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Dialogue and Disruption at the Doorstep: Participant Perceptions during a City Walk as a Climate Communication Format

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Abstract: Since there is a broad empirical consensus that linear science communication focusing on disaster framing rarely empowers audiences and prompts transformative action, alternative climate communication formats are needed. This paper explores an alternative climate communication format, which integrates the issue into a local context (Munich, Germany) via transdisciplinary cooperation, specifically through collaboration with local climate educators and tapping into the scientific expertise of local stakeholders. The conceptualized format of a City Walk on the subject of climate justice addresses urban citizens and tests the effectiveness of climate justice as an alternative framing. Drawing on an accompanying empirical study with qualitative group discussions (n = 14, October 2023), this article explores how the format and framing are perceived by the participants. Based on these findings, we discuss the potentials and pitfalls of the format for transdisciplinary science communication. In summary, the City Walk deepened participants' understanding of local climate justice—that is to say, how heat and flooding could amplify existing inequalities, and why adaptation and mitigation measures have not yet been implemented more thoroughly. Here, the crucial point is not whether the shift from climate change being a general topic to a personal one is supported by technical aspects of communication (e.g., virtual simulations). However, perceived local climate justice barriers (like bureaucracy) led participants to prioritize individual action ('footprint') over collective action (e.g., addressing local change). With these results, this study underlines the importance of new transdisciplinary formats for climate communication to address local change.

Keywords: transdisciplinary science communication; climate communication; education for sustainable development; city walks; climate justice; dialogue-oriented science communication

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1. Introduction: Need for New Formats of Transdisciplinary Science Communication

Extreme weather events like the sweltering summer of 2022 or flooding in North-Rhine Westphalia and the Ahr Valley in 2021 have underscored the importance of climate adaptation in Germany, especially in populated areas. As a result, the concept of climate justice has gained attention in this context. Pörtner et al. [1] characterize three aspects of climate justice:

> *"The term climate justice, [. . .], includes three principles: distributive justice which refers to the allocation of burdens and benefits among individuals, nations and generations; procedural justice which refers to who decides and participates in decision-making; and recognition which entails basic respect and robust engagement with and fair consideration of diverse cultures and perspectives".*

One aspect mentioned here is participation: Urban sustainable development for just climate adaptation needs ongoing engagement and support from the local communities for its successful implementation [2]. In the concept of locally led adaptation [3], the knowledge of local communities is crucial to identifying adaptation pathways [4] and solutions, while real-world laboratories can influence modes of urban climate governance [5]. "Public

participation in spatial planning" [6] is already used in disaster risk reduction [7], and the same goes for recovery, where community resilience is considered [8]. Climate change communication, on the other hand, often remains one-sided, with the delivery of messages from science to civil society [9] with a focus on a disaster frame [10], which does not lead to empowerment or behavioral change to a sufficient extent. The integration of scientific and stakeholder knowledge for urban climate adaptation in this context poses specific challenges for both the scientists and the stakeholders involved in the process, leading to the need for "boundary workers" [11] facilitating the transmission [12] and understanding of scientific information.

The climate communication format "City Walk" conceptualized, realized, and empirically evaluated in this study aims at bridging this gap. The format is an in-person, dialogue-oriented, and transdisciplinary format for science communication. It aims to not only transmit information (first-order thinking), but also encourage dialogue (second-order thinking) and, moreover, enable perspective taking. This should lead to a deeper understanding of how adaptation and mitigation measures are realized or hindered on a local level, and which role different actors may have here (third-order thinking). These outlined communication goals refer to Irwin's notion of first-, second-, and third-order thinking for science communication [12] (Or, to put the addressed communication goals in a more poetic way: "Stroll through city streets, Climate emotions bloom bright, Empowering hearts". This haiku is offered as an alternative, creative summary of the format and its communicative goals).

The specific City Walk designed and realized in the context of this study therefore includes three crucial aspects: dialogue with experts, social interaction, and the outdoors. The City Walk combines both scientific knowledge from local stakeholders (as on-site input talks) and group discussions about the participants' related emotions (via moderated group discussions). This implicitly addresses climate justice in local climate change adaptation as an aspect of sustainability, SDG 11 (Resilient Cities) and SDG 13 (Climate Action). Answering the following two research questions is the scholarly objective of this study and therefore determines the empirical study design aimed at exploring to what extent the format does in fact lead to the given communication goals:

(1) *To what extent can the framing of 'climate justice' help inspire and open up dialogue between scientific and practitioners' expertise and urban citizens in relation to climate change?*
(2) *How can new formats for transdisciplinary dialogue-oriented science communication help engage people with the climate issue such that their responses incorporate scientific and practitioners' expertise?*

2. Research Field

Climate scientists have long-standing and ambiguous experiences of acting as visible experts in the (mediated) public [13]. There is an ongoing discourse on the role and self-identity of science and scientists in 'post-normal' situations [14], especially in relation to climate change. Should scientists act more like map makers—neutral, but actively selecting and documenting relevant knowledge—or more like navigators—assessing policy-relevant knowledge [15]? Should scientists protest on the streets ('Scientists for Future' [16]) to demonstrate how far removed current policies are from the scientific consensus, or are policy briefs and expert hearings still the most fruitful way to be heard in decision-making processes?

Over the past decade, a multi-disciplinary field of research has emerged around these questions—the 'science of science communication' [17]. The main consensus in this field is that accurate and up-to-date information on scientific findings will not lead automatically to societal progress (information-deficit model [9]). Accordingly, environmental sociology heavily criticizes the belief that scientific information about the anthropogenic source of climate change alone will help people change individual behavior ('knowledge-action gap' [18]). The current paradigm of scientific communication has thus shifted from

linear information-transfer models toward participatory and dialogue-oriented forms of communication [19]

Recent research has elaborated the key characteristics of dialogue-oriented science communication, which can be summarized in a nutshell as the mutual exchange of meanings [20]. In public dialogues (like in talk shows), it is expected that scientists not only 'send' their information but also listen and learn about people's perspective on the issue—their concerns, hopes, beliefs, wishes, and fears. However, to start a dialogue, the objective and issue need to be framed by the initiating partner (e.g., a scientist) to open up and define a room for dialogue: "Framing should be used to design communication contexts that promote dialogue, learning, and social connections and that allow citizens to recognize points of agreement while also understanding the roots of dissent" [21].

The issue of climate change has a long tradition of being framed as a catastrophe. Overall, this framing can be seen as the most dominant and successful framing for establishing climate change as a salient issue for mediated public communication [22,23] and for contributing to a correspondingly high level of public awareness of the problem. At the same time, audience studies have repeatedly shown that precisely this framing leads to feelings of being unable to confront this issue, of being overwhelmed, and of blame [24–26]. A current focus of psychology-oriented research [27] demonstrates the relevance of climate feelings, including anxiety [1,28,29], grief [30], anger and frustration [31,32], and positive emotions [33,34] like humor (ibid.), connectedness (ibid.), and hope [35,36]. Positive and negative emotions play complex roles in climate communication and education [35], such as predicting or hindering policy support [37]. Thus, they require nuanced approaches tailored to specific contexts and individuals [33]. Here, a reflection of one's own climate emotions is suggested as a constructive and empowering coping strategy.

The framing of climate change as a catastrophe provokes defensive reactions in the sense of cognitive dissonance, which can cause people to avoid and ignore the issue [10,23,38]. New formats for communicating climate change as a local, on-site issue often explore art and (media) technology as "mediators". This specific research field is quite fragmented as it is multidisciplinary in nature, and it is often rooted in research on climate change adaptation and/or education for sustainable development (ESD). For example, research by Yavo-Ayalon et al. [39] included a communal extended-reality (CXR) bus tour that depicts the possible impacts of flooding and climate change. These possible outcomes were analyzed via group discussions to examine to what extent this format can inspire action on climate adaptation. One of the major effects of the VR bus tour was an increase in people's awareness of the impacts of climate change on their city. Additionally, participants were found to have a stronger emotional connection toward the community after the rides. One disadvantage of this climate communication format is the use of technical devices, which could imply barriers for certain target groups due to their sensory abilities or being unable to afford the necessary technology.

Another study dealing with emotions in the context of on-site climate communication conceptualizes a participatory and collaborative art installation "situated in East Boston [. . . that] combines public art with digital technology". The installation depicts the receptions of sea-level rise by visualizing local projected flood levels and the public's emotions toward this threat [40]. The corresponding empirical survey concentrated on measuring the emotions evoked by the fact that their city (Boston) will be heavily affected by flooding in the near-future. 'Concern' was the feeling most frequently articulated (compared to four other categories: anger, sadness, optimism, and other), and the accompanying observation of people's reactions supported the idea that rising awareness was the main impact of the art project.

As linear communication with the framing of climate change as a catastrophe has not been fully successful, it opens a door for participatory science communication which emphasizes dialogue. Local, on-site climate communication formats, such as virtual reality tours and art installations, engage diverse audiences despite accessibility concerns. As the roles of scientists in public discourse on climate change evolve, science communication is

shifting toward participatory and dialogue-based approaches and requires new framings of the issue. Utilizing local, on-site climate communication formats like virtual reality tours or collaborative art installations can enhance awareness and emotional connection, although accessibility barriers may arise. Moreover, a resource-intensive setup may hinder the broad adoption of these formats. In this study, a City Walk presents a promising alternative for engaging diverse audiences in climate action.

3. Conceptual Foundations for the City Walk

The City Walk format is a pedagogically inspired learning arrangement implemented to explore different stations in urban surroundings [41] by foot, with each element or location in the walk [42,43] addressing an aspect of an overarching theme or topic [44]. Overall, this approach is apt to provide a learning experience that integrates different perspectives on a thematical reference point in real-life settings, providing a different kind of information which can supplement studies, articles, reports, and media coverage.

3.1. Conceptual Foundations in ESD

Since the concept of education for sustainable development (ESD) aims at shaping competencies in cognitive, socio-emotional, and behavioral dimensions [45], innovative learning arrangements such as City Walks are particularly well suited to addressing issues of sustainable development.

> *"ESD aims at developing competencies that empower individuals to reflect on their own actions, [. . .] from a local and a global perspective [. . .] [,] to act in complex situations in a sustainable manner, [. . .] and to participate in socio-political processes, moving their societies towards sustainable development".* [46]

A City Walk involves a group of adult learners walking a pre-defined route through an urban environment, stopping at different stations to explore a certain topic. The stations consist of an introductory and final activity highlighting the sense of place [47], with generally two to four thematic stations between them, which can be augmented by media input, experts, discussion prompts, etc. The format breaks with the notion of linear and digital learning, focusing on social exchange in an outdoor experience and new perspectives, even on well-known surroundings and personal feelings. This unusual, sometimes disruptive learning experience (since accustomed perceptions and convictions are being reflected and questioned) fosters reflection on collective and individual perceptions and actions, which in turn can lead to transformation.

> *[. . .] transformation necessitates, among other things, a certain level of disruption, with people opting to step outside the safety of the status quo or the "usual" way of thinking, behaving, or living. It requires courage, persistence, and determination, which can be present at different degrees, and which are best sourced from personal conviction, insight, or the simple feeling of what is right.*
>
> (Para 4.2, Framework for the implementation of ESD for 2030, quoted in [45])

Reflection not only refers to the topic and its various contents, but also to a broad skillset, described as a framework of 12 crucial educator competences in a "rounder sense of purpose" (RSP). The resulting framework comprises 12 competences, each with three learning outcomes and several underpinning components [48,49]. The RSP framework provides structure for educators to practice an action-oriented, transformative pedagogy that engages learners in participative, creative, and critical thinking and acting processes, and the various competences cover reflection (criticality, responsibility, decisiveness), practice (transdisciplinarity, creativity, action), involvement (attentiveness, empathy, values), and integration (systems, futures, participation) [50,51].

For the City Walk discussed in this paper, the skillset "dealing with emotions" [50] is a focal point. Accordingly, the competences focusing on and involving empathy are very important:

> *"The educator helps learners to respond to their feelings and emotions and those of others. [. . .][, to] listen to their own emotions and those of others; understand and apply strategies for dealing with fear, conflict, or despondency, differentiating between unfounded hope and realistic sources of hope [. . .] [and to] develop their own and others' coping mechanisms and sources of resilience when confronted with potentially overwhelming sustainability related issues".* [50]

Essential characteristics of all ESD-related formats, such as City Walks, are as follows:

a. A holistic approach, which seeks integrative thinking and practice;
b. Envisioning change, which explores alternative futures, learns from the past, and inspires engagement in the present;
c. Achieving transformation, which changes the way people learn and the systems that support learning [52].

Aiming at transformation as an ultimate learning goal, this approach resonates with findings that the more time an individual spends outside and interacts with their surroundings, the more likely it is the person will engage in activities that foster planetary health [53]. Not only is it possible to address topics of sustainable development, such as climate justice, but phenomena related to sustainable development are also demonstrated at interactive stations. Furthermore, participants have the opportunity to discover best practices, engage in perspective shifts, and learn about actionable options.

While peripatetic philosophizing or learning stems from antiquity, walking through a landscape or urban parks for the purpose of recreation and enhancing the awareness of those natural surroundings is a habit that became popular in the era of industrialization as a counterweight to industrial settings. Social walks exploring literary or historical themes can be traced back over a century [54]—with the aim, for example, of walking in the footsteps of literary figures or learning about artists and their oeuvre. Politically motivated City Walks emerged during the same period, when nationalist students in Germany and Austria around the end of the 19th century sought verbal and physical confrontation with opponents [55]. The recently emerged ESD City Walk format, by contrast, is non-confrontational. Even though verbal interaction might be purposeful and thus intended, the focus lies primarily on the interaction among the participants and the leader, rather than with others in the city. That being said, contemporary pedagogical walks in formal and informal educational settings can be understood as a counterweight to individualized digital practices [56].

City Walks as an ESD format have been documented as a learning environment in non-formal education [44,57], focusing on social and political topics such as overconsumption or postcolonialism [58]. The format is said to have high potential for connecting real-life issues [57] with new perspectives on people's familiar surroundings in a "meeting-space" (German: "Begegnungsraum", [44]). However, climate justice, especially with respect to one's personal climate feelings, has not been explored in this context thus far, and there is little evidence on the reception of the pedagogical setup of the communication format in different settings [54]. As such, the study in this paper is intended to make a major contribution to the field.

The City Walk described here as "Climate justice at the doorstep" [59] has three crucial aspects: dialogue with experts, social interaction, and the outdoors. By sharing their ideas and viewpoints around climate justice, the participants make it a social issue among themselves. This aspect may also help them connect the different viewpoints they might have; for example, some participants might focus more on how members of their (extended) families experience hot summers, while others bring the perspective of the Global South. In any event, a vast majority of participants agreed that action is required immediately. The presence of experts at the stations is one way of conveying information. In the present case, they gave cognitive input and communicated scientific findings to the adult learners and opened up dialogues.

3.2. Transdisciplinary Approach behind the City Walk

Together with local stakeholders and the implementation partner "Netzwerk Klimaherbst" (NGO), the City Walk was chosen as a climate communication format because it offered a broader view on the participants' familiar neighborhood. Secondly, walking between the stations was expected to promote dialogue within the group.

Addressing people living in Untergiesing or nearby neighborhoods in Munich, the walk's intended goal was to foster a clearer understanding of climate justice and action, to strengthen the skillset of "dealing with emotions" [50], and to inspire new ways to become active about climate change.

The format would be inconceivable without its transdisciplinarity, which is based on the local expertise imparted by the speakers, who work outside academia but have strong scientific backgrounds. In addition, the event's concept was developed in cooperation with a partner from non-scientific practice, namely "Klimaherbst" (NGO), a major organization for climate-related knowledge transfer in Munich [60]. The topic and framing were proposed from the scientific perspective to the implementation partner, who further developed it with suggestions for speakers and content.

Flooding and heat were chosen as core subjects for the walk, due to their high relevance (floodings of the Ahr Valley in 2021; heatwaves in 2022). One of the invited speakers was the head of the local water management office (water supply, hydraulic engineering, and watercourse development). The other speaker worked for an environmental non-governmental organization ("greening office" [61]; greening measures for buildings, roofs, walls, or courtyards (ibid.)). Additional information on how the event was setup [62] and assessed [63], and on the route and contents [64] of the City Walk "Climate justice at the doorstep" [59], including a map and a schedule, can be found in the Appendix A.

3.3. Empirical Methods

While acknowledging that "education [...] does not function according to input-output logic" [65], we designed qualitative group discussions (n = 14) before and after the City Walk to better understand the process of how participants perceive and interpret the City Walk (see Yavo-Ayalon et al. [39]) and to answer research questions (1) and (2).

Before the City Walk, a recruitment questionnaire (see Figure 1) was sent out via email to sketch the participants' background, focusing on descriptive characteristics, values, and climate emotions, as well as knowledge, attitudes, and actions related to climate justice. The questionnaire included open-ended questions aligned with these themes, covering aspects such as age, gender, place of residence, climate emotions, knowledge on climate issues, and important values.

Figure 1. Overview of the methods used.

Qualitative focus group discussions (initial discussion and final discussion, Figure 1) were chosen as the central empirical method to answer the research questions, as this research is explorative in nature and aims at discovering the perception of the participants in an open and non-predefined way. As an established method for qualitative social science research, it does not aim at representativeness in a statistical sense, but at in-depth understanding. The recommendation for sample size is to use a small number of participants (e.g., around 6–8 people), as this setting allows closer social interactions and a more trustworthy atmosphere. Based on our theoretical perspectives, we developed a structured discussion guide [66,67], and thus provided a framework for organizing the discussion around the central research interest in research questions (1) and (2). As an icebreaker, the initial discussion began with graphical 'climate animals' [68], such as the "angry gorilla" or the "busy bee". These devices were intended to make it easier for the City

Walk participants to talk about their own attitudes and actions related to climate justice. The spirit of each climate animal was supplemented by a short text, such as the following for the angry gorilla (also, see Appendix A):

> *"We have a problem here, and it makes me angry! We can't go on like this! We must do something. Fighting is my mode. I'm going to tackle the problem. Immediately. And don't let anyone get in my way! I'll tell them something!".* [68]

A discussion on the topic of climate justice followed, as this was the central framing (research question 1). In the final discussions, each participant was asked if they would choose a different climate animal. For more information on the moderator [67,69] and the questionnaires [34,67,70–74], see Appendix A.

After the group discussion had been transcribed using the AI-supported software Trint and a complementary manual check, a qualitative content analysis was undertaken to ensure the systematic analysis of the central themes in the discussion. Accordingly, the main aspects of the discussion were classified thematically. Then, the participants were anonymized and assigned numbers, such that "P. 1" designates Participant 1 in what follows. The supplementary questionnaires were used as qualitative, contextual information [75,76] for interpreting the data. More information about them can be found in Appendix A.

3.4. Sample Description (Participants)

The results of the recruitment questionnaire (n = 14, 1 missing) help to contextualize the qualitative data (Table A1 in Appendix A), characterizing the participants according to their age, gender, education, first language, and place of residence. Eight people had obtained a (specialized) university degree, while two had completed high school and three had completed vocational training. The participants had large intersections concerning their values nonetheless, with their responses implying an orientation toward nature and the common good. In terms of nationality, they were homogeneous, with none of them speaking a mother tongue other than German. This is untypical for Munich, as the proportion of people with diverse language experiences and backgrounds is quite high [77]. Both phenomena can be explained by the fact that participants signed up for the event through its German website [59] for which some interest in the topic and knowledge of German is required. According to the information in the recruitment questionnaire, most of the participants identified themselves as female. The age structure shows gaps among the younger cohort, which explains the later focus on intergenerational justice in the discussion among older people. Most participants came from Munich. Altogether, the participants represent the typical target group of a climate-related event organized by an environmental NGO like Klimaherbst (The German UNESCO Commission named the elderly and "socially disadvantaged children and young people" [78] as target groups that had not received enough attention in 2012, and several projects are trying to reach diverse target groups, such as [79]. We searched scientific databases without success for scientific sources for the typical characteristics of participants of ESD and climate communication events by NGOs, including the number of participants. The terms "NGO target groups AND climate AND NGOs AND Germany" and "target groups AND diverse AND extracurricular ESD" were used. However, the exchanges with stakeholders of ESD and climate justice reinforced the participants' characteristics outlined above and the number of participants as being typical.), with around 10 to 15 urban Germans interested in the topic and involved to a certain degree already (see Table A2 in the Appendix A) and tending to be higher-educated.

4. Results

In the following, we discuss the results of the empirical study in order to characterize the participants' perceptions of the City Walk. According to the two research questions, the results are structured into a first part answering the first research question, and into a second part with answers for the second research question.

4.1. Perception of the Framing on 'Climate Justice' and Related Climate Emotions

On the cognitive level, the initial discussion was about different dimensions of climate justice and the shared perception of a lack of adequate policies on climate action between the participants. The latter resonated differently with them on the emotional level. The results from the recruitment questionnaire reveal that even though the participants assess climate action as very important beforehand, different interpretations of the term "climate justice" appeared during the initial group discussion. In the beginning, the group discussed the global impacts of climate change—possibly to establish a common set of values and mutual assurance as a basis for further discussions on the social level. Building on that common understanding, the local impacts were picked up by the participants during the City Walk.

The participants' perceptions on climate justice resonated strongly with distributive justice [1]. In particular, those who were professionally or privately involved in tackling the climate crisis emphasized the need to combine theoretical scientific knowledge with social justice in practice (P. 12, 36 and P. 11, 37) (In the following, a person's contribution in the group discussions is assigned to a page in its transcript with "(P. [no.], [page number])", or in the running text with "P. [no.] [text] ([page number])". With the capital "P" for "Participant" and given that the transcript's pages start with page 36 and are in round parentheses, they cannot be mixed up with the participant's numbers (n = 14) and the references in square parentheses. Statements from the recruitment and feedback questionnaire do not have page numbers. The discussions at the stations were not transcribed.) on both the global and local level. Only two people were not yet familiar with the term "climate justice" at all. Once again, the global dimension was mentioned first, in the form of global injustices regarding fossil fuel emissions and the resilience to extreme weather events of nations and individuals [1]:

> *"Climate change, the big picture: [. . .] There are people, especially in the Global South, who are more affected by it".* (P. 7, 39)

Furthermore, the term was connected closely to the participants' reflection on their own privileges living in Munich in the Global North, in the so-called "rich bubble" (P. 7, 39) that most people considered themselves part of. This context was stressed through comparison with a location in the Global South:

> *"The growing areas in the Global South, [...] [have] suffered greatly from the droughts. [...] We just get [...] the grain 50% more expensive. But they [meaning the people living in those areas] suffer so badly that they can no longer feed their children because [they] have no money to buy any food".* (P. 6, 39 and 40)

P. 7 emphasized in the questionnaire that "compared to the global South", the climate crisis has had less impact in Munich, which P. 12 confirmed (41). Coming to the individual [1] and local level, poverty and homelessness were cited as decisive factors for how individuals and cities deal with the consequences of the climate crisis (P. 6 and P. 10, 40; P.11, 41). Heat was already discussed here as an example, even before the associated station (P. 11 and P. 12, 41), and was also mentioned most frequently in the recruitment questionnaire. The increase in other extreme weather events, such as drought or heavy rainfall, which affect fewer people locally in a direct way, was mentioned less frequently.

The role of privileges was also discussed in terms of climate action. Here, the importance of financial resources was stressed—in relation to climate-friendly technologies such as electric vehicles (P. 14, 42), but also in relation to people's carbon footprint:

> *"Poverty is already a contribution to climate change mitigation".* (P.11, 41)

In addition, the role of justice between generations [1] (P. 1 and P. 13, 38; P. 11, 37) was addressed. Concern was expressed about "the environmental conditions we are leaving behind for future generations" [80]—thus, the sample is very much in line with the general German public (ibid.).

In summary, all three sub-aspects of distributive justice [1] were discussed by the participants in the initial discussion. All but one person agreed with the statement, "I feel the consequences of the climate crisis are socially unjust", in the recruitment questionnaire.

On the emotional level, the perceived lack of adequate policies on climate action (P. 3, 37) resonated differently with the participants' attitudes and behaviors, as the initial discussion and the recruitment questionnaire showed. Most participants talked openly about their own climate emotions and identified themselves with the climate animals.

Anger was the climate emotion most people expressed in the discussion:

> *"Nothing is happening, and politicians are not taking the steps that are urgently needed".* (P. 6, 37 and cf. P. 3, 37)

Anger was much more prevalent than fear, anxiety, or sadness. Anxiety was addressed by two participants in the context of mental health [81], especially by P. 10, who linked her depression to the difficulty of finding a personal way of dealing with the climate crisis (37). P. 13 mentioned a "psychological burden" when asked about points of contact with the climate crisis in everyday life. P. 14, on the other hand, emphasized the following: "We only have one chance. Everything else is ... fatal" (38). Two participants who are eager to engage more with the topic of climate action expressed their keen motivation to do that and their enjoyment in sharing their interest with other people (p. 14 and P. 15, 38). Others exhibited curiosity (P. 8, 37), partly out of professional interest (P. 3, 38; P. 3 and P. 5, 37). The older participants in particular expressed feelings of guilt about their own gap between problem awareness and action [18] vis-à-vis subsequent generations, which P. 13 formulated as follows:

> *"Yes, I've actually always been very apolitical. Climate change has really come into my consciousness in the last few years. I wasn't aware of the Club of Rome at all. I was still too young (. . .). I don't have any children, but I have two nephews, and I'd like them to have a world they like to live in".* (38)

In addition to guilt, anger is also closely connected to frustration about the lack of political implementation of climate action (P. 1 and P. 7, 36; P. 14, 38).

Pro-environmental behavior (PEB) [82] was mostly expressed in the group discussion through mentions of the "busy bee" climate animal (P. 2, 36; P. 12, P. 9, P. 5, and P. 6, 37) and references to climate change mitigation, while adaptation was rarely mentioned. Participants who had just started to engage with the topic (P. 8, P. 13, and P. 14) mostly discussed low-threshold measures to reduce their ecological footprint [80]. In contrast, participants who had been working or fighting for climate justice for a longer time concentrated (P. 11) on increasing their ecological handprint [80] through political commitment, their job, or conversations about the climate crisis (P. 1, P. 11, P. 9, P. 10).

In sum, participants' responses to the City Walk provided valuable insights for framing a constructive dialogue between scientific expertise and citizens, avoiding the focus on disaster narratives. The emphasis on climate justice, resulting from the collaboration with Klimaherbst (NGO), resonated strongly with participants across different levels of engagement. Discussions on injustices between nations and individuals were particularly notable among those with greater prior knowledge. The emotional emphasis on intergenerational justice has potential to inspire climate and science communication efforts, especially among older demographics. Furthermore, discussions on distributive and procedural justice (especially on lobbying and power imbalances) stimulated emotional responses. However, participants struggled to acknowledge diverse perspectives (e.g., climate-damaging behavior and lack of response to arguments on policy perfectionism).

The framing of reflections on climate crisis emotions created space for meaningful exchanges. Speakers not only presented as experts, but also shared their own climate experiences, making them more relatable to participants. Reflecting not only on personal emotions, but also on how climate feelings evolve over time, fostered mutual understanding among participants:

> *"[It] is also quite often the case that [...] at the beginning [...] you are a different animal. [...] For example, first [...] the meerkat, which is in a state of shock, first of all checks, oh, what's happening ... Then at some point you get angry and then at some point you become a busy bee".* (P. 6, 46)

On the other hand, not all climate emotions were equally shared by the participants. Some may have been uncomfortable sharing their own vulnerability associated with fear and sadness at the beginning of an event in an unfamiliar group and thus only ticked it in the recruitment questionnaire. Dealing with these feelings in relation to the climate crisis could, for example, be facilitated by the approach of looking at characters in movies or TV series and identifying with them in terms of people's own climate emotions [83].

To answer research question (1), it can be summarized that climate justice provides a helpful framing to talk about climate change, and to discuss different adaptation and mitigation measures on a local level. Addressing climate-related emotions adds an important layer to the discussion, helping bridge the gap from the global to the local level. However, the framing of climate justice and related climate emotions should be assessed as a starting point to deepen that connection.

4.2. Perceptions of the City Walk

The final discussion demonstrated that the participants had gained a differentiated understanding of the problems of climate change mitigation and adaptation during the City Walk on a local level—especially in comparison to their prior knowledge (initial discussion). Figure 2 summarizes these results, which are thoroughly discussed in the subsequent sections. Finally, the overall assessment of the format from the participants' perspective is discussed.

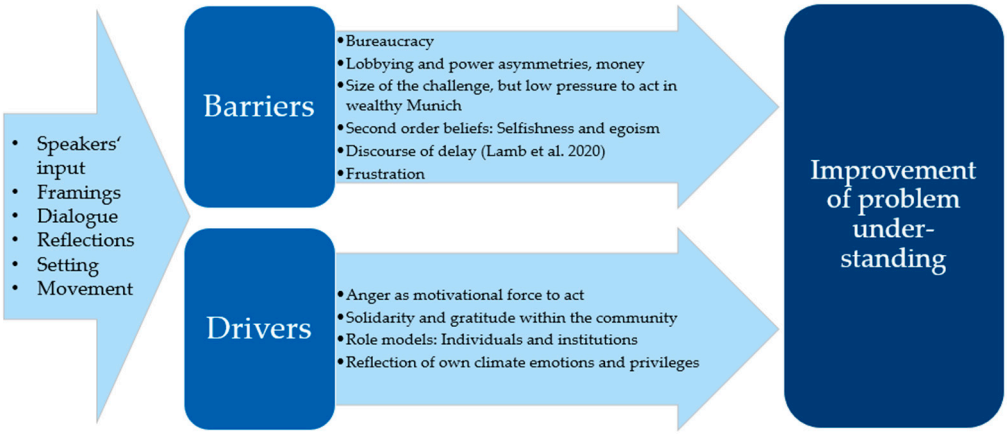

Figure 2. Own visualization structuring the key dimensions in the perception of the participants (reflecting the discourse of delay [84]).

4.2.1. Barriers

The speakers' input confronted the participants with the urgency of action at the local level and at the same time with the solutions that are actually on the table. Many of the participants responded with a reflection on the reasons for this contradiction. Bureaucratic hurdles and power imbalances, exemplified by a lawsuit initiated by a single person (against plans for a green 'super block' in a Munich neighborhood conceptualized as a living lab [64]), were noted. One participant criticized the influence of money, observing that "*money rules the world*". (P. 2, 45). Another expressed frustration, emphasizing that climate action is a marathon, not a sprint, and invoking the "slow turtle" climate animal [68]. The wealth of Munich and its resulting complacency emerged as a barrier, with some feeling that the city does not act, due to its affluence. However, others argued that many believe it is someone else's problem. This divergence highlights second-order beliefs about climate awareness.

Participants recognized the challenge of aligning others' attitudes with climate action, which was described by one participant as "like wading through treacle *to somehow get people on board with you*". (P. 9, 46). Discussing policy perfectionism, one participant stressed the need for global cooperation, noting that efforts in one country may be futile without global participation (P. 4, 38). Referring to the inaction of other countries, this statement of P. 4 supports the findings from Taddicken et al. [85], where German citizens rated climate change awareness in their own nation as being much higher than in the US and China (ibid.). Furthermore, participants described the selfishness and egoism (P. 5, 45; P. 6, 46; P. 1, 40; P. 10, 41; P. 14, 42) of others (e.g., frequent flyers), perceiving it as a barrier to climate action.

4.2.2. Drivers

Conversely, the anger aroused by some of the aforementioned barriers, as referenced by the "angry gorilla" [51] (P. 4, 45; P. 2, 46; P. 11, 47), can also be constructive. Opportunities for action highlighted by the event (P. 14, 38, feedback questionnaire) or a sense of solidarity resulting from distinguishing oneself through actions (41 and 42) can help "channel it [anger] into action" (P. 6, 46). Gratitude was also expressed for the organization of the event, the moderator, the speakers, and the interest shown by people with varying levels of prior knowledge (P. 5, 44; P. 10 and P. 9, 45; P. 6, 46; P. 7, 46; P. 3 and P. 8, 47; P. 13 in the feedback questionnaire). Role models, such as dedicated individuals (P. 10 and P. 9, 45; P. 11, 46), or institutions like those represented by the speakers and Klimaherbst (P. 7 and P. 11, 46), can also contribute to change. Another driver mentioned was reflecting on one's own climate emotions and privileges (see Section 3.2).

Some participants emphasized in the final discussion that their climate stance had not changed, while others reflected on the evolution of their own climate feelings in the context of political and social engagement, indicating a "change of consciousness" (P. 6, 46). However, this process takes time and cannot be substituted by a three-hour experience like a City Walk (P. 6, 46). Nevertheless, the latter can broaden horizons by enabling a change of perspective and dialogue (P. 4, feedback questionnaire) for participants like P. 4, who had indicated limited prior knowledge in the recruitment questionnaire: "It would actually be so easy to change something, but then it is somehow made so difficult" (P. 4, 44).

4.2.3. Strength of the Format from the Perspectives of Participants

The feedback questionnaire sent out by the practitioners (Klimaherbst) showed that the participants rated the event as very good, especially the design of the knowledge transfer and the exchange with others. The "interactivity" (P. 11) and the instructive and multi-faceted design were perceived to have made the event accessible and easy to understand for non-specialists (P. 7). P. 8 mentioned the learning location of the neighborhood in the feedback questionnaire, summarizing the strengths of the format ("No boring, dull lecture—but discussions and interesting conversations outdoors").

Revealing the connections of extreme weather events like flooding and heat to people's daily lives can be perceived as an unexpected, irritating disruption [45] and reduced the psychological distance participants felt toward the climate crisis [86].

By connecting local stakeholders and members of civil society with an interest in the topic, the City Walk brought together groups outside the academic world to discuss the practical topic of local climate change adaptation. The speakers' strength consisted of telling stories about barriers and successes from the field and providing scientific information in that context. Their knowledge on the factual level stems from their scientific background but is applied through their field of work in local practices. Combining this knowledge with the participants' personal experiences with extreme weather events in Germany makes it relatable and more tangible and thus a good basis for dialogue.

Without the speakers' input and the ensuing discussions, some of the participants would not have had an opinion on local climate adaptation, due to a lack of awareness and/or knowledge about the topic compared to climate change in general. On a very

small scale, sending the statement below to the City of Munich added another stakeholder, expanding the transdisciplinarity.

In terms of empowerment to act [46], the event "can be a contribution" (P. 5, 45) to what needs to be done (ibid.). P. 13 specified in the feedback questionnaire that she felt "encouraged [...] [to] keep at it and remain active in [...] [her] environment". By showing them places, ways, and institutions where and through which they can get involved, the participants can perceive themselves as actors at the local level. Going beyond reducing their own personal footprint by getting active politically in any way can be the second step. But first, they need to overcome the demarcation of others as being the active persons, the role models, but not them personally (P. 9, 46; P. 2, 36) [87,88]. Exchanging thoughts and feelings with other participants on their engagement, and seeing their struggles, including on the level of mental health (P. 10), could encourage participants who are not involved that deeply to engage more and empower them to act [46]. At the same time, it can strengthen the resilience of those active, as P. 11 stresses: "For me, it's always very, very good to be at such events" (P. 11, 46). To summarize, the setup of the City Walk in the participants' neighborhood in combination with the speakers' input enabled transdisciplinary dialogue-oriented science communication.

5. Critical Discussion

The results set out above suggest opportunities for this City Walk and similar approaches in other settings. The main limitation of the employed empirical methodology and the respective exemplary case (City Walk in Munich) is the small sample size [76], meaning that only two group discussions were conducted for a single target group in the affluent city of Munich in the Global North. This decreases the potential for the results' transferability to other contexts [75]. To address this methodological weakness, City Walks could be implemented and studied in diverse cultural and social contexts, aiming for a broader and diversified sample. Additionally, quantitative surveys based on this study's explorative findings could test to what extent the results are generalizable. Individual qualitative interviews could analyze changes in the experts' perceptions and the format's pitfalls and benefits.

In the case of the City Walk showcased here, the NGO "Klimaherbst" helped formulate participants' opinions into demands to the City of Munich. Klimaherbst summarized them as follows:

> *"Munich must fulfil its responsibility as a rich city and support poor people in the city with climate adaptation!".* [60]

The statement was passed on to the City of Munich and communicated to the participants in a follow-up email. The City Walk gave them the opportunity to have their voice heard on the issue of local, just climate change adaptation. This process highlights benefits of the transdisciplinary approach of combining the event of a City Walk with academic research. Yavo-Ayalon et al., for instance, created a "draft of a community resiliency plan based on the creative ideas and strategies discussed by the community" [39], which was passed on to the participants and local authorities as a way of kicking off a formal community resiliency plan.

Regarding climate emotions and their significance for people's ecological footprint and handprint, many other aspects would be of additional academic interest, such as the scientific validation and further development of the climate animals or a typification [89] of different phases of climate awareness based on the "five German states of the climate crisis" [90]. Building on knowledge, attitude, and action in each phase, type-specific measures for climate communication and ESD could be developed. Further analysis could be carried out on the motivating function of role models (for example, in relation to avoiding air travel [91]), and on how positive emotions like gratitude (P. 10 and P. 13, 46) can mitigate negative climate emotions [34] and climate anxiety (P. 13, recruitment questionnaire and P. 10, 37).

Especially for people who have been working intensively on the overburdening of planetary boundaries for a long time, either professionally, such as P. 3, P. 5, P. 6, P. 7, and P. 11, or in their political commitment like P. 1 and P. 10, engagement in the current highly emotional discourse can be "very, very exhausting" (P. 6, 46). Referring to SDG 5 (Health and wellbeing), it therefore makes sense to invest in the mental health of climate-active and climate-interested people.

Despite their limitations, the results of this study are consequently relevant to both academia and the stakeholders of climate and science communication and ESD. This study also suggests opportunities for adapting the format to neighboring framings and issues (such as food, transportation, and consumption) and for upscaling the format. The training of climate scientists as science communicators would also be desirable. Additionally, regional multipliers and scientifically informed experts (such as the speakers in this walk) could provide very valuable (knowledge) resources. Moreover, offering the event to employees as in the Climate Puzzle [92] or in different languages could also help attract people from more diverse cultural backgrounds.

6. Conclusions

This study uses a qualitative focus group discussion to generate exploratory results in a newly developed format for climate communication and education. The framing of a dialogue on different aspects of climate justice [1] helped all the actors involved—NGOs, scientists, experts from local stakeholders, and participants—to share their climate emotions [27] on topics such as intergenerational justice. In contrast to the paralyzing disaster framing [10]—often characteristic of expert explanations—the climate emotions of anger, hope, joy, and gratitude were strengthened in some participants through the event.

In summary, the setup of the City Walk in the participants' neighborhood in combination with the experts' involvement enabled transdisciplinary dialogue-oriented science communication. The results resemble those of Yavo-Ayalon et al. [39], who found a closer connectedness through feelings in the participants who had gained awareness about the here and now of the climate crisis and its relationship to their community. Thus, "bringing climate change closer to home" (ibid.), to "the doorstep" [59] of people's familiar neighborhood, can be the irritating disruption necessary for transformation [45].

The crucial point is not whether the shift from climate change being a general topic to a personal one is supported by virtual reality [39], local experts, or other creative learning environments and climate communication formats: that it occurs is more important than the how of the disruption. As such, the journey may vary; it is the destination that we should focus on.

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Data Availability Statement: Data are available in a publicly accessible repository. The data presented in this study are openly available in OSF (https://osf.io/6shmy/?view_only=3c9bb07eb3bb46c8a8cdbca598df6310, accessed on 14 March 2024) at https://doi.org/10.17605/OSF.IO/6SHMY.

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Appendix A

The following documents will be available online on ORCID OFS (https://osf.io/6shmy/?view_only=3c9bb07eb3bb46c8a8cdbca598df6310 with https://doi.org/10.17605/OSF.IO/6SHMY) to download:

- German transcript of the group discussions;
- Pictures and English description of the climate animals;
- German discussion guide;
- German schedule of the City Walk;
- Detailed information on the City Walk and the questionnaires in English;
- German recruitment questionnaire;
- German feedback questionnaire from Klimaherbst.

Table A1. The participants' demographic background: age, gender, education, first language, and place of residence.

Age	18–25	26–40	41–65	Over 65	Missing
Gender	1 Female	6 Male	3 Other	2 -	2
Formal education	7 High school degree	3 Vocational training	0 University degree	-	4
First language	2 German	3 -	8 -	-	1
Place of residence	11 Untergiesing-Harlaching	Adjacent neighborhoods	Bavaria	-	3
	4	5	4		1

Table A2. Contextual information on the participants.

ID	Gender	Level of Professional and Personal Involvement	Initial Animal Selected	Final Animal Selected	Other Relevant Attributes
1	Female	Protests (Extinction Rebellion), sustainable consumption	Mixture		Retired, left after Station 1
2	Missing	Sustainable consumption, protests	Slow turtle and angry gorilla	Slow turtle and angry gorilla	
3	Female	Works for a climate NGO, sustainable consumption, volunteering as a (sustainable) City Walk guide	Angry gorilla	Busy bee	
4	Male	None	Shocked meerkat	Angry gorilla and shocked meerkat	
5	Male	Speaker from the local water management office, sustainable consumption	Busy bee	Angry gorilla	
6	Female	Speaker from the Greening Office (Green City)	Busy bee and angry gorilla	Busy bee and angry gorilla	
7	Missing	Works in solar energy, studies engineering ecology	Angry gorilla	Angry gorilla	
8	Missing	None	Busy bee	Busy bee	

Table A2. *Cont.*

ID	Gender	Level of Professional and Personal Involvement	Initial Animal Selected	Final Animal Selected	Other Relevant Attributes
9	Male	Works in the automotive industry, sustainable consumption, protests (Fridays For Future)	Slow turtle	Slow turtle	
10	Female	Protests (Fridays For Future), Health For Future, food bank, sustainable consumption	Startled chicken	Mixture	Sees her depression as connected to the climate crisis
11	Missing	Works for an environmental NGO in ESD, activism	Angry gorilla	Angry gorilla, but happier	
12	Female	Studies engineering ecology, sustainable consumption, protests	Shocked meerkat		Mentions psychological (climate) stress, left after Station 2
13	Female	Sustainable consumption, protests	Busy bee		Left after Station 2
14	Female	Sustainable consumption	Busy bee		Left after Station 2

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