Public communication serves to raise TDR's profile, strengthening the recognition of the research mode (IF01) and affirm participants' contributions, thereby helping to balance power within project teams (IC04).

Inclusiveness

In TDR, inclusiveness—understood as integrating diverse perspectives and knowledge types, with a particular focus on marginalized or under-represented groups—emerges as a critical theme. Our data shows the increasing importance of "opening up, to look at problem statements from different perspectives with people from different backgrounds, and to work on them and on possible solutions" (IF02, translated). This perspective aligns with broader arguments for inclusive research practices, which suggest that incorporating diverse viewpoints enhances the relevance and effectiveness of research outcomes (Horcea-Milcu et al. 2019). Our data shows that while inclusiveness is often an explicit goal in many projects, its implementation remains challenging. Instead, it may be overlooked (IC13, IC15), considered unnecessary for a particular research focus (IC03), or is limited by structural constraints. Our data reveals two main aspects within Inclusiveness: Inclusion of perspectives and the dependence of participation on the availability of resources.

Inclusion of perspectives

A key goal and challenge in ensuring inclusiveness lies in the integration of different perspectives. Disciplinary logics, epistemologies, terminologies, and methodologies often diverge, leading to tensions within research teams (IF04, IF06, IC05): "The disciplinary logics, to which one is also committed, […] they must also be fulfilled. And sometimes it generates such a tension […]." (IC05).

Moreover, the involvement of practice partners throughout the research process is crucial but often inconsistent. While some projects succeed in maintaining active participation from external practice partners, others experience limited engagement, particularly during the initial and final project phases. That is not always due to deliberate restrictions, but also because practice partners' interest, motivation, availability or resources decline over time, resulting in a lack of mutual understanding and co-creation (IF06, WSF2). Several methodological approaches have proven effective in fostering the inclusion of diverse people and perspectives and strengthen a shared understanding. Arts-based formats, for example, offer an alternative, non-text-based medium for engagement, encouraging participation beyond traditional academic or technical discourses. Artistic interventions, interactive workshops, such as science fiction writing exercises, create an open environment for exchange, enabling diverse practice partners to contribute (IC10, IF05, WSF3, WSF4, WSF5): "Artistic and culture-connecting approaches seem to trigger an identity-forming impulse, especially for locally/regionally based projects, which can lead to greater self-efficacy and motivation among groups of actors. […] It became clear that integrating population groups that are distant from science and education into transformative projects and TDR continues to be a major challenge. Here, too, art-based approaches can help." (WSF4, translated).

Another significant aspect of inclusiveness is the empowerment of under-represented groups. Traditional academic structures tend to favour scientific approaches of the Global North, side-lining alternative forms of knowledge such as indigenous wisdom, community-based expertise, and lived experiences (IC02, IF01, IF02). Efforts to integrate these knowledge forms often face resistance, either due to a lack of recognition or conflicting priorities between scientific rigour and practical applicability (IC02, IF04, WSF2): "The problem is that the people in the West, including scientists […], have been educated to disconnect with […] non-human life and to connect with their intellectual life. […] In general, indigenous cultures have preserved that […] relational way of being in the world versus the more egocentric, individualistic […] way in which we educate in the West to live in the world." (IC02).

Clear and target-group-specific communication plays a crucial role in promoting the inclusion of under-represented groups and inclusiveness in general. Simplified language, visual materials, structured brainstorming sessions, and

translation services help bridge communication gaps. Informal meetings and iterative feedback rounds ensure that diverse perspectives are heard and contribute to the development of a shared understanding. Workshops designed with inclusiveness in mind—such as gender-specific formats to create safe spaces—can further empower under-represented groups: "For example, we held separate workshops for women and men when it came to wellbeing, so that each group could really speak freely." (IC16, translated) Likewise, participatory approaches like role-playing games, socio-educative practices or real-world experiments allow for deeper engagement and mutual learning (IC04, IC06, IC08, IF02, WSF1). In order to be able to carry out such group-specific communication with the appropriate format and methods, an intensive examination of the framework conditions and characteristics of the target groups is required (see context analysis in "Data collection").

Another question that comes up is whether the integration of diverse perspectives can also entail risks for the project. On the one hand it would be important to avoid prejudices against certain groups, on the other hand there are doubts on that: "How can we be open, but at the same time make sure that our processes are not being hijacked by e.g., undemocratic movements?" (WSI1). This underlines the delicate balance required between openness and safeguarding the normative foundations of the research process.

Participation dependent on availability of resources

One of the most pressing barriers to inclusiveness is the availability of resources for participation. Civil society actors, particularly those from non-institutionalised backgrounds, often lack the financial and temporal flexibility to engage in transdisciplinary projects. Many participants have full-time jobs, household responsibilities, or other obligations that prevent long-term commitment to often unpaid research activities. Consequently, participation often lacks in integration of such actors and participation levels are often dictated by socio-economic hierarchies, thus increasing power imbalances within research collaborations (IC04, IF01, WSI1): "[The waste pickers] live in the subsistence economy and they're working day to day. It's difficult to them to plan something, to […] have the time to, for example, stop [collecting] waste […]. It is not possible to them because they need to work from day to day to sell day to day to have money today." (IC04).

Given the constraints, often especially faced by civil society actors, strategies to facilitate participation include the creation of ownership, the activation of people, and the provision of added value. One approach is to offer incentives that go beyond monetary compensation, such as issuing certificates that hold professional or educational value. Providing travel reimbursements, covering participation-related expenses, or offering symbolic incentives (e.g., prepaid phone credits) can encourage sustained involvement without distorting the relationship between research and practice partners (IC11, IC13, IC15, IF01, IF02).

Furthermore, specific participation forms are necessary to reach particular groups effectively, for example such that are low-threshold and connect with the everyday practices of societal actors. Rather than relying on passive invitations, targeted outreach efforts are required to ensure the inclusion of marginalised perspectives. Collaborations with intermediary organisations, community representatives, and local facilitators can help bridge gaps between different people involved in a project (IF01, IC12, IC15).

Trust

Our analysis highlights the relevance of trustful relationships among scientists as well as between scientists and practice partners for accessing key individuals and understanding the local context. The data addresses both factors that influence trust—such as past positive or negative experiences—and the formats or methods that help build it. The following section is organized around two themes: building on existing mutual trust and creating new trustful relationships.

Building on mutual trust and door-openers

Positive experiences made in the past (IC16) and existing relationships (IC11, IC17) are described as conducive to trust as researchers in this case can already build on a foundation of trust. The fact that in some projects, practice partners were selected precisely on this basis underlines the significance of trust which requires efforts to build (IC07, IC11). If actors already have a trusting relationship, they potentially already have a common language and understanding, which eases communication and the development of a shared goal. This is another factor identified as essential for trust (IC16).

Also, several interviewees bring forward that the trust within a project is based on individual relationships (IC01, IC11, IF05, WSF1). Any change in the individuals involved in or relevant to the project therefore potentially means a loss of trust. Consequently, individual relationships must be established and maintained. However, in case of local conflicts and distrust between some societal groups, it can be beneficial for researchers to act as an external person who is perceived as neutral (IC06, IC09): "And I think […] [it] was really interesting, coming from outside to a certain extent, both from Germany but also actually from being able to say, 'Oh, we are students', because we were all PhD students

and Master students, etc. put at a bunch of divert in field, was something that contributed to trust from the stakeholders towards us in the sense that it's like, 'Oh yes, you're just working towards your degree. You're not involved in these like local conflicts.' And I think that helped in the terms of trust between participants and researchers in the project." (IC09).

A particularly effective strategic element that emerges across several projects is the involvement of 'door openers'. These are either individuals in specific roles, or 'multipliers' with extensive networks, or institutional mechanisms that help researchers gain access to local networks and understand local settings better. Door openers, according to the interviews we analyzed, can be respected community members, long-term local collaborators (e.g., IC12), advisory boards (e.g., IC03): "Our partner, […] very well-respected in the province by nearly all the stakeholders who are involved—he's held a variety of positions in non-governmental organizations for quite a long time. He's lived in the region for quite a long time. […] I think that helped us to have the kind of response rate that we did" (IC12). Even students (e.g., IC17) who—due to their perceived neutrality or 'newness' to the topic—can reach practice partners and relevant people more effectively and serve as door-openers.

These examples illustrate how door openers do not only facilitate logistical access, but also actively foster trust by translating between different social worlds, signalling legitimacy, and smoothing pathways for collaboration.

Creating new trustful relationships

Our data shows that trust is not always an existing foundation that collaborations can build upon. Even more, historical or current conflicts (IC15) and negative experiences made with similar research projects, e.g., if these were of an exploitative nature (IC05), can be identified as hindering conditions for the development of trust between researchers and local actors. Political and economic instability further complicate trust-building, as unstable environments often foster a general climate of mistrust and make open collaboration difficult (IC09).

However, if a basis of trust does not exist, there are methodological means to building it. Practices that enable trust in the analyzed TDR projects were personal contact, strengthened through face-to-face meetings (WSF4) and relationship work more broadly, i.e., "[getting into action and building trust with each other] not only verbally, but also in terms of content" (IF02, translated). In order to create a trusting environment, talks are prepared bilaterally (IC17). In the research process itself it is also about reciprocity, i.e., sensitivity to the perspectives of others and mutual rather than one-sided benefit (IC15, WSF2).

Further strategies to increase trust can be "informal meetings and open discussions about values and expectations to counter power asymmetries" (WSI1). One interviewee also highlights the role of expectation management as an approach to establishing a relationship of trust. One project participant reports: "I have done a lot of expectation management. My strategy is to play down expectations as much as possible and then perhaps raise them. […] That way I never fail them in any way, because to fail means to fail them. So not in general. So, failing is okay, but not to these people, because then you lose their trust and if you lose their trust, you've basically lost everything." (IC01).

Another workshop participant emphasises that researchers should acknowledge the novelty of the process and share their uncertainties in order to help establish common ground among everyone involved in the project (WSF5). Creating a local platform for exchange between previously unconnected individuals can also foster trust, which may have a positive impact beyond the scope of the project itself (IC15, IF03).

Additionally, and in contrast to what has been said earlier, when researchers are perceived as outsiders, either due to their institutional background or lack of familiarity with the local context, this distance can make it harder to establish trustful relationships. Local actors may question the motives and relevance of the researchers, which can slow down the process of building mutual understanding and cooperation. Local researchers, on the other side, can be better placed to build such relationships of trust with locals (IC13). The practice partners emphasized the need for sufficient funding for their efforts as well as a time frame that allows them to get to know each other personally and to become familiar with the various institutional frameworks (WSF2).

Navigating junctions in practice: insights from two case studies

We want to now refer back to the two case studies RUNRES and Co-CreART introduced in the Method section and connect them with the junctions developed above. To this end, we will first consider the selection of formats and methods at the start of the project, before turning our attention to their adaptation as the project progresses.

Choice of format and methods

The initial decision to use the Ten Steps format in the RUNRES project was taken mainly because the project management team had already worked with the approach on several occasions and had experienced Ten Steps as a helpful approach for designing a TDR project. RUNRES was set in low-income countries, where the project team had to

experience that local actor perceived the transdisciplinary approach far removed from their needs. Local actors focused in the beginning on pragmatic and immediately effective solutions, such as introducing better agricultural machinery: "Some say, 'I take care of plants, I'll tell you what nutrients they need. Okay, do I now have to talk about some toolbox approaches?'" (IF04). In contrary, scientific actors from the project regions appreciated the structured approach of Ten Steps: "Some people […] perhaps more from academia […] [say] that this is the missing link, […]. If I had known this 20 years ago, it would have made my world much simpler" (IF04). The choice of such a strict, highly academic format had a negative impact on trust-building. A hierarchical divide emerged between the researchers and local stakeholders, which initially led to the latter not participating in the workshops.

In contrast, the methods used in the arts-based formats within the Co-CreART Lab were strongly geared towards the needs of the target group of children and young people. A particular focus of the project was to strengthen their self-efficacy by addressing emotions and using empowering methods such as poetry slams, songwriting and theatre performances. The interviewee explained that arts-based formats are important for "making things experienceable and perceptible in a different way […] but also for opening up new perspectives in the process" (IF02). In this way, the choice of format and methods simultaneously serves the need to incorporate a wide variety of perspectives and a non-hierarchical approach.

Use of formats and methods in the further course of the process

In RUNRES, a major challenge was to reconcile the conflicting positions between local and scientific actors and involve all stakeholders in the process. To ensure this, it was necessary (1) to establish some technical solutions before addressing more complex transdisciplinary approaches, and (2) to reduce the complexity of the methodology: "The Ten Steps […], they are sometimes far too complex for simple practical applications and, in the end, I actually […] simplified many of the methods" (IF04). This also meant not using the individual methods in successive workshops, but rather combining several methodological steps in a single workshop, thereby taking up less of the local actors' time. Within the RUNRES setting, researchers experienced a deep initial distrust of the practitioners in the structured Ten Step approach. Only by adapting the methods was it possible to gain the trust of local stakeholders, overcome the hierarchical divide between local and scientific actors, and thus integrate the perspective of local actors into the project.

In the Co-CreART case study, too, selecting methods deliberately turned out to play a key role for adapting the format to the context and getting the young people on board. The format was continuously adapted using low-threshold reflection methods such as critical friends' meetings, reflection sheets and smartphone voice memos: "Of course, there are always reflections after every loop and after every event […]. We call these critical friends meetings, where we bring people back together and […] discuss with them what we should do next" (IF02). These methods enabled the incorporation of the feedback in the general TDR process and the adaptation of methods and their selection towards the needs of children and young people. The choice of audio protocols in the form of voice memos proved particularly successful in reaching young people. This gives the impression that the methods contribute significantly to creating trust and inclusiveness, as well as a non-hierarchical atmosphere.

Discussion

Summary of key findings

This study identifies four junctions—adaptivity, hierarchy, inclusiveness, and trust—as points where contextual conditions meet formats and methods that can be actively designed by those involved in TDR processes. These junctions thus represent dynamic spaces of negotiation and reflection that shape the quality and effectiveness of collaboration in TDR processes.

Adaptivity emerges as a central junction where the project team continuously recalibrates formats and methods in response to evolving contextual factors, namely local needs or historical trajectories. This resonates strongly with Lam et al. (2021), who argue that TDR success hinges on the capacity to adapt research processes to local realities. Similarly, Tolksdorf et al. (2025) emphasise the necessity of ongoing reflexivity and responsiveness to contextual changes. Our findings extend this literature by illustrating how adaptivity is operationalised through method selection and adaptation as well as negotiation among the research team. In our case study Co-CreArt audio-visualised methods were selected with regard to the preferences of the involved practitioners (children and youths). The case study RUNRES shows that e.g., working with practitioners in the low-income sector and in countries with high poverty rate, the fast generation of solutions is pending which means that methods were adapted in such a way that they are effective and efficient in order to not consume too much time of those involved. The findings indicate a temporal and functional distinction between formats and methods in relation to context. The formats are generally selected at an early

stage of the process depending on the desired objectives and contextual factors. In contrast, methods emerge as the more flexible layer of adaptation, allowing researchers to respond to shifting needs, participants' dynamics, or emerging constraints throughout the process. In this regard, more adaptable formats that work with a less fixed set of methods seem to have an advantage as they allow more space for adaptation (Mbah et al. 2025). Furthermore, this junction shows strong interconnections to the remaining junctions as all the interactions between context and formats as well as methods should be considerate of the above-mentioned points inherent to adaptivity. This suggests that adaptivity plays a key role within the four junctions.

The junction of hierarchy highlights the persistent influence of power dynamics and resource imbalances in TDR, especially in transnational and North-South collaborations and when research is done in collaboration with marginalised groups, e.g., children/youths or low-income groups. Our findings align with Jahn et al. (2012), who identify the negotiation of power as a core challenge in transdisciplinary processes. In our case studies, which refer to the Ten Step approach, hierarchies between local and scientific actors were overcome by simplifying the methodology. By documenting how project teams address hierarchical tensions—through transparent communication, role clarification, and shared leadership—we contribute practical insights to the literature on equitable collaboration (Pohl et al. 2017; Pregernig et al. 2018). However, while direct design options are evident in the case of hierarchies within the team, external hierarchies can only be influenced indirectly, such as institutional structures or funding requirements (Atallah 2016; Fritz and Binder 2020).

Inclusiveness emerges as a dynamic junction where the integration of diverse perspectives is both a methodological and contextual challenge. Our findings support Belcher et al. (2016), who stress the value of inclusive processes for robust knowledge co-production. The empirical data illustrate that inclusiveness is best fostered through intentional design—such as differentiated communication, arts-based approaches, and tailored participation incentives—echoing the frameworks proposed by Mbah et al. (2025) and Lawrence et al. (2022). For example, the Co-CreArt project introduced 'critical friends meetings' for reflexion and song writing as safe spaces and low-threshold forms of expression for children and young people. Nevertheless, our study also highlights persistent barriers to inclusiveness, including language, cultural norms, and uneven access to resources (Chouinard and Milley 2016; Meyer and Vilsmaier 2020). Addressing these barriers requires ongoing reflexivity and adaptation, reinforcing the interconnectedness of the two junctions adaptivity and inclusiveness.

Trust shows to function both as a precondition and an outcome of successful collaboration, shaped by past experiences, relational dynamics, and communication practices. For example, creating spaces for openness and reflection, and fostering a positive culture of error (Mbah and Brohmann 2021). Consistent with Vincent et al. (2018), our results show that trust-building is a continuous process, shaped by both formal (e.g., transparent decision-making) and informal (e.g., interpersonal interactions) mechanisms. In the RUNRES project, trust was built by adapting the methods used to the needs of the practitioners as they were feasible with minimal time expenditure, efficient, and goal oriented. Since trust is mostly tied to individuals, the individual attitudes of those involved in the project have a great relevance. The literature emphasizes that trust is particularly critical in the early "phase 0" of TDR (Horcea-Milcu et al. 2022). Our cases demonstrate this finding, for example by incorporating door openers—an initial investment in relationship-building that facilitates later stages of co-production and co-integration.

Our analysis further reveals that while formats and methods can support trust-building (e.g., through participatory workshops or arts-based engagement), the process is highly context-dependent and often extends beyond the methodological domain (Lux et al. 2019). Recent studies emphasise the importance of developing an "inter- and transdisciplinary personality", which is "characterized by a particular mix of motivations, attitudes, skills and behaviours" (Guimarães et al. 2019). To develop such a personality other scholars propose "Transdisciplinary Learning Trajectories" that include both experiential and instructional approaches (Horn et al. 2024).

Emerging patterns across the data

The analysis reveals several cross-cutting patterns that extend beyond individual junctions, offering broader insights into the underlying dynamics. One observation is the limited methodological influence over project-external structures and specifications, such as researchers' time in the field, change of actors, crises, or different working cultures.

As already observed in the results, the data does not always reveal specific methods used in a specific format that effectively cope with or address contextual constraints. However, beyond formats and methods, strategies and structural aspects play a critical role. Fostering ownership, activating people, and providing added value become key to supporting participation. One concrete approach described above is to offer non-monetary incentives with personal or professional relevance which can motivate sustained involvement without distorting the relationship between researchers and practice partners. These practices illustrate

how superordinate structures—not just methods—can be deliberately designed to navigate and balance context conditions. Furthermore, informal meetings and open discussions about values and expectations were highlighted as important strategies to build trust and counteract power asymmetries. In this regard, expectation management emerged as a key approach for cultivating sustainable relationships. Whether understood as a standalone category or as part of broader structural considerations, such strategies highlight that designing junctions requires ongoing, reflexive and reflective work beyond specific methods.

Each junction represents a distinct area of context-format-method interaction and serves the purpose of clustering the field. However, the junctions are interdependent and mutually reinforcing. For instance, when institutional norms or resource distribution shape whose voices are heard, hierarchy, trust, and inclusiveness intersect, and trust is likely to be a result of this dynamic. Hierarchies can hinder open dialogue and mutual understanding, while flattening them fosters trust. Transparent communication builds trust and also supports inclusiveness. Adaptivity and inclusiveness connect through the need to tailor formats and methods to diverse groups, while trust enables adaptivity by sustaining partner engagement during changes within the research process. The concept of door openers illustrates how practices targeting one junction can ripple across others—navigating hierarchies, enhancing inclusiveness, and enabling adaptive, context-sensitive approaches.

Reflective practice as a navigation tool

The junctions are intended to simplify navigation through the complex relationships between context and format/method by highlighting key decision points. As already mentioned before, this requires a particular degree of reflection, and reflexivity of one's own biases, from all participants. In one workshop (WSI2), it was proposed that junctions become more usable through reflective questions, helping teams consciously analyse and navigate critical points in their transdisciplinary projects (Table 2). These reflective questions represent an initial, illustrative set distilled from the junctions identified in our study and are intended primarily as orientation rather than an exhaustive or prescriptive list. Instead of treating adaptivity, hierarchy, inclusiveness, and trust as checkboxes, they should be seen as dynamic tensions that require ongoing attention throughout the research process. In the sense of Herwix et al. (2023), the reflection questions are not intended as a guarantee of success but as robust reference points to better navigate the complexity of a TDR. We differentiate two types of questions: Those meant to support the initial reflection about the specific relevance of certain junctions (type 1), and those that could—exemplarily - support the process of actually working on concrete issues and improvements within a specific junction category that the research team would deem important for the concrete project or context, based on the initial reflection (type 2).

Transferability and practical relevance

The identification of four key junctions offers a structured lens for analysing the interplay between context and formats as well as methods in TDR. Through this lens, project participants can more effectively navigate the complex realities of TDR, leading to more robust and impactful research outcomes. It explicitly contributes to three areas: practice, analysis and transferability.

Practically, the junctions highlight concrete areas where researchers and practice partners can intervene or improve the project design or execution. Analytically, they serve as a framework for understanding how context influences research formats and, conversely, how formats and methods can be leveraged to influence contextual conditions. Lastly, the transferability of this framework lies not only in the applicability of these four junctions across diverse TDR projects, but also in the broader idea of identifying and working with junctions as critical points of interaction. As further research may reveal additional or context-specific junctions, the underlying concept remains relevant and adaptable, providing a valuable tool for both practical application and ongoing methodological development.

Limitations and future research

This framework, while grounded in empirical material, remains a first step toward systematising the relationship between context and formats as well as methods. It does not exhaust all possible junctions or interactions. The junctions were derived from a specific dataset, focusing on selected case studies and workshop reflections. While the dataset includes several project examples, each project was only represented by one interviewee. Because context is co-constructed and can be experienced differently by different project partners, especially in North-South collaborations, this lens may have obscured alternative perceptions of the same junctions. As such, they do not capture all possible interactions between context as well as formats and methods in TDR.

Future research could further refine this framework by broadening the interview base within projects to include multiple voices as well as testing it across a broader range of case studies and methods, incorporating longitudinal analyses to examine how junctions evolve over time. Thinking context and the formats as well as methods together from

Table 2 Reflective questions for each junction

Junction	Reflective question (type 1—diagnosis)	Reflective question (type 2—taking action)
Adaptivity	• Which context conditions are (most) relevant for my choice of format? Are the properties of the formats in question suitable or how can I adapt certain formats to local requirements? • To what extent does my chosen format allow for adaptation to changes in context that might occur?	• How can I ensure that my chosen format is purposefully aligned with both the key context conditions and the overarching objectives of my project? • How can I systematically analyse and understand local conditions before selecting formats and methods accordingly? • How can I ensure ongoing reflection and adjustment of formats via methods as the project context evolves? • What methods and mechanisms do I have in place to document and learn from adaptations made during the process?
Hierarchy	• What hierarchical structures (e.g., resource disparities, language barriers, institutional power) exist within and outside my project team and how might my choice of format either reinforce or help mitigate these hierarchies? • What limits exist in addressing external hierarchies? • Who benefits from the research project? What benefit can be offered to the participants?	• Which format or methods can make existing power imbalances more transparent and open to discussion? • How can I design processes that enable equitable participation and ownership among all actors, especially those with less formal power? How can my format and methodological choices compensate for constraints related to external hierarchies within the project?
Inclusiveness	• Who (including whose ideas, and which epistemologies) is currently included and who is missing from the process, and why? • How do local context and existing networks shape who participates and whose voices are heard?	• Which format or methods best engage the inclusion of approaches or diverse perspectives, especially of those less represented or marginalized, as equally valid? • (How) Can I adapt the format and methods to lower barriers for participation (e.g., language, accessibility, timing)? • What strategies can I use to continually assess and improve the inclusiveness of the project as context shifts?
Trust	• What is the current level of trust between the different actors within the project? What context factors influence this? How might previous experiences (positive or negative) shape trust dynamics in this project?	• Which methods can help to (re-)build trust? • How can I ensure that trust-building is an ongoing part of the process, especially when personnel or local conditions change? • In what ways can I use formats and methods to foster reciprocity, transparency, and shared ownership in the research process?

the beginning could also help further analysis to reveal the more implicit or hidden connections that this secondary analysis might not have been able to capture. Additionally, while this study primarily explores four junctions, other significant intersections or a refined version of the existing ones may emerge through further empirical investigation—eventually enhancing the applicability and robustness of the framework.

Conclusion

Our analysis shows that "junctions"—points where context, format, and method intersect—can be deliberately identified and reflected upon to shape TDR processes. We identified adaptivity, hierarchy, inclusiveness, and trust as four of such junctions.

Recognising these junctions matters because they determine whether design choices translate into equitable collaboration and tangible outcomes. Continuous reflection and formative evaluation enable teams to adapt quickly to shifting circumstances, while transparent communication helps mitigate entrenched structures both inside and outside the project.

With the help of the analysis and suggested reflective questions, we invite project teams to map junctions at the project onset by first determining the status of each junction and then defining measures to maintaining or improving this status. Furthermore, iterative reflections in the form of regular exchanges or inclusive sessions should be embedded within the project timeline. This in turn requires

a certain flexibility from all internal and external parties involved in terms of allocating time and funding for this ongoing learning and adaptation. At the same time, funding structures should allow sufficient flexibility for projects to adapt methods and formats in response to evolving contextual conditions.

By foregrounding these steps, future TDR projects can be more deliberately designed along identified junctions, steering the research towards outcomes that are both scientifically robust as well as socially equitable and impactful.

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