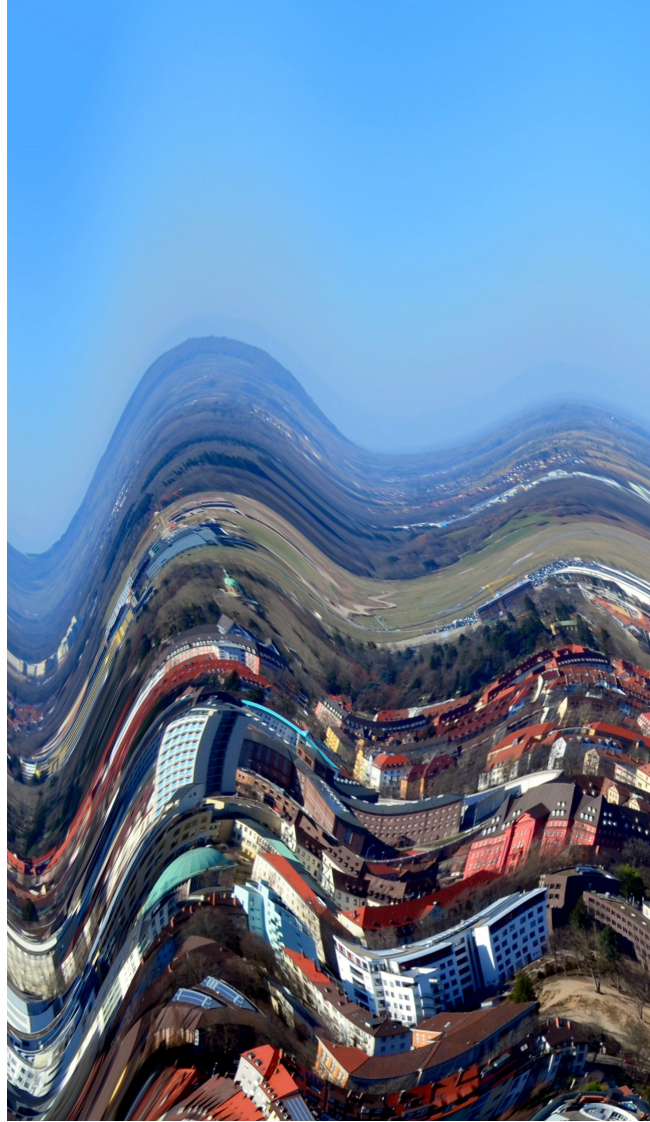


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# Shifting perspectives The role of communication in climate transformation



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# Abstract

**Keywords:**

Climate communication, transformation, mobility, transdisciplinary research, social design

The growing urgency of climate change mitigation puts policymakers under pressure, as current efforts increasingly target everyday life in Germany. Climate change communication has become an increasingly important field of study and practice over the past decades. This thesis takes stock of environmental psychology, communication science, social science, and political science literature by integrating the design perspective as a practical standpoint. The aim is to introduce a new component to recent scholarship discussions. With the focus on two specific measures, the electrification of vehicles and speed limit within Germany, the context is being set, and empirical data from other studies are integrated into the discussions. Contrary to the demanded interdisciplinary research, broadening it into transdisciplinary research helped gain new insights into the complex societal challenges faced in climate change communication. By focusing on measures that may have a substantial impact on the mobility transformation, it was possible to contextualize the research and provide actionable knowledge by incorporating qualitative practices, such as artifacts, co-elaboration workshops, and interviews, to inform the first climate communication principles. Afterward, the principles created served as a basis for further practice-based research, such as observing a climate district, facilitating a conference workshop, or collaborating on a museum installation, supporting the path toward researching a more systemic approach to communicating climate measures. As a result, climate communication may focus more on building resilience and sustainable acceptance than on short-term effects. This may require time and the use of alternative practices to further establish the positioning of design, which may help fill this gap.

# Affidati

I hereby solemnly declare that I have independently prepared this final year thesis. Ideas directly or indirectly taken from outside sources are indicated as such. While writing the thesis, DeepL was used to translate texts, and Grammarly to optimize the writing. The work has not previously been presented to another examination authority nor otherwise published in the same or similar form.

*Lennart Schiffers*

Lucerne, 04. June 2026

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The MAD coaching and discussions with fellow students and the faculty, which extended beyond the format, helped diversify knowledge and enabled faculty members and peers to discuss the research topic from new perspectives. Furthermore, I would like to thank all participants who took the time to participate in the interviews and the workshop, supporting the creation of actionable knowledge for the thesis.

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# Introduction

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# Introduction

Climate change is considered one of the main challenges of the 21st century. There is now a consensus across most of society that we, as humans, are the primary cause. To curb the steady worsening of climate change, the Paris Agreement was adopted in 2015 (The Paris Agreement | UNFCCC, n.d.). The agreement's primary goal is to keep global warming below 2°C and, in the best case, 1.5°C. To achieve this, countries such as Germany have decided to become climate-neutral by 2045 (Klimaschutz, n.d.).

Researchers have focused on communicating climate change over the past few decades (Ballantyne, 2016; Moser, 2010; Trümper & Beck, 2021). The existence of a knowledge-action gap, which is the phenomenon that merely communicating scientific information often does not lead to direct action, is now recognized across climate communication literature (Boon-Falleur et al., 2022; Trümper & Beck, 2021). As a result of these findings, a consensus has emerged that emotions play a role in the perception of information (Leuser & Weiss, 2020; Rey, 2024). Furthermore, a targeted approach that focuses on the social groups and addresses their values, norms, and

attitudes is of great importance in communication (Kruse, 2024; Tschötschel et al., 2021). Transformative research approaches within climate communication are slowly emerging that value interdisciplinary work to address complex, interrelated challenges (Trümper & Beck, 2021). In recent years, there have also been louder calls from the scientific community for greater consideration towards social justice to increase behavioral change and acceptance of new laws (Huber et al., 2020; Maestre-Andrés et al., 2019).

Despite these findings, applying them remains challenging. Germany is still lagging behind its interim 2030 targets of 65% savings compared to 1990 in the buildings and transport sectors (Förster et al., 2025, p. 32). Those sectors intersect directly with everyday life. Consequently, they will need widespread societal acceptance of their measures to achieve the transformation to lower greenhouse gas (GHG) emissions in those sectors. As a result, a communication that includes all social groups and understands and acts within the social context will be necessary (Ballantyne, 2016). In 2023, the Gebäudeenergiegesetz (GEG) also provides a fundamental example of how poor communication can undermine the intended target for reducing emissions from heating systems (Braungardt et al., 2024; Jost et al., 2024). In the end, the failed regulation, along with decreased trust in the government, was partly due to a major factor: communication (Jost et al., 2024). The assumption is that one major factor is that the exclusion of marginalized groups, such as low-income groups, leads to a degrading trust in the governmental entities and their efforts. As a result, the German government is under more pressure than ever to find new solutions.

There is growing awareness of climate change theories and models for addressing these challenges. To strengthen climate measures and actions, institutions first form climate districts and citizens councils. However, there is still a broader lack of transformative, actionable approaches to increase acceptance of climate change mitigation measures. Research that directly engages with potential measures for climate change mitigation remains rare. In sum, the government needs them more than ever to use alternative pathways to address this challenge.

# Motivation

The motivation to pursue the master's thesis topic arose from observing recent challenges in climate communication in Germany. The final push came from the GEG, which was failing, and highlighted the ministries' ineffectiveness in communicating the planned measures. Furthermore, there was a continued interest in viewing the topic itself from a design perspective, as designers could introduce new creative practices to the field. Therefore, the perspective taken in this thesis is normative and supports the need for further measures.

The thesis differs from my previous profession as a product designer. There, the primary focus was on creating "delightful" experiences for the "user." With this shift in direction towards a focus on change for a better society, the aim is to pave the way for future contributions that consider the environmental and social context and contribute to climate change mitigation.

**Figure 1**  
Prototyping exhibition  
in January 2026 (Lennart  
Schiffers 2026). Note.  
Showcasing the current  
research standing and  
gathering feedback.



# Research question and thesis outline

The introduction states that communicating climate change measures has become a crucial factor in the policy-making process. Ministries need to be able to address the increasing complexity and interdependencies of the issues they face. Therefore, during the research, the following hypothesis has been developed: The better policymakers communicate climate change mitigation measures, the higher the acceptance of those measures will be. Further, when policymakers integrate insights from communication science, media science, political science, and environmental psychology with practical knowledge from the design domain, the communication will lead to a greater acceptance of climate change mitigation measures across society. With the hypotheses in mind, my master's thesis will address the following research question:

**“What strategies can policymakers use to communicate climate change mitigation measures to the public to better progress towards the net-zero goal of 2045?”**

To examine this, the thesis is structured into five chapters. The first chapter discusses the contextual background of the case. Starting with the GEG, the chapter will outline the difficulties policymakers have faced with communicating and implementing the measure. The outline is based on analyzing recent studies on media involvement and the influence of the emotional tone of the debate on its acceptance. Afterward, by using two potential measures: the speed limit and the electrification of vehicles, the chapter outlines the challenges of the transportation sector. Surveys will help to understand the current acceptance.

In the second chapter, the thesis will explore the relevance of environmental psychology to understanding social dynamics and underlying psychological factors in communication. The two cases, speed limit and electrification of cars, will be related here to utilize the gathered knowledge. This chapter aims to support design knowledge by fostering greater awareness of how artifacts can support behavioral change. Afterwards the chapter will shift the focus to social and ecological justice. It will outline the existing imbalances and identify measures within the government to mitigate GHG emissions. For instance, subsidies have been a key focus, predominantly benefiting wealthy individuals. Therefore, the importance of ethical considerations, including social justice, will be outlined, and this will be demonstrated through the first examples: the Citizens' Councils of the government and a prototype for future direction.

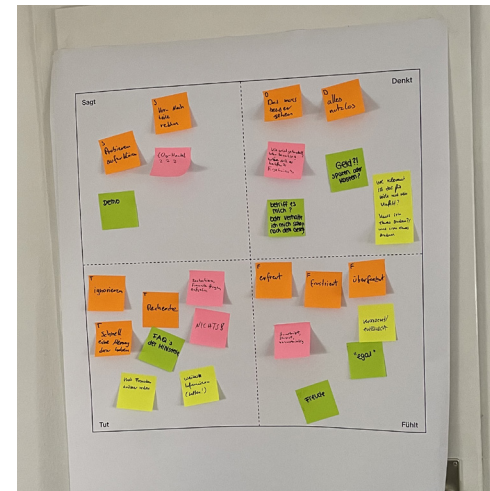
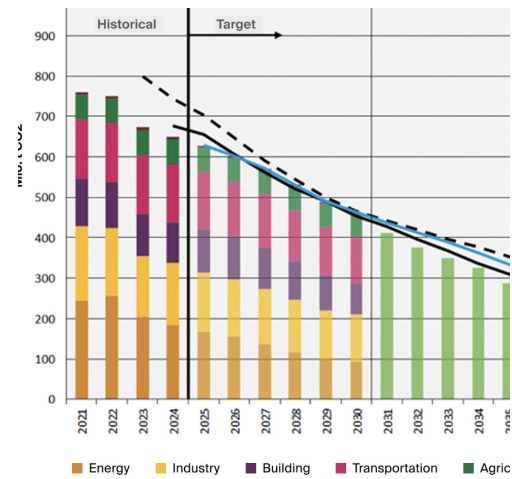
The fourth chapter outlines different messaging patterns. The focus will be here on framing techniques. Misinformation and the relevance of prebunking and debunking will be examined and related to state-of-the-art examples and proposals.

The fifth chapter focuses on design artifacts and their process to strengthen the proposed systematic communication approach. The chapter will discuss artifacts developed through and for the previous research of the research and design thesis. As a foundation, the Climate Communication Principles are first outlined. Afterward, the chapter will outline observations from the climate district Zähringen in Freiburg im Breisgau, a facilitated workshop at the Environmental Observation Conference on AI and

Social Justice, and observations from a Seminar for Youth Climate Action of the European Council. To further bring the principles into practice, a Climate communication chatbot based on the principles will be outlined. Lastly, an essay and a chatbot's perspective from a mountain's view will outline how they might support the inclusion of a more-than-human lens in climate communication.

The last chapter will then lead to the discussion of the findings. It enables reflection on the thesis and highlights its relevance, as well as the limitations encountered in conducting the study. To provide policymakers with tangible, real-world outcomes for their practice and further validate the research thesis's findings. Lastly, the process and its outcomes will be reflected in an additional view of the role as a designer within an interdisciplinary field.

**Figure 2**  
Projected development of the GHG emissions in Germany between 2021 and 2035. Note. Adapted from Wehnemann et al. (2025, p. 11).



**Figure 3**  
Workshop Co-elaborating the perception of environmental regulations (Lennart Schiffrs 2025). Note. The left figure shows results of the perception and behaviour mapping.



**Figure 5**  
Multiplier workshop in the climate district Zähring Freiburg im Breisgau (Stadt Freiburg 2026). Note. Within the workshop, I took an observational and supporting role. The organization and facilitation were done by AllWeDo and Haus des Engagements.



**Figure 4**  
Debunking artifact of the potential saving of an electric vehicle (Adobe Mockup).

# Methodology

The thesis is situated in a complex social setting, as the values, norms, and attitudes associated with the mobility transformation differ among German society. As a result, policymakers should engage in communication and interaction with the entire German society. Therefore, the research uses a mixed-methods research methodology. This approach means that throughout the process of gathering insights, the research employs a pluralistic, qualitative, and quantitative stance. Quantitative research is beneficial in the context of climate communication, as it helps to understand societal sentiment and study its trends. Here, it was required to use recent and representative studies. Consequently, to offset the weaknesses of the secondary data, qualitative research was employed by conducting interviews with experts from the field and everyday life. Further, insights were enriched and supplemented by a co-elaboration workshop and the first artifacts, such as a debunking approach. Within the research to analyze different strategies for policymakers, a subsequent approach was chosen where one method informs the other, and also determines the subsequent method to adapt as best as possible to the

changing circumstances in the context in which the research is situated. It will help to provide a different perspective and enable us to understand the underlying phenomena of the research goal.

## **Desk research**

Throughout the research process, the thesis employs desk research. For that, an extensive literature review of the following fields was conducted: (1) The problem of climate communication in the media was first analyzed using the GEG as a case study. A recent backlash against the implementation of the GEG in 2023 revealed valuable insights into miscommunication. (2) For climate change communication theory, the research investigated a broader field of models. Followed by in-depth research into environmental psychology to understand how values, norms, and attitudes influence people's behavior and perception, and further how emotions will help in the communication to foster actionable knowledge. (3) The researchers' demands for ecological and social justice called for an in-depth analysis of the problems and identification of possible levers. Therefore, case studies were compared, thereby underlining implications and highlighting similarities with the co-elaboration workshop. (4) Misinformation and different techniques to prevent it were later compared and analyzed based on the findings from the two potential regulations. When new knowledge from other fields provided new insights and perspectives in research domains, the domains expanded to incorporate the acquired knowledge.

## **Surveys**

To illustrate the acceptance and sentiment towards climate change mitigation and its measures, it was necessary to take into account various surveys. The thesis uses data from existing representative studies. Therefore, it was necessary to take the limitations of their approach into consideration. The following surveys were selected for this study to identify levers for policymakers in their climate change mitigation communication strategies: The Ipsos (2025) survey, because it analyzes the general sentiment towards climate change. To understand the landscape of

the GEG, two studies were used (Braungardt et al., 2024; Jost et al., 2024). Furthermore, the Forsa study (Andor et al., 2024), due to its comprehensive questionnaire, outlines potential measures for transforming the transportation sector.

### **Interviews**

Seven semi-structured interviews were conducted during the thesis to validate findings from the literature review and gather in-depth insights from domain experts. The interview duration ranged from 30 to 120 minutes, and the interviewees were from the industry, governmental, and academic institutions. The goal of using interviews was to supplement desk research with in-depth insights and to navigate within new areas. Therefore, the questionnaires were based on findings from the literature review and adjusted throughout the interviews. In Appendix x-x, the interview questionnaires are available.

Because of the two different interview focuses, only four transcripts are available. The transcribed interviews aimed to gain in-depth insights into the EnergieSchweiz case study (LadenPunkt, 2025), the KEA-BW communication guideline (Mathias Schmid, 2023), the Communications Department of the Ministry of Transportation, and the work experience of the "Geschäftsstelle der Nachhaltigkeitsstrategie Baden-Württemberg" ("Office of the Baden-Württemberg Sustainability Strategy"). Each interview generated detailed notes. A summary of each interview followed, to discuss them within the thesis and inform later methods, such as further interviews, desk research, and the use of systemic mapping to synthesize.

### **Co-elaboration**

Two co-elaboration workshops were facilitated. The first workshop was used to expand the knowledge of environmental communication. This was achieved by discussing and mapping with experts from everyday life the factors that contribute to successful communication. The second workshop was held on the 18th of November at the Environmental Observation Conference in Bern. Conference attendees from the environmental field elaborated together on how marginalized groups, such as segments with lower income,

can be included in the discussion of the combustion engine ban. As a result, the workshops informed the research by opening new areas of study and validating previous findings.

### **Mapping**

Mapping methods were used throughout the process to consolidate findings and reinterpreted them to contribute to the research goal. Models such as the multi-capital, rich context, and causal loop mapping were employed to understand the dynamics of the electric vehicles and their adoption (Jones & Ael, 2023). When incorporating the social context into the mapping, it will help to map complex societal problems without oversimplifying the findings. The approach is important and planned to be used in future interviews or workshops to discuss and reiterate in an elaborate process those mappings.

### **Observations**

The observation method (see: Schöne, 2005) was primarily used to observe the climate district Zähringen in Freiburg im Breisgau (Unser Klimaquartier, n.d.) between January 2026 and May 2026, the Seminar on climate action and youth information in November 2025 (Alves, 2025), and the Workshop on AI & Social justice in November 2025.

Within the five months, observations included the Jour fixes and climate communication-related meetings. Further three of their workshops are the Multiplikator\*innen-Workshop (Multiplier Workshop) (Diekmannshenke, 2026a), Visions- und Aktionswerkstatt (Vision and Action Workshop) (Diekmannshenke, 2026b), and Aktionsgruppen-Treffen (Action groups meeting). During the observation, different methods were used, including participant observation and overt observation. Based on the setting, the method was chosen and, if necessary, dynamically adjusted. The inner perspectives from the internal meetings, but the remaining distanced view, helped gather valuable insights (Schöne, 2005, p. 188). The goal of the observation was to understand how local citizens currently move towards action and what necessary steps may be needed in future formats.

The observations were primarily documented as field notes or photographs. For that, (1) background information of the events, (2) the structure of the observation, (3) the influence and role of facilitators, (4) the overall atmosphere, and (5) behavioral insights were noted down. Depending on the situation, notes were taken directly during the event to avoid distortion due to memory lapses (Schöne, 2005, p. 190). This documentation and its insights may help inform future formats and also serve as a discussion point for observations on the current state of research.

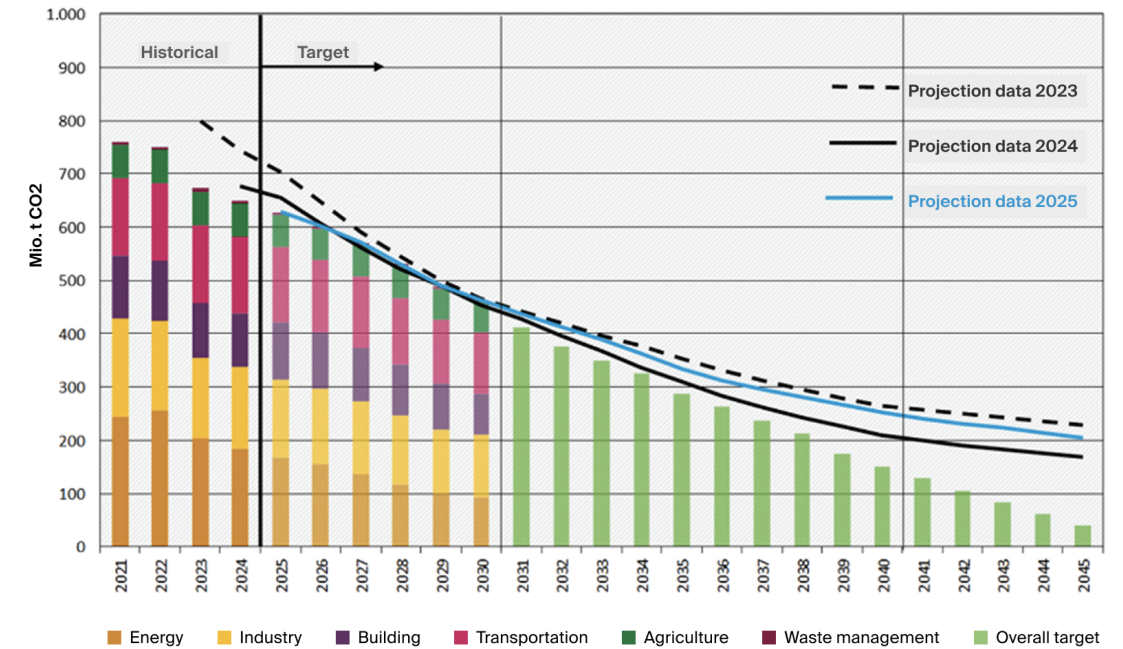
# Contextual analysis

- p. 28 **Germany's climate change mitigation status quo**
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# Germany's climate change mitigation status quo

Climate change is one of the most pressing issues at this time. GHG emissions are one of the main drivers of global warming. In the efforts of climate change mitigation, Germany has set its goal to cut its GHG emissions step by step and reach net-zero by 2045. The goal of the European Union is to reach net-zero by 2050, which means Germany aims to achieve net-zero 5 years prior (Klimaschutz, n.d.).

To achieve Germany's ambitious and long-term goal, the German government sets interim milestones to mitigate its GHG emissions. The GHG progress is reported annually in an extensive report, Greenhouse Gas Projections 2025 for Germany (Förster et al., 2025), and a compact version is also available (Wehnemann et al., 2025). Therefore, for the GHG emission data references of Germany in this thesis, both reports will be used. The interim goals of the German government serve to approach the overall goal of reaching net-zero by 2045 in a more tangible way. For this, the reduction must reach 65% by 2030, and by 2040, it is meant to be 88% compared to the GHG emissions from 1990, which were 1252.4 million tons (Förster et al., 2025, p. 32).

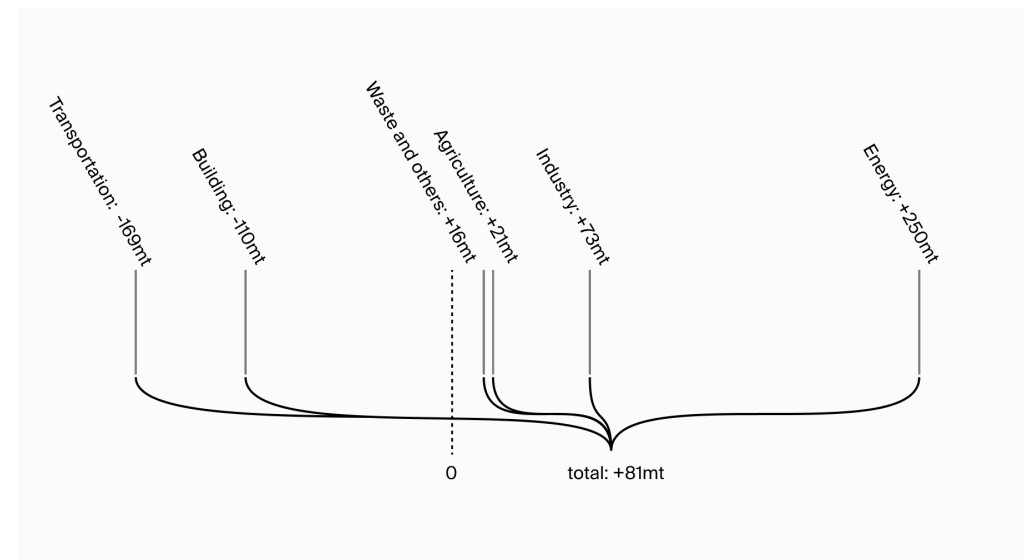


**Figure 6**  
Projected development of the GHG emissions in Germany between 2021 and 2045.  
Note. Adapted from Wehnemann et al. (2025, p. 11).

These targets had to be covered across all six defined sectors (see Figure 6). However, in 2024, these sectoral targets were then redefined as a collective goal across all sectors (Neues Klimaschutzgesetz ist in Kraft | Bundesregierung, 2024). As seen in Figure 7, the sectors, including Energy, Industry, Agriculture, and Waste and others, have between 2021 and 2030 a projected total cumulative GHG emissions of 360 million tons above their target. To the “Energiewende” (“energy transition”) and its high stake in renewable energy (Die Energiewende in Deutschland, 2025), as well as the fading out of coal-generated energy by 2038 (Bundesnetzagentur - Kohleausstieg, n.d.), most of the success in these sectors can be attributed to. The two sectors, the building and transportation sectors, as shown in Figure 7, are projected to be significantly behind their cumulative targets. As the building sector is predicted to miss its cumulative goal between 2021 and 2030 by 110 million tons (Förster et al., 2025, p. 33), and the transportation sector by 169 million tons (Förster et al., 2025, p. 34). This new calculation, which combines all sectors, makes

the next interim goal more realistic, as the predictions in the Treibhausgas-Projektionen 2025 report (Wehnemann et al., 2025, p. 12) show that GHG mitigation will be a cumulative 81 million tons above the target of a maximum of 7012 tons. However, it also moves the issue and puts even more pressure on finding ways to mitigate emissions in the future. As the government may now address mitigation in lagging sectors in incremental steps, due to the new calculation, the overall goal remains achievable. By addressing mitigation in smaller steps, it will put pressure on future measures, as policymakers will then have to implement these measures within a shorter timeframe. However, a transformation may require time, especially when it intersects with everyday life. Since the building and transportation sectors directly impact daily routines, fast changes might be challenging. The building blocks (Umweltbundesamt, 2025) described in the “Transportation sector” chapter and visualized in Figure 8 outline potential measures for the transportation sector, including a ban on combustion engines for vehicles and adjusted speed limits. As a result, the building blocks are tied to societal behaviors, making further progress dependent on both policy innovation and public acceptance. In the following subchapters, the current efforts to reduce the GHG emissions and implications from the two key sectors, building and transportation, will be outlined.

**Figure 7**  
Sectors and overall target achievement/short-fall according to projection data for 2025 (2021-2030).  
Note. Adapted from Wehnemann et al. (2025, p. 12)



# Building sector

The primary driver of GHG emissions in the building sector in Germany is fossil fuel use within the buildings. Their heating systems play a substantial role. In 2023, around 72% of heating systems relied on fossil fuel (Bundesverband der Energie- und Wasserwirtschaft e.V., 2023). On average, these systems last for around 15 to 25 years. The long lifespan of a heating system necessitates a long-term view and urgent action. The government therefore conceptualized and implemented new measures, the Gebäudeenergiegesetz (GEG) and Bundesförderung für effiziente Gebäude (BEG). The GEG now requires new heating systems to use at least 65% renewable energy, with this percentage increasing over the years to ensure emissions-free systems by 2045. As a result, these measures aim to reduce the current 110 million tons to 68 million tons by 2030 (Förster et al., 2025), with the GEG projected to save 12 million tons and the BEG 15 million tons. However, the report anticipates that we will see most of the effects of the implementation after 2030 because the existing systems will gradually fade out.

Within the regulatory process of the GEG, not everything went as planned, and this provides lessons for further regulations across sectors. In February 2023, the largest tabloid newspaper in Germany, Bild, leaked the first draft of the GEG novella. It set the first frame in the later debates with the headline “Schon ab 2024 – Habeck will Öl- und Gasheizungen verbieten” (“As early as 2024 - Habeck wants to ban oil and gas heating systems”) (Habeck will Öl- und Gas-Heizungen verbieten, 2023). The article built up the urgency and misinterpreted the regulation by framing it to forbid fossil-fueled heating systems in general by 2024. By making Robert Habeck the focal point in the debates, it seems that the Bild tabloid aimed to divide society and oppose the politicians against whom they had already been running a campaign in the past few months, as the analysis of Fink (2023) suggests. The negative framing from the leak was also present in other articles later.

Other media outlets quickly picked up the topic, and the coverage reached its peak in June 2023 with around 8000 articles that could be found in the Wiso database by the Öko-Institut (Braungardt et al., 2024). The tabloid Bild was using “Heizungshammer” (“Heatinghammer”) and “Heizungsverbot” (“Heatingban”) as strong rhetorical means in their news headlines. The word “hammer” appeared in 103 articles, with 32 of them featured in the headlines. Outside of the Bild, the Braungardt et al. (2024) study identified the term “Heizungshammer” (Heatinghammer) almost 700 times, and the term “Heizungsverbot” (“Heatingban”) even 760 times. Misleading narratives were primarily found in the study by media outlets positioned in the tabloid, far-right, and far-left spectrums (Jost et al., 2024). These ranged, according to the study, from high costs for the heating system to ideological opposition.

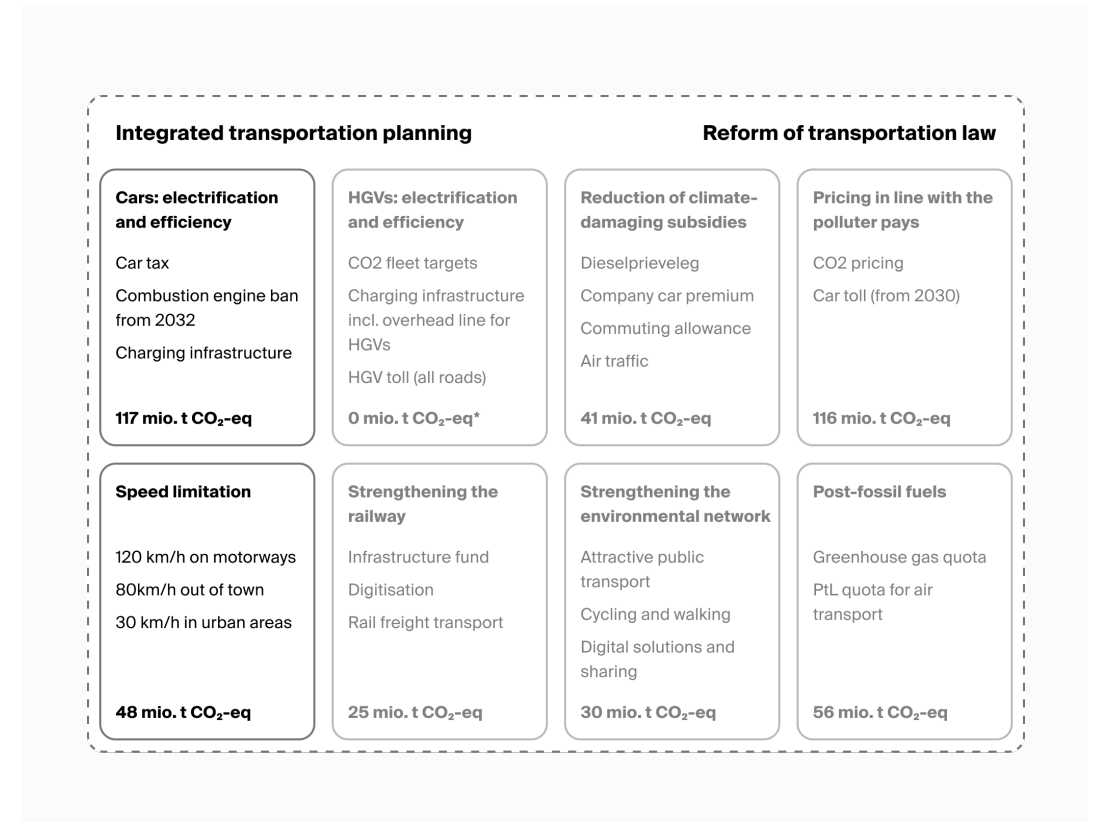
These findings could also be confirmed by a second study (Jost et al., 2024), which analyzed around 2000 articles from local to national media outlets, considering all spectrums and ranging from the Bild to the Frankfurter Allgemeine Zeitung. It analyzed in-depth the content of the filtered articles. The analysis of Jost et al. (2024) demonstrated that the lack of acceptance and communication was the

main negative picture expressed by the newspapers. However, misleading articles from Bild were the most shared ones, and were most present at the start of the media coverage of the GEG debate. Therefore, it still looked like the misleading articles would dominate the reporting about the regulation itself. Due to the negative media coverage across all spectrums, policymakers faced increasing pressure. As a result, until the adoption of the new regulation, the measure was weakened (for a timeline of the revision see Braungardt et al. (2024), p. 237). A reason might be that the government and its leading ministry underestimated the power of communication and the initial acceptance (Jost et al., 2024). As in 2021, studies were already indicating that only 30 percent of society would support the now-proposed installation ban of fossil fuel-powered heating systems (Manuel Frondel et al., 2022). These data should have been a warning signal to the government and its responsible ministry. Given the low acceptance of the transition away from fossil fuels, the government should have considered communication strategies to raise the support. The cost of the heating systems and their resulting injustice towards low-income households were major points (Jost et al., 2024). These issues could have been addressed through targeted subsidies for low-income individuals, as well as by clearly communicating when a heating system needs replacement and visualizing the long-term costs.

The difficulties in implementing the GEG as initially planned, due to its lack of acceptance within the German society and later also within the political parties, demonstrated that it is necessary to communicate new regulations with care to avoid further damaging the trust of the government and its capabilities to mitigate climate change. With the rising urgency to meet net-zero by 2045, these challenges to communicate with society may even rise.

# Transportation sector

As presented in the “Germany’s climate change mitigation status quo” chapter, current data for the transportation sector indicates that the sector is far behind its interim goal of 2030. Between 2021 and 2030, the Greenhouse Gas Projections 2025 report projects that the transportation sector will fall short of its goal by a cumulative amount of 169 million tons (Förster et al., 2025, p. 34). Between 1990 and 2023, the transportation sector made the least progress in reducing GHG emissions of all sectors (Umweltbundesamt, 2025). The transportation sector achieved a reduction of just 10.9% compared to the building sector’s reduction of 51.9%. The data reveals significant differences between the two sectors, highlighting the difficulties and growing urgency for transformative change within the transportation sector. To understand these difficulties in this chapter, possible measures and their current acceptance will be outlined.



**Figure 8**  
Eight building blocks for ambitious climate protection in the transportation sector. Note. Adapted from Umweltbundesamt (2025, p.7): A proposal from the Umweltbundesamt that may be crucial to achieve the mitigation interim goal for 2030 within the transportation sector. Each block shows the cumulative GHG emission reductions in millions of tons of CO2 equivalents for the period 2026 to 2045.

As a reference for potential reduction measures in the transportation sector, the ambitious “Acht Bausteine für ambitionierten Klimaschutz im Verkehr” (“Eight building blocks for ambitious climate protection in transport”) (Umweltbundesamt, 2025) from the Umweltbundesamt is being used. Figure 8 visualizes the collective GHG emission reduction between 2026 and 2045 for each building block. If the government were to implement all these measures, the transportation sector would be able to reach its interim goal for 2030, as it would save an additional 26 million tons of GHG emissions. Therefore, the thesis will focus on the two building blocks: car electrification and speed limit. The electrification of vehicles aims to ban combustion engines by 2032, which would be three years earlier than planned by the EU and result in a further reduction of 117 million tons CO2-eq (Umweltbundesamt, 2025, p. 7). As a result, most studies focus on a ban by 2035. Therefore, in the research thesis, the general acceptance of an adoption is discussed.

As a result, when the research and design thesis discusses the ban on combustion engines, it aims to point to an exit by 2035 and provide first indications for a ban in 2032. Furthermore, the Umweltbundesamt (2025) suggests reducing the speed limit to 120 km/h on motorways, 80 km/h outside town, and 30 km/h in urban areas, resulting in a reduction of 48 million tons CO<sub>2</sub>-eq. In the following discussion, the speed limit will be associated with 120 km/h and will exclude the other two options due to their depth. These areas directly impact individuals and, therefore, are of greater interest for climate communication. However, within the governmental institutions, a consensus on these two measures and their savings is not always represented. For example, the Federal Ministry of Transport argues that the savings would be less than often claimed (BAST-Studie zu CO<sub>2</sub>-Einsparmöglichkeiten durch ein Tempolimit auf Autobahnen, 2025). In their study, they work with a speed limit of 130 km/h for motorways and predict a saving between 1.3 and 2 million tons. Due to the differences in speed limits, a direct correlation with the data of the building block (Umweltbundesamt, 2025) is not possible. However, they indicate that reducing the limit for motorways and out-of-town areas would have a short-term saving effect of 5 million tons (Umweltbundesamt, 2025, p. 13). Furthermore, the Ministry of Transport may distort the public debate, as its report only shows the savings for 130 km/h, which are known to be less GHG emission savings. However, the full version of the report (Pinkofsky et al., 2025) also presents results from previous studies for example from Lange (as cited in: Pinkofsky et al., 2025, p. 12) from 2020 that included 120 km/h and 130 km/h, showing for 130 km/h a saving of 2.2 million tons and for 120 km/h 2.9 million tons which would be an increase in GHG emission saving of around 32%.

In 2024, a study by Andor et al. (2024) examined Germany's current mobility behavior and attitude towards potential measures to reduce emissions. The market research institute Forsa conducted the study between 24 April and 20 May 2024. The study's primary focus was to investigate Germany's current mobility behavior and attitudes towards potential measures to lower emissions in Germany. While the majority of participants supported

measures aimed at regulating current driving patterns, the study observed a notable difference between participants with and without vehicles, with the latter group being more supportive of these measures. Measures associated with costs and losses caused low support from the participants. Support for phasing out fossil-fueled vehicles by 2035 stood at around 24%, and higher diesel taxation at approximately 27%. Although the speed limit, which is also one of the essential blocks to reduce emissions, was supported by 63% in the study, a polarization was identified here (Andor et al., 2024). Most respondents had either a strong acceptance or rejection, and only a minority were neutral to this question. The tendency towards polarization in German society towards new measures could result in negative media attention. In comparison to the 2022 study, a downward trend is evident, with a 5% decrease in the acceptance of a ban on fossil-fueled vehicles. News articles have also reflected these numbers, criticizing the low acceptance negatively (Bug et al., 2024; Erhebliche Akzeptanzprobleme, 2024; Sonnenholzner, 2024).

Until now, we have seen the role of media outlets, policymakers, and citizens involved in the discussion of climate change mitigation; however, the industry also has to be taken into consideration. Germany is a car nation (Richter & Haas, 2020) with an extensive infrastructure of car manufacturers, for example, Volkswagen, BMW, Mercedes, and Porsche, as well as their extensive network of suppliers (Voigt, 2025). Furthermore, for the large number of car manufacturers, an extensive supplier infrastructure also exists. Therefore, the report by Richter & Haas (2020) argues that manufacturers, together with workers' unions, attempt to influence regulations and communication in their favor. The annual advertising expenditure of the automotive industry, around 1.8 billion euros (Ben Impey, 2024), may be one of the contributors to the strong social norm of the car. Among the younger demographic in German society, aged between 18 and 35, the study by Continental-Mobilitätsstudie 2024 | Das Auto ist für viele junge Menschen ein Statussymbol (n.d.) indicates that the car remains a status symbol for this demographic segment, with habits shaped by the ease of charging and driving range, as well as potential speed limits.

The influence of lobbying on the government might reflect the slow progress in this sector (Richter & Haas, 2020).

Furthermore, Richter & Haas (2020) indicate that in the past, the high domination of car manufacturers, suppliers, and worker unions was evident, as the focus of the transformation remained on the car. These actors used double-sided communication with the public. They turned towards electrification of mobility, but on the other hand, the industry hesitated against taking direct action when discussing specific measures. As a result, for quite some time, nothing happened in the sector (Richter & Haas, 2020).

Despite the low acceptance rate in climate communication, the consensus is that there currently is a knowledge-action gap (Boon-Falleur et al., 2022; Trümper & Beck, 2021). The knowledge-action gap means that society is educated about climate change and its effects, but is not taking action to diminish GHG emissions. Most individuals are informed about climate change through the media. Therefore, media outlets have the power to form public opinion and pressure politicians. The pressure can lead to a weakening of the intended regulations and a resulting negative view of them. Moreover, it means that politicians should not underestimate the outlined reinforcing loop of negative perception.

In summary, the low acceptance rate could be an alarming signal for these potential measures, the adoption of electric vehicles, and the reduction of the speed limit to 120 km/h. As a result, new creative efforts (Trümper & Beck, 2021) will be necessary to communicate in the transportation sector to raise acceptance for potential measures. Therefore, to identify potential levers and gain detailed insights into this rising issue, the following chapters will conduct an extensive literature review of current climate change communication.

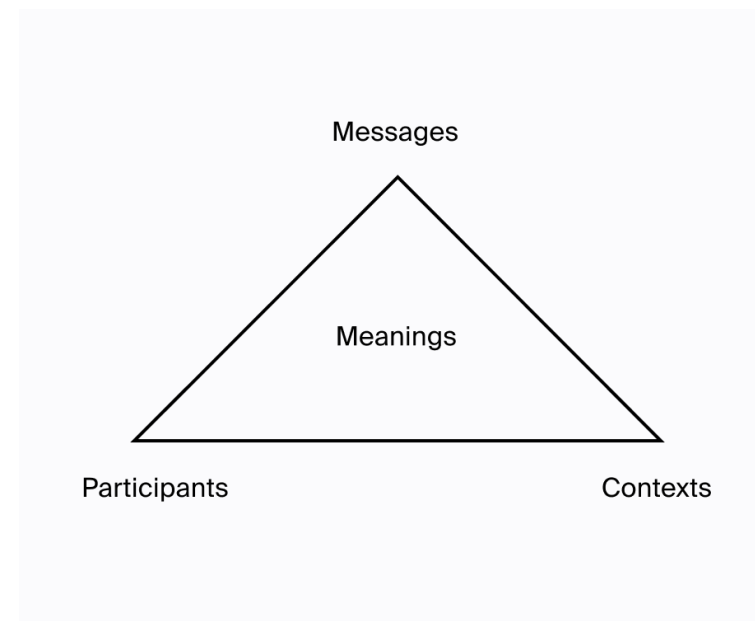
# **Climate change communication theory**

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# Introduction

In more than 40 years of climate communication (Ballantyne, 2016; Moser, 2010; Trümper & Beck, 2021), it has been possible to raise awareness of climate change in society. Although research scholars have experimented with participatory practices and models, such as the model in Figure 9 from Fiske (1993) and new calls for engagement (Badullovich, 2023), there remains a gap in the acceptance of the required efforts to mitigate climate change as outlined in the “Contextual analysis” chapter. Furthermore, such participatory approaches from the climate change literature appear to be rarely implemented by policymakers in Germany, and the focus still often relies only on information transfer. In response, scholars (Trümper & Beck, 2021, p. 164) suggest that policymakers and researchers should test new creative approaches. Therefore, in the following subchapters, the core principles of transformative climate change communication (Trümper & Beck, 2021) and their relation to the acceptance of climate change mitigation measures will be investigated as follows: (1) an investigation of environmental psychology literature (Kruse, 2024;

Tschötschel et al., 2021) will be conducted, which will lead to (2) examining the relevance of ecological and social justice (Huber et al., 2020; Maestre-Andrés et al., 2019; Wittmayer et al., 2024) within the process of the communication. The examination will involve expanding the current interdisciplinary working structures (Kruse, 2024; Trümper & Beck, 2021) to a transdisciplinary approach. To achieve this, the research explores the integration of design with traditional scientific practices. Furthermore, the application of actionable knowledge in the transdisciplinary approach will be outlined (Bartels et al., 2020; Hölscher et al., 2023).



**Figure 9**  
Communication with meaning. Note. Adapted from Fiske. (1993 p. 4): Fiske communication model.

# Environmental psychology

A transformational change is often described as disruptive (Jaspal et al., 2014; Kruse, 2024) because it intervenes in the behaviors of individuals in everyday life. Jaspal et al. (2014, p. 125) argues that when framing changes as less disruptive, individuals are more likely to adapt. Furthermore, for effective communication in this intersection with everyday life, there is a high consensus that positive narratives are necessary for transformation (Kruse, 2024; Leuser & Weiss, 2020). Additionally, policymakers should convey in their communication that a transformation will not only mean loss but also a chance for the better (Kruse, 2024). Because of the substantial impact on individuals in the transportation sector, focusing on changing behavior may be a recommended approach. Therefore, environmental psychology offers valuable insights that can help understand the fundamental factors driving behavioral change within these transformative contexts. This chapter examines in greater depth the influence of (1) values, (2) attitudes, and (3) norms and social identity on acceptance of change. Furthermore, through analysis of empirical data from representative studies conducted in the German context, these theoretical findings will be validated and contextualized for local applications.

## Values and attitudes

Values are the fundamental beliefs and principles that people consider desirable and worthwhile. Schwartz (2012, p. 3) describes values as follows: “Values are used to characterize cultural groups, societies, and individuals, to trace change over time, and to explain the motivational bases of attitudes and behavior”. Meadows (1999) also emphasizes the importance of values in her 12 leverage points, and they are positioned as the most transformative levers in her system to intervene in. Abson et al. (2017) further emphasize this by transferring the leverage points into the context of sustainability transformation. However, Meadows (1999) indicates that the more transformative the levers are, the more difficult they are to change.

Those values may form the basis for individuals’ evaluation of attitudes, whether something is good or bad (Schwartz, 2012). Moreover, the author argues that they are a decisive part in shaping the behavior. As a result, the study indicates that it is necessary to understand individuals’ attitudes. This mechanism and the importance of attitude are established in the academic environment, as the Theory of Planned Behavior is one of the fundamental reference points (Ajzen, 1991). Therefore, to understand how the theoretical insights apply in practice, examining current attitudes in Germany will provide valuable context.

The Ipsos (2025) study reveals that Germany still has a relatively low attitude towards climate change, with 58% of respondents considering it a high threat, compared to the median of all 32 countries of 69%. Between 2021 and 2025, this attitude declined by 16 percentage points, which is one of the highest declines among the 32 countries surveyed. Also, according to the study, Ipsos (2025) identified a correlation: when countries are more severely affected by climate change, individuals tend to be more concerned. Furthermore, the findings indicate that the Philippines has the highest concern among society and is rated in the climate risk index as the third highest in terms of risk. In Germany, however, the society’s risk perception is low, as reflected in the risk index for Germany. These findings suggest a connection between the security values of groups and individuals and their attitudes. Additionally, when climate change

poses a direct risk to the country, the individual's attitude is more likely to change. Grothmann (2018) links this to psychological distance, and therefore, communicating regional links may increase the perceived risk.

The authors, Tschötschel et al. (2021), suggest that policymakers could give more attention to individuals' and political beliefs. They argue that individuals' efficacy beliefs about regulations influence behavioral change, and political efficacy predicts policy support. Further, policymakers should not underestimate media outlets in downplaying the efficacy of beliefs and should address this issue with effective methods. Therefore, in the "Application of the communication" chapter, possible applications are examined. For instance, the experiment by Feldman & Hart (2016) demonstrated that the political messages in news articles had a strong effect on efficacy beliefs of individuals. In media debates, patterns of misinformation circulate in discussions that downplay the efficacy of electrification (Sonnenholzner, 2024). Statements by politicians that mitigation measures in Germany are ineffective, as they account for only one percent of the world's population and two percent of GHG emissions, might not help to rebuild trust in the government. Chancellor Merz made this statement on 9 July (Müller, n.d.), and it was also reported in the media (Merz, 2025; Schneider, 2025; Stöcker, 2025). Other studies (Brulle et al., 2012; Carmichael & Brulle, 2017) suggest that statements by politicians might have a high perceptual impact on society. Therefore, it may reinforce critics' view that measures are unnecessary and ineffective in Germany. Furthermore, Merz's statement downplays German efforts and attempts to divert attention from the German mitigation goals by also emphasizing foreign compensation. Policymakers should therefore also focus on communicating the group's effectiveness by directly targeting social groups.

With this in mind, an investigation of the importance of norms, group identity, and emotions is relevant for further communication practices to understand the levers to change attitudes and behaviors.

### **Norms and social identity**

Norms can be described as unspoken rules and expectations that individuals give to themselves (Schrader et al., 2024, p. 71), for example, "you should not fly short distances". Furthermore, it argues that social norms derive from the influence of others. When there is a critical mass, the so-called tipping point of around 25-35% varying in studies (Andreoni et al., 2021; Judge et al., 2024), that changes their attitude towards the current norms and behaviors, a ripple effect can arise that ultimately leads to a greater shift in society. However, these numbers should be viewed with care and will vary strongly depending on the context.

Social identity derives from the groups to which we belong (Fielding & Hornsey, 2016; Schrader et al., 2024). Furthermore, Fielding & Hornsey (2016) argue that a large number of social categories characterize these social groups. As a result, it also means that if the norms of the group support a measure, the person associated with the group is more likely to support it as well. However, if they reject it, the group can also act as a barrier. Also, Schrader et al. (2024) suggest that those group affiliations are not only shared by similar norms but also may require a reflexive process to determine their group affiliation. When someone has identified themselves with the group, those with similar views are seen as in-group members (Badullovich, 2023) and may be more influential and credible when communicating than people with opposing views.

### **Pluralistic ignorance**

Groups frequently misjudge how others perceive norms (Andre et al., 2021, 2024; Kjeldahl & Hendricks, 2018; Miller, 2023). American studies (Kjeldahl & Hendricks, 2018; Sparkman et al., 2022) highlight a notable discrepancy between the perceived level of support for climate change mitigation among various groups and the actual support they provide. For the speed limit, tendencies of pluralistic ignorance are visible. The study by Wolf et al. (2023), p. 16, found that the first-order belief (what people think) was at 60%, whereas the second-order belief (what people think others think) was at 43%.

A cause of the divergence of the first and second-order belief may be the low visibility of a change in attitude (Boon-Falleur et al., 2022; Miller, 2023). The problem is that in climate change mitigation, most changes in attitudes and behaviors lack the access and exposure needed to be recognized by a majority of the group (Boon-Falleur et al., 2022). Furthermore, Miller (2023) outlines that even when people recognize a behavior change, there can still be the challenge of a potential misjudgment of the reason why others change their behavior. The author reasons this because of the polarized nature of the climate change discussion. Because topics are often not publicly discussed within their group of belonging. Furthermore, this is because individuals may fear social disapproval or embarrassment within their group.

Additionally, researchers (Huszár et al., 2022; Miller, 2023) suggest that non-representative media coverage can cause pluralistic ignorance. Therefore, Miller (2023) also argues that through the divergent representation of society, pluralistic ignorance can be triggered and enforced. Because they tend to give more coverage to views that generate more engagement, fear, and anger, prominent and credible messengers within the group may also influence the phenomenon of pluralistic ignorance.

The non-representative coverage by a credible messenger can be reflected in the debate about the speed limit, as Volker Wissing, the Federal Minister for Digital and Transport between 2021 and 2025, said about the speed limit, “Die Menschen wollen das nicht.” (“People do not want that.”) Also, Christoph Ploß (CDU) stated “untauglichen Vorschlag zur Rettung des Weltklimas” (“unsuitable proposal for saving the global climate”) (NDR.de, 2024). These statements promote a false perception of the mood surrounding this measure, as outlined above, since politicians are often held in high esteem (Brulle et al., 2012; Carmichael & Brulle, 2017). The lobbying of the car industry may contribute to the political denial of speed limits. Richter & Haas (2020) demonstrate the power dynamics of lobbying with an extensive analysis of the power dynamics of the National Platform for Electric Mobility.

Therefore, to summarize, in the perception of changes in norms and values, policymakers may not underestimate the power of credible actors (Fielding & Hornsey, 2016; Schrader et al., 2024; Tschötschel et al., 2021) and the influence of media outlets (Feldman & Hart, 2016; Tschötschel et al., 2021). To rebalance the representation of media outlets, other credible actors may communicate and inform the German society of climate change mitigation measures. Also, lobbying, as outlined in the “Transportation sector” chapter, is likely to be a challenge. Policymakers influenced by lobbyists sometimes fail to represent society effectively due to their non-representative messages. Nevertheless, among the findings discussed in direct climate change mitigation papers, power dynamics and pluralistic ignorance are often overlooked by general

climate transformation scholars (Ballantyne, 2016; Moser, 2010; Trümper & Beck, 2021). Miller (2023) also suggests that there is still a lack of practical solutions to mitigate pluralistic ignorance. Furthermore, the current efforts to reduce pluralistic ignorance rely on providing information about the actual distribution of the sentiment. However, Miller (2023) also suggests that providing this information does not have to mitigate pluralistic ignorance. Due to the lack of intervention options, these dynamics can grow and serve as a tool to resist transformative change, not only by lobbyists but also by political parties seeking to maintain the status quo. Therefore, the following questions come up: (1) How might we use in-group and credible messengers to transport this data? (2) How might we visualize this information to be best accepted?

### **Collective perception**

Understanding pluralistic ignorance demonstrates why collective perception becomes crucial in climate communication. Furthermore, Heitfeld & Thiele (2024) point out that, besides beliefs, groups also share emotions and amplify them through discussions, resulting in similar motivations. Further, the author argues that those shared beliefs, emotions, and motivations may lead to a collective expectation of effectiveness. This collective perception suggests

that the behavior ultimately depends on the group to which individuals belong.

### **Challenges**

Grothmann (2018) suggests challenging the status quo of norms. As a result, policymakers may develop new narratives about the city's usage and the current influence of vehicles. Suppose the majority of citizens believe the city is for everyone. In that case, a measure that changes the current car dominance in Germany's cities by creating car-free blocks may be more likely to be supported. However, despite the success of cities such as Barcelona ("The Implementation of the Superblocks Programme in Barcelona," 2018) and Paris (Paris Voters Approve More Car-Free Streets, 2025), a lack of support can still be identified in Germany and other countries, as outlined in the "Contextual analysis" chapter. Also, different cultures have different norms. Therefore, the contextual observation may be important. Moreover, those may change dynamically (Chiu et al., 2010; Wetts et al., 2025). Visualizing a group's shift towards a more positive transformation can help influence the local society to adopt the new norms (Chiu et al., 2010). Furthermore, Chiu et al. (2010) point out that social identity defines belonging to social groups. As a result, perceptions and communication should not only focus on individuals, but also on social groups.

Despite this literature, there is now a growing consensus that knowledge, values, and attitudes alone will not lead to behavioral change (Leuser & Weiss, 2020; Moser, 2010). It also resonates with the recent study by Wetts et al. (2025), which suggests that in the past, there had been too strong a focus on attitudes over actions. A previous study by Kahan et al. (2012) amplifies this correlation between knowledge and attitude. The findings show that higher science knowledge and numeracy were associated with a decrease in risk perception in their testing. Among people who value social justice, climate awareness has increased risk perception. This phenomenon is also often referred to as the attitude-behavior gap or value-behavior gap (Leuser & Weiss, 2020; Moser, 2010).

## Ecological and social justice

Building on knowledge drawn from environmental psychology and the theory of behavioral change, social justice is considered an influential factor (Huber et al., 2020; Maestre-Andrés et al., 2019) in building acceptance towards policy support. A meta-analysis from Bergquist et al. (2022) underlines this, as the results showed that distributional fairness had the strongest determinant for public opinions about climate change taxes and laws. In the building and transportation sectors, where individuals are directly affected, including marginalized groups in policy development is particularly important. They are suggested to be most affected by the changes and are currently often excluded from efforts, as seen in the “Contextual analysis” chapter. In the GEG backlash, the cost factor and the fact that they did not prepare the subsidies model upfront (Braungardt et al., 2024) meant that they had no way to communicate

against the media outlets that initially focused on that topic (Jost et al., 2024). With headlines like “Habecks Heiz-Hammer würde uns 590 000 Euro kosten” (“Habeck’s heating hammer would cost us €590,000”) (3 Häuser, 3 Schicksale, 2023), exaggerated costs were presented to polarize and paralyze society. It shows the exaggeration of the topic and the concern of individuals; even though the numbers themselves are not correct, it triggers negative emotions for most. It highlights the importance of considering all segments, particularly those with lower incomes. This pattern is also evident in the transport sector.

The government designed subsidies for electric vehicles on the principle of the watering can (Förderung für E-Autos, 2025). The water can principle means everyone will receive the same amount of subsidies. The data from the report of Technopolis Group & Fraunhofer ISI (2024), p. 71, shows that 60% of the people who profited from the subsidies had an income above the median income (median is 3813€), with 4500€; furthermore, 30% had an income above 6000€. The data exemplifies the creation of imbalances in the subsidies dependent on income. In France, however, the report from Incentives and Legislation | European Alternative Fuels Observatory (2025) demonstrates that it is also possible to implement subsidies for leasing and the purchasing of electric vehicles, depending on an individual’s income. Households with an income below 15,300€ per year are eligible for a social leasing model. Furthermore, the purchase process features a three-stage graduation based on household income. However, despite the urge to balance the impacts in society, Leuser & Weiss (2020) argues that it can also happen that the results of regulations have a negative influence on the economic aspects of individuals. Therefore, the costs need to be distributed fairly across all segments, and policymakers may communicate the short-term imbalance. Otherwise, it may result in a loss of trust and acceptance for future regulations. Even though the illustrated importance of social justice by Maestre-Andrés et al. (2019) and Huber et al. (2020), the example of the subsidies in Germany (Technopolis Group & Fraunhofer ISI, 2024, p. 71) demonstrates that a real-world implementation is still sometimes lacking.

### **Role of ethical considerations**

In the process of conducting the analysis and forming actions, it is essential to consider ethical concerns to ensure social justice throughout the research. The literature about transformative research (Florin & Lindhult, 2015; Wittmayer et al., 2024) suggests that, in the transformative research, there is a need to extend beyond traditional principles when conducting research in a transformative research approach. Therefore, in the mobility transformation and its communication efforts, ethical consideration and wisdom are essential. The established principles have, in the past, more protected the researcher than the marginalized and vulnerable groups to ensure social justice. These were according to Beauchamp and Childress (as cited in: Wittmayer et al., 2024, p. 3) (1) not to harm others, (2) create appropriate outcomes that outweigh the participation, (3) autonomy by providing the information, and (4) fairness in participation and distribution of benefits.

From an ethical standpoint, we should emphasize creating actionable knowledge (see Hölscher et al., 2023) that will shape society for the better. Marginalized and vulnerable groups should benefit from transformations (Newell et al., 2021). Enabling them to participate will be a crucial step towards achieving this goal. To achieve this, it would be beneficial for researchers and policymakers to stop acting neutrally (Fezer, 2022). The reason for this is that leveraging our power enables us to amplify the voices of the marginalized and vulnerable even further (Wittmayer et al., 2024). Furthermore, Wittmayer et al. (2024) illustrates that when including others in participatory practices, the facilitator should discuss the expectations with the participants. Discussing the expectations ensures that people might not feel exploited (Mertens, 2021) and feel comfortable within the environment.

Through the contextual situatedness of the practices, Brydon-Miller et al. (2006) argues that we as researchers have to reflect and adjust our ethical principles constantly, as we make decisions within the specific situation. These reactive adjustments suggest that there may be no single solution that fits all. Therefore, it is crucial to diversify the knowledge of ethical principles and practices (Florin &

Lindhult, 2015; Partelow et al., 2025). To enable researchers to adapt the ethical framework depending on the context in which they are working. The main argument of ethical awareness in co-production and elaboration, according to Partelow et al. (2025), is that it helps us better understand and explain why working with other participants can lead to a meaningful and positive change. Despite the critiques and limitations from Wittmayer et al. (2024) of the current ethical principles for transformative research, the high reliance on wisdom emphasized by scholars (Florin & Lindhult, 2015; Partelow et al., 2025) can also be questioned. It argues that conducting research in transformative fields would, for now, only be privileged to a small group of researchers. Partelow et al. (2025) argues that we, as researchers, should also discuss how to create a broader field of knowledge of ethical considerations in practice to a broader audience, not to exclude groups.

### **Segmentation**

To understand the behaviors of societal groups, effective segmenting will be needed (Sgaier et al., 2018). Sgaier et al. (2018), p. 50 claims “that understanding why people make decisions is the most effective way to change their behavior and improve their lives”. Betsch et al. (2025), p. 9, survey results from Germany indicate that demographic factors may not be sufficient to understand why people take action. Furthermore, from the “Norms and social identity” chapter, we learned that messengers from within the group might be more influential in communicating climate change messages (Badullovich, 2023). For that, using psychographic behavioral factors may be a promising approach (Borg et al., 2021; Fuchslin, 2019; Rode et al., 2015; Sgaier et al., 2018). The approach results in the fact that, beyond the demographic factors, incorporating values and attitudes is necessary. The study by Rode et al. (2015) illustrates this by examining attitudes towards transport options in Berlin and London, and using these attitudes to categorize them into six segments. By understanding the mobility patterns, the required, targeted promotions (Rammler et al., 2022, p. 16) can be better created and communicated. From institutions, also value-based segmentation exists with the six

social types (“6 gesellschaftliche Typen,” n.d.) and the Sinus Milieus (Sinus-Milieus – The Gold Standard for Target Group Segmentation, n.d.). However, the models may not be sufficient for every project because they may be more general. Specific factors, particularly attitudes towards the mobility transformation, are not incorporated into the results.

### **Co-elaboration**

Wittmayer et al. (2024) from the ethical consideration of transformative research and further authors (Fazey et al., 2018; Pohl, 2008) stress the use of participatory practices to foster a closer engagement. Therefore, it is also necessary for the mobility transformation. Moreover, the communication theory models, such as the one from Balantyne (2016), emphasize that further. The facilitator should conduct the collaboration in a manner that ensures the receiver and sender are treated equally (Badullovich, 2023; Fiske, 1993). The participatory and, in the context of the thesis, the co-elaborative practice is already established in design processes and seen, for example, as a central part of social design, and discussed in different literature (Fehér et al., 2024; Tromp & Vial, 2023). However, it started with user research (Vardouli, 2016) approaches to understand the user needs to optimize the products to be more efficient and desirable (Fessenden, 2022). As a result, the goal is to raise the conversion rates (Nielsen, 2013). This view of the product and “user” is criticized for being overly focused on the product itself and failing to consider the broader context, resulting in a highly simplified perspective. This simplification and further limitation, Van Velsen et al. (2022) points out in the context of the health sector in their study. Consequently, it would not work in a complex system dynamic such as climate communication, where the research may be situated in a social context (Hine et al., 2014) and, as a result, relies on more contextual and segment-based approaches. Here, co-elaboration brings the individuals from everyday life on the same level as the researcher and sender of messages.

### **Co-elaboration in the German government**

The Citizens’ Councils are now a frequently used practice in the regulatory process (Wieczorek et al., 2024), operating as a co-elaborative approach in Germany. The governmental institutions’ aim in these approaches is to gather feedback from German society (Deutscher Bundestag - Bürgerräte, n.d.). In Germany, the “Ernährung im Wandel” (Deutscher Bundestag - Der erste Bürgerrat des Deutschen Bundestages, n.d.) was held as the first official format by the government, between September 2023 and January 2024. However, as analyzed by Wieczorek et al. (2024), there had been, between 2000 and 2023, a total of 190 lot-based citizens councils. The “Bürgerrat Klima” (Bürgerrat Klima, n.d.) is especially relevant as it was organized by the non-profit association BürgerBegehren Klimaschutz e.V. and was trying to find answers to the question “Wie gestalten wir Klimapolitik: Gut für uns, gut für unsere Umwelt und gut für unser Land?” (“How do we shape climate policy: good for us, good for our environment, and good for our country?”). A working group could be created (BürgerBegehren Klimaschutz e.V., 2021, p. 12) through the random selection of 160 participants, constrained by demographic factors, to represent German society. The result was that the Bürgerrat Klima presented and handed 80 recommendations (Bürgerrat Klima, n.d.) over to the government (BürgerBegehren Klimaschutz e.V., 2021, p. 12). Despite the co-elaborative approach and the desire to represent society, there are also limitations to this approach of generating potential climate change mitigation measures and communicating them to the government. For example, the project persisted more as a recommendation (BürgerBegehren Klimaschutz e.V., 2021, p. 1) because it was organized by a non-profit association and framed from the start like this. Reflecting on the ethical principles for transformative research, this situation presents a moral dilemma. On the one hand, it is positive to demonstrate that society as a whole is capable of generating valuable knowledge in the form of 80 recommendations for climate change mitigation to the government. However, this knowledge is unlikely to be implemented in its original form and may therefore lack the actionable knowledge that ultimately leads to change.



This conclusion is further substantiated by the findings of numerous studies referenced in the “Ecological and social justice” chapter.

However, the conducted workshop also had some limitations. The low number of participants and, as a result, a lack of diversity do not comply with the set ethical standards. As well, a failure to include marginalized segments. Diversity, particularly the consideration of disadvantaged groups of people, is important in order to recognize the grievances here and also to communicate new concepts to them. Differences between urban and rural areas are particularly interesting for the transportation sector. As there are different mobility infrastructures here, some people in the countryside are more dependent on their cars. In addition, to address the concerns of groups with lower incomes, they should be included in additional workshops. To increase their commitment to striving for sustainable change. These results, therefore, need to be interpreted with caution. Another key takeaway from the conducted workshop is the importance of carefully selecting information to share with participants and avoiding excessive nudging during the elaboration phase. These limitations are part of the constraints I face as a researcher working on my master’s research thesis.

#### **Further directions for workshops**

Therefore, in the future, further formats for close engagement and different mapping models have to be tested. The elaboration session should focus more on the two mitigation blocks from the “Transportation sector” chapter: the speed limit and the electrification of cars. To develop an in-depth understanding and further investigate findings from previous quantitative surveys (Andor et al., 2024; Ipsos, 2025), and also to foster long-term engagements. Therefore, the goal of the direct discussion of potential measures and behavioral shifts should help to understand the underlying values, norms, and attitudes of the society in Germany.

Transformative research practitioners (Mertens, 2021; Wittmayer et al., 2024) suggest that engagement should be enabled throughout all layers of society,

facilitating a profound understanding of how social justice could be improved. Moreover, discussing and understanding the underlying psychological patterns will help to segment the communication based on the psychographic behavioral factors (Borg et al., 2021; Fuchslin, 2019; Rode et al., 2015; Sema K. Sgaier et al., 2018). Regarding the polarization in climate communication, which Andor et al. (2024) also identified in the context of the 130 km/h speed limit, Badullovich (2023) proposes reducing polarization by promoting more discussions and overcoming the current communication barriers from outside the group. New engagement formats should further verify this. Here, Leuser & Weiss (2020) suggests that identifying credible messengers for each group could help. Promoting discussions will require high efforts in organizing those relationships, but Badullovich (2023) emphasizes that it could help in the long-term transformation.

Further, researchers and policymakers may also examine how to transform those engagement formats into actionable insights that are then incorporated into the communication process. The examination may be a crucial step towards ensuring the outlined ethical constraints of research and engagement from the subchapter on “Ethical considerations”. Practitioners must be cautious not to oversimplify the results in complex and interrelated discussions. Systemic design methods (see Jones & Ael, 2023) may be a first direction to look into to understand the causes of the issues further. Nevertheless, Nastar et al. (2018) outline the limitations of those practices as they may exclude a social and political analysis. Therefore, mappings that incorporate social and political factors need further investigation and testing with additional participants. By focusing on the social factors, such as norms and values of participants, we can empower them to assume the role of co-authors of the message with the capacity to select the appropriate values in accordance with the prevailing context (Ballantyne, 2016). To ensure communication adapts to a changing environment, long-term engagements would help refine the findings constantly.

### **Ecological and social justice summary**

This chapter outlined the need to stop pretending to be neutral (Fezer, 2022) and to use one's power to navigate the current dynamics carefully (Wittmayer et al., 2024). Transformative research suggests that when we are more aware of our options and apply them to take a fairer path in climate communication and regulatory processes, we can already achieve a lot. However, it also shows the necessity of a structural change in the governmental strategy to communicate climate change mitigation measures in order to move away from a one-way approach.

Communication (Badullovich, 2023). The first impulses are already visible also on the governmental level with the Climate Council (Deutscher Bundestag - Der erste Bürgerrat des Deutschen Bundestages, n.d.) and various other initiatives (Wieczorek et al., 2024) at the state level. However, the challenge of implementing a long-term engagement persists because those councils were used mainly for a fixed timeframe. By moving forward to two-way communication, Badullovich (2023) argues that we will not just see individuals as the audience but as practitioners in the debates, and more meaningful communication can take place. A closer engagement and co-elaboration with social groups proved by Pohl (2008) and Fazey et al. (2018) to be a crucial part in supporting social justice. Focusing on co-elaborative practices throughout the policymaking process helps build shared knowledge among groups and tailor communication to each segment by considering their context and psychological factors (Fazey et al., 2018). The co-elaboration workshop confirmed research findings and gave new inputs for the research. However, further co-elaboration techniques should be tested in the context of the mobility transformation. By building shared knowledge and tailoring communication to the context and psychographic behavioral factors (Borg et al., 2021; Fuchsli, 2019; Rode et al., 2015; Sema K. Sgaier et al., 2018) of each social group, these approaches foster more long-term, inclusive, and effective societal change.

A recommendation based on the literature and qualitative findings in this chapter is that the experiences of new formats should be shared efficiently across all ministries

to break up current silos. States and local governments may also benefit from this potential knowledge expansion. When policymakers engage in actionable knowledge, they can interact in more transparent discussions about specific implementable solutions. Close cooperation will also be necessary to build successful resilience against misinformation and groups that argue against the necessity of further climate change mitigation measures and the resulting acceptance of measures. That means, rather than closed communication, there should be transparency and knowledge sharing. Therefore, it must be well-coordinated among policymakers to be successful.

# Application of the communication

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# Introduction

This chapter examines how communication can lead to resilience in response to the previously outlined strong emotional loading and power dynamics of media outlets and lobbyists. The focus on resilience would therefore also contribute to a higher acceptance rate throughout the policy environment by building trust in the governmental structure and its measures. For that, the analysis draws upon the communication frame-setting mechanism literature from Flusberg et al. (2024). As Jost et al. (2024) pointed out in the GEG debate, it is problematic. To further aid the discussion in exploring potential paths towards greater resilience and acceptance, techniques such as debunking (Cook et al., 2017; Tay et al., 2022; Trisha et al., 2022) and prebunking (Jost et al., 2024; Lewandowsky, 2021; Trisha et al., 2022) will be discussed in relation to debates on new regulations. Lastly, Göpel (2025)'s proposal for a central information point for Germany's measures will be discussed by linking it further to existing conversations.

# Communication guidelines

The principles of climate communication are also reflected in mobility communication guides provided to cities and municipalities. The “Klimakommunikation im Verkehr” Mathias Schmid (2023), which builds on the “Leitfaden Klimadialog” (Grahsl et al., 2022) from the Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie of Austria and the “Über Klima sprechen” (Schrader et al., 2022), has been created for the state of Baden-Württemberg in Germany. A second guideline in the German context is the “Leitfaden Nahmobilität” from TU Berlin, Fachgebiet integrierte Verkehrsplanung et al. (2023) and can be seen as a guideline for local mobility. Primarily, the “Klimakommunikation im Verkehr” will be investigated; however, the differentiation and weaknesses compared to other guidelines will be examined. Furthermore, an interview with KEA-BW was conducted to delve into the guidelines and further exchange in the field of climate change communication in the mobility transformation.

In the 16 guidelines, a better approach to mobility communication by Mathias Schmid (2023) addresses areas such as: misinformation, inhibitions caused by negative topics, the relevance of a credible messenger, and solution-oriented communication, those were further amplified in the interview with Interviewee No. 2. It provides representatives of cities and municipalities with a good orientation and access to the complex topic of climate change communication in the context of mobility transformation. This was also reflected in the primary goal of the guideline, according to Interviewee No. 2, that “We would like to provide municipalities with a concise overview of what they should pay attention to in their communications, based on scientific evidence.”. However, the guidelines lack specific implementation strategies and engagement approaches with society.

On the other hand, the TU Berlin, Fachgebiet integrierte Verkehrsplanung et al. (2023) guide demonstrates more strength in raising the importance of engagement approaches. Furthermore, the report emphasizes the integration of marginalized groups in the process.

The guideline of KEA-BW had to be accomplished in a short time frame, as Interviewee No. 2 pointed out; as a result, certain limitations may have occurred. A limitation of the Mathias Schmid (2023) guide is its approach to recommending message testing. According to the report, testing with colleagues is equivalent to potential focus groups. However, greater emphasis should be placed on real-world testing with the actual target groups that are supposed to be addressed by the messages, to enforce a two-way communication (Badullovič, 2023). This was also emphasized in the interview with Interviewee No. 2. Furthermore, when categorizing topics into different guidelines, there is a risk that municipalities might view the guidelines in isolation. However, as outlined in previous chapters, different factors work together. For example, a consensus illustrating risk, fear, and possible actions should be viewed as complementary (Dennison, 2024; Flusberg et al., 2024). Otherwise, the risk could also result in helplessness and be associated with negative consequences.

Furthermore, despite the guidelines lacking participatory methods, the importance of such methods, including

dialogues, was highlighted in the interview with Interviewee No. 2. Therefore, the direct use of only the “Leitfaden Klimadialog” and “Über Klima sprechen” for the guidelines, due to the project’s timeframe, may be criticized. However, this may be a general structural problem. Furthermore, it may be helpful for future projects to implement measurements to observe their impact. This may be a challenge. However, it may provide valuable learning for the proceedings and new projects in the area of mobility transformation communication. The Interview with Interviewee No. 3 amplified the necessity of measuring success in the context of climate communication. For that, the state may also view those projects more in a long-term perspective to establish a sustainable development in the climate change communication field.

In summary, the reports of TU Berlin, Fachgebiet integrierte Verkehrsplanung et al. (2023) and Mathias Schmid (2023) demonstrate that there is already an awareness of climate communication and participatory practices within certain federal states, as well as their guidelines. These are valuable tools for the municipalities. Collaboration across these initiatives may benefit from sharing their learnings. As a result, stronger examples may be created that would lead to a more sophisticated and tangible guideline.

## Frame-setting

Setting the frame is about establishing the initial tone of a debate through the opening message. Words, images, symbols, or audio commonly trigger a frame (Moser, 2010). It can be either negative or positive, and policy debate can also consist of multiple frames. When the sender successfully implements a frame in the conversation, it will be hard for others to change the tone of the debate (Jost et al., 2024). Also, Flusberg et al. (2024), p. 136, argue that if the audience has strong prior beliefs or attitudes about the issue, it will be more challenging to establish the frame. Moreover, the frame can disappear, weaken, or even backfire in the conversation. The framing technique has to continuously adapt the frame according to the context (Moser, 2010). Furthermore, it can not be determined how long a frame will persist, as this may depend on whether the sender is repeatedly addressing the frame (Flusberg et al., 2024, p. 138).

In the GEG debate, the tabloid Bild initiated the tone of the debate with framing terms, such as “heating ban”, “heating hammer”, and “heating bomb”, which demonstrate

a strong rhetorical framing (Braungardt et al., 2024). In addition, the terms are negative, and the content consisted of misinformation at the beginning of the debate (Jost et al., 2024). As discussed above in the “Environmental psychology” chapter, the negative emotions may result in avoidance, denial, or helplessness (Bloodhart et al., 2019; Leuser & Weiss, 2020, p. 14; Rey, 2024). The government was not able to reframe the discussion around the policy (Jost et al., 2024). Therefore, the negative emotional framing remained throughout the entire debate. Given the power of initial framing demonstrated in the GEG case, understanding how to combat resulting misinformation becomes crucial.

# Misinformations in climate debate's

In the German GEG debate, emotional manipulation and misinformation around the costs were identified in the GEG analysis (Braungardt et al., 2024). Further politicization by portraying the Bündnis 90 die Grünen as “Verbotspartei” (Buckenmaier, 2023) caused polarization. Braungardt et al. (2024) previously analyzed strong rhetorical framings that resulted in emotional framing of the regulation. Examples include terms like “heating hammer”, “heating bomb”, found in various headlines of the tabloid Bild (3 Häuser, 3 Schicksale, 2023; Beim Heiz-Hammer piff Habeck auf Experten-Rat – „Fühlen uns übergangen”, 2023; Jetzt knallt es in der FDP!, 2023; Zuschüsse, Förderung, Fristen, 2023) (3 houses, 3 fates, 2023; Habeck ignored expert advice on heating costs – “We feel overlooked,” 2023; Now there's trouble in the FDP!, 2023; Subsidies, funding, deadlines, 2023). Also, as outlined in the “Pluralistic ignorance” chapter, misinformation could be seen on a political level in the transportation sector. Misinformation and fears surrounding electric vehicles are an issue. Some of these issues are outlined in the Tagesschau article (Sonnenholzner, 2024).

The term “Reichweitenangst” (fear of driving range) can now be found in the Duden (Reichweitenangst, n.d.), exemplifying the anticipated fear of electric vehicles.

## Pre- and debunking

Contemporary scholarship (Jost et al., 2024; Trisha et al., 2022) argues that working against misinformation in the past relied on debunking. The literature (Tay et al., 2022) broadly defines debunking as a technique that addresses misinformation after it has been spread. However, Trisha et al. (2022) suggest that there are multiple challenges here because it is considered both expensive and time-consuming. In addition, misinformation can be hard to dispel, and individuals often continue to rely on it (Tay et al., 2022; van der Linden et al., 2017). Fact checks are frequently used for debunking, but are suggested to face the challenge of a lack of engagement (Trisha et al., 2022). Further, Lewandowsky (2021) suggests that debunking techniques are more effective when the sender and receiver share similar positions. The importance of psychological factors was furthermore strengthened by their test of the influence of social norms on misbeliefs (Ecker et al., 2022), also led by Lewandowsky. Moreover, this study demonstrated that if peers reject the misinformation, it can weaken the perceived misbeliefs. Therefore, linking Environmental psychology and social norms with efforts to combat misbeliefs, misinformation, and their origins should be considered.

Given the limitations of debunking misinformation, prebunking has emerged as an alternative (Jost et al., 2024; Trisha et al., 2022). The technique focuses on how individuals are commonly manipulated, rather than addressing all potential false information. Additionally, when using prebunking, the sender should assume that the receiver has no prior knowledge, and therefore, narratives should be addressed on a higher level (Trisha et al., 2022).

Further, the prebunking technique is often connected with the inoculation theory (Cook et al., 2017; Trisha et al., 2022). This theory's main aims are described by Cook et al. (2017, p. 4) as follows: (1) to educate individuals about the approaches that senders use to spread misinformation, (2) to provide a refutation of an expected argument that reveals

its fallacy. The potential of refutation and providing a common ground of knowledge is increasingly interesting for the transportation sector. In addition, Jost et al. (2024) argue in the analysis of the GEG that prebunking is important and has potential against polarization and emotionalization.

Despite the recent consensus in the literature for prebunking techniques, Tay et al. (2022, p.63) argue that debunking seems to be more effective based on the descriptive differences. To overcome misinformation, the author argues that both prebunking and debunking will be essential tools. Furthermore, the suggestions of Trisha et al (2022) that prebunking messages should be addressed with the assumption that the receiver has no prior knowledge seem to be contradictory with the output of Ecker et al.'s (2022) study, which suggests that the connection to descriptive and injunctive norms would benefit the efforts in debunking. These outlined discussions demonstrate that there is no clear consensus on which technique has more advantages in the efforts against misinformation.

Therefore, in the context of the speed limits and the electrification of cars, the two possible techniques will be further outlined by case studies and a prototype that employs the debunking method. Furthermore, the need to understand the underlying psychological factors is strengthened due to their influence (Ecker et al., 2022) and the need for closer engagement to achieve this understanding. In the following subchapters, first, an exploration of the debunking technique will be presented with a created artifact based on the misbeliefs of the electric vehicle. Afterwards, prebunking techniques to build resilience will be outlined. First, the opportunities of EnergieSchweiz (n.d.) will be examined, and afterwards, a possible direction for the German policy context will be outlined based on the previous findings.

### Debunking artifact

Figure 12-13 shows the first developed debunking artifact. The focus was on the misbeliefs of electric vehicles (EnBW, 2025; Meinung zum Einfluss von E-Autos 2023, n.d.; Sonnenholzner, 2024). It explores opportunities to address the misinterpretation of the electric vehicle's GHG emissions during its life span. Some sources argue that an

electric car causes more emissions because of its production than a conventional car (EnBW, 2025; Meinung zum Einfluss von E-Autos 2023, n.d.). Further, the argument is based on the battery production's GHG emissions; however, on a long-term perspective, the GHG emissions are significantly lower (Agora Verkehrswende, 2019, p. 54; EnBW, 2025). Also, the fear of range is still an issue (Sonnenholzner, 2024). However, studies show that the daily driving patterns are relatively low, with an average of 17.2 km in 2023 (Der Deutschlandatlas - Wie Wir Uns Bewegen - Pendeldistanzen Und Pendlerverflechtungen, n.d.). The need for new infrastructure, which Germany is slowly establishing, strengthens anxiety.

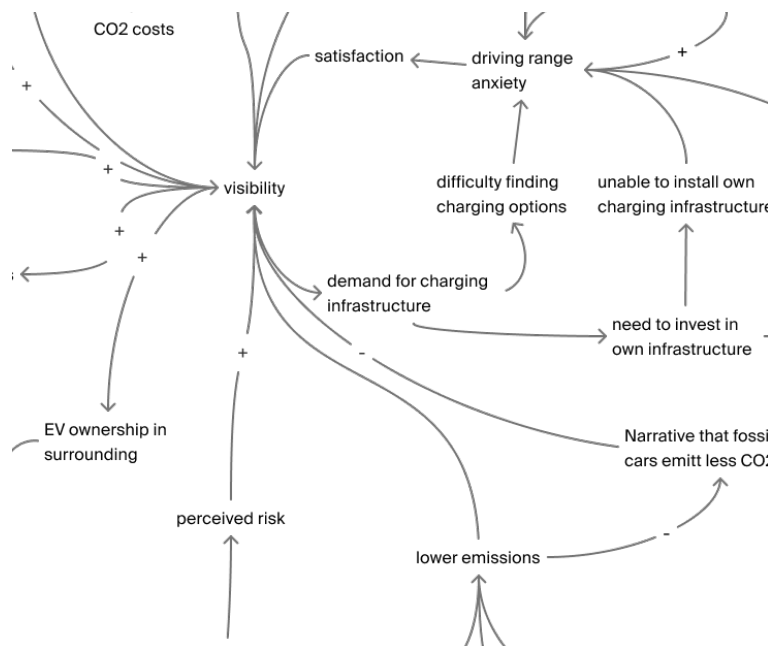
**Figure 12**  
Debunking artifacts  
about battery usage and  
CO2 emissions. (Adobe  
Mockup)



**Figure 13**  
Debunking artifact  
of the potential saving of  
an electric vehicle. (Adobe  
Mockup)

Additionally, the behavioral change in car charging triggers new fears due to its lower perceived availability and longer charging times compared to refueling combustion engines. However, the infrastructure and also the range are developing quickly now, with their range now being estimated to be 425 km by ADAC (Test, 2025). Further, the cost is still a primary concern from a short-term perspective; electric vehicles cost on average more (ADAC Kostenvergleich, 2025), but the long-term perspective may look different if the electricity price decreases.

To systematically analyze these misconceptions, causal loop mapping was employed, following Jones & Ael's (2023) systemic design methodology, which enables visualization of complex feedback relationships in behavioral change contexts. Further, the aim was to identify key system levers that the debunking campaign may address. Following their recommendations, the research process used multicapital and rich context mapping prior to enriching the causal loop. Therefore, the causal loop in Figure 14 helps to understand the causality of current beliefs and how they affect the adoption of electric vehicles. To address the criticism of Nastar et al. (2018) regarding the exclusion



**Figure 14**  
Causal loop of the electric vehicle visibility and adoption (Lennart Schiffrers 2025). Note: For the complete causal loop, see Appendix Figure A1.

of social factors in systemic mapping methods, the causal loop incorporates norms into its variables.

The systematic analysis identified three acceptance barriers: (1) misbeliefs about the GHG emissions, (2) concerns about the driving range, and (3) the charging time and infrastructure. This analysis suggests debunking strategies. To reach a large audience for the prototype and to start new discussions amongst car drivers and pedestrians, the campaign positioned itself in everyday life locations (Rammler et al., 2022, p. 16). Schwanen et al. (2012) emphasize the strengths of campaigns that intersect with individuals' movement patterns. Furthermore, by the direct placement in the intersection of everyday life situations, people can receive the information without actively searching for it. The content aims to achieve a positive emotional tone by highlighting the benefits of electric vehicles. Further, to address the "Reichweitenangst", the artifact used an everyday pattern to illustrate the amount of battery that is remaining after a typical commuter's day. In addition, to make the message more approachable, it used an informal tone.

In sum, the prototype functions in a sense as a practice-based research method (Rust et al., 2007). Therefore, it is appropriate as a first conversation starter in discussions and to elaborate on different solutions for long-term and short-term messaging. However, the Interview No. 1 with EnergieSchweiz showed that a limitation might be that those public campaigns are costly and, as a result, not always used.

In addition to the efficacy, the misjudgment highlights that despite the high consensus on climate change in Germany, as outlined in the "Transportation sector" chapter, the need for detailed scientific messages may still be necessary to address remaining misbeliefs (EnBW, 2025; Meinung zum Einfluss von E-Autos 2023, n.d.; Sonnenholzner, 2024). Therefore, those messages may have an effect where the perception and saturation of the knowledge is still not available (Tschötschel et al., 2021).

## Prebunking alternatives

Conventional prebunking methods rely, as described, on direct refutation or the education of misinformation. However, alternative strategies emphasize proactive positive messaging and comprehensive information transparency to build public acceptance before opposition narratives may emerge. Therefore, this section emphasizes two such approaches: (1) Switzerland's voluntary measurement strategy and its communication through EnergieSchweiz (EnergieSchweiz | Das Energie-Förderprogramm des Bundes, 2024) and (2) Göpel's (2025, pp. 119-121) suggestion of a transparent governmental policy page.

EnergieSchweiz is a support program from the Bundesamt für Energie (BFE) in Switzerland. It relies on a voluntary approach for the implementation of the measures (EnergieSchweiz | Das Energie-Förderprogramm des Bundes, 2024). It focuses on three sectors, which cover 74% of the current energy consumption: (1) Building efficiency, (2) mobility, and (3) industry and services. It supports projects, executes public campaigns, and offers consulting services. The mobility of private households and businesses utilizes the pointed-out prebunking techniques to inform the public about the costs, GHG emissions of different car types, and also the daily usage patterns. These were pointed out in the debunking article above (EnBW, 2025; Meinung zum Einfluss von E-Autos 2023, n.d.; Sonnenholzner, 2024). By also covering success stories for different domains (Die ersten Erfahrungen mit einem E-Auto, n.d.), the website can establish a close relationship with the target's behaviors, values, and norms.

These voluntary approaches that are being used in Switzerland represent a promising approach to consider in the first step. However, also in the GEG, these efforts were also on a voluntary basis before, and subsidies were provided by the BAFA (Infoblatt zu den förderfähigen Kosten, 2023), but even with the voluntary approach, the acceptance before the consideration was notably low (Manuel Frondel et al., 2022). However, the subsidies were not given to the extent of the communication, as we see with the EnergieSchweiz case. Therefore, the following questions might be further explored: What were the differences between the

German and Swiss approaches? How does the transition in the Swiss context of policies from voluntary to obligatory look like?

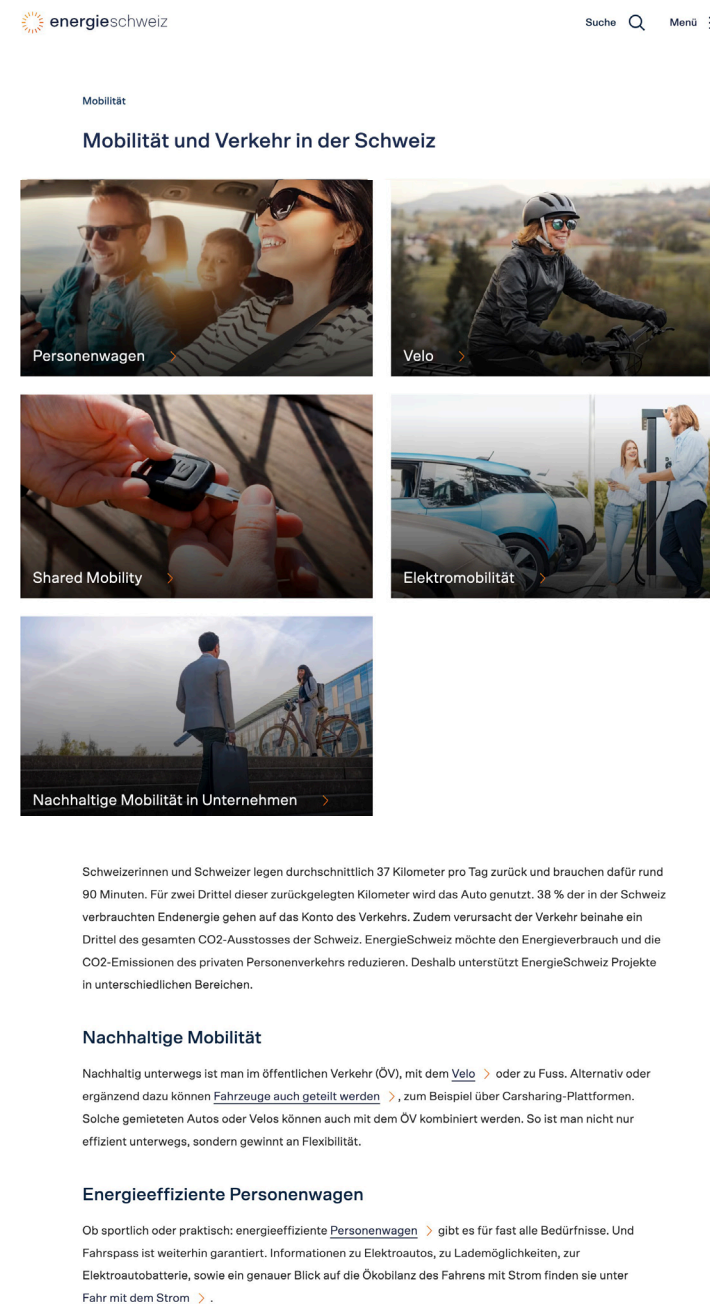


Figure 15  
EnergieSchweiz website (Screenshot 2025)

In addition, the approach of EnergieSchweiz reflects aspects that Göpel (2025, pp. 119-121) points out in her book. Göpel suggests providing a central information point for societal goals, measures, evaluations, and further development directions. For the evaluation's aspect, the Energiemonitor, a subpage of the Zeit newspapers (Bauer et al., 2025), is mentioned as a positive example. It provides a visual data access to the energy supply in Germany. By including the fossil fuel price, electricity price, and energy production, it ensures a transparent view and direct comparison. Further, the page provides insights into the mobility transformation, into how vehicle electrification is progressing, and the progress towards the goal of banning the combustion engine by 2035. These presented numbers explain the positive effects of the Energiewende and try to build trust within society. There exist other similar tools (Agorameter, n.d.; SMARD | Stromerzeugung Und Stromhandel Im Dezember 2021, n.d.) also provided by the Bundesnetzagentur, but there, we can only see a small part of the dataset. Also, the Zeit is an established newspaper that enables it to achieve higher site traffic, as reflected by the broad engagement of the page with 14,763 comments as of 9 July 2025.

The achieved transparency may also be beneficial to change the current low trust towards the government. The study by Betsch et al. (2025, p. 32) indicates that 52% of respondents do not trust the government to address climate change effectively. As a result, the co-elaboration workshop showed that, in response to the question “what you would need to trust new measures,” transparency would leverage the trust.

### Misinformations in the climate debate summary

To summarize this chapter, both the debunking (Cook et al., 2017; Tay et al., 2022; Trisha et al., 2022) and prebunking (Jost et al., 2024; Lewandowsky, 2021; Trisha et al., 2022) techniques have their challenges, and there seems to be no clear consensus on which technique communicators should favor (Tay et al., 2022, p.63). In conclusion, communicators should consider both techniques in communicative efforts to address misinformation. However, further studies in the context of the German mobility

**Figure 16**  
Zeit Energiemonitor website (Screenshot 2025).  
Note. The Energiemonitor is displaying different energy datasets from Germany.



transformation may help to investigate the differences between the two practices. Also, possible long-term measures in the prebunking should be further explored (Tay et al., 2022). For measures in the transportation sector, the EnergieSchweiz from the Bundesamt für Energie of Switzerland (EnergieSchweiz, n.d.) may be a promising practical source. However, the difficulty remains in capturing society's attention with the content. Passive receptive knowledge acquisition against misinformation may be the direction to reach a broad audience. However, the possibility of receiving more in-depth information should also be explored as outlined above.

# Further research and design outcomes

## Design thesis

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p. 112	<b>Co-elaborating AI and social justice in the combustion engine ban debate</b>
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# Introduction

This chapter outlines how design artifacts and the designer's role can support a transdisciplinary research approach in climate communication, fostering resilience within society. This approach is crucial for overcoming the knowledge-action gap. As a foundation for the transdisciplinary research, a set of twelve climate communication principles was developed. These principles are based on previous research and were later informed by field interactions. By focusing on the principles of normative, systemic, and applicable areas, this will underline the need to address all layers when working in climate communication. Afterward, the chapter will outline observations from the climate district Zähringen in Freiburg im Breisgau, a facilitated workshop at the Environmental Observation Conference on AI and Social Justice, and observations from a Seminar for Youth Climate Action of the European Council. To further bring the principles into practice, a Climate communication chatbot based on the principles will be outlined. Lastly, an essay and a chatbot from a mountain's perspective will describe how they can support the inclusion of a more-than-human lens in climate communication.

# Climate communication principles

As outlined in the chapter communication guidelines, for example, the one titled “Klimakommunikation im Verkehr” (Mathias Schmid, 2023), guidelines for communicating to the public already exist (see also Grahl et al., 2022; TU Berlin, Fachgebiet integrierte Verkehrsplanung et al., 2023). However, these approaches mainly focus on communication as a single entity. With the new principles, the approach now emphasizes the complexity and interconnection of communication. It does this by drawing on systemic and normative views, along with applicable principles, to develop a strategic framework. This interconnection can be beneficial. It allows for more reflection on the work and increases awareness of the broader context of the measure. Furthermore, the approach supports treating communication more as a catalyst than as the endpoint of measures.

The focus on the two measures, the combustion engine ban and the speed limit, may narrow the use case of

<https://shifting-perspectives.lennart-schiffers.de/climate-communication-principles>



the principles down. Principles such as “Make the change of behavior visible” may help minimize pluralistic ignorance and lead to a narrowed view of their specific characteristics. However, this chapter broadened the focus by including further practice-based research, such as observations in a climate district or a youth climate action seminar. This broadening strengthened the validity of the principles. Therefore, applying it in other fields may be done with care. However, especially in communication with people from everyday life and the transportation sector, there may be only a slight divergence. Another limitation may be, as outlined in the chapter on communication guidelines, the criticized didactic approach of the guidelines. To that end, the following chapter outlines an alternative path for using and learning from guidelines in daily practice.

## Normative

### Collective responsibility

Current climate change mitigation communication emphasizes individual responsibility, such as using a CO2 calculator and framing climate action as an individual effort. A shift toward collective responsibility is necessary, using language that frames climate action as a collective effort and measures that distribute responsibility across society. For example, a framing of how we could change our district could create a sense of belonging and shared purpose. However, factors such as industry and disparities in CO2 emissions across groups should not obscure the unequal contributions to emissions. Reframing the effort as a collective action to mitigate and adapt to climate change can help foster broader behavioral change.

### Reflect on the effects

Ethically reflect on how climate actions and messaging affect different groups, particularly the most vulnerable, when communicating about climate change. For that, an ongoing evaluation through quantitative data surveys or qualitative methods, such as interviews or workshops, helps create a basis for reflection. Also, monitoring ecological effects is crucial, as more-than-human actors are important to consider in climate action.

### **Include marginalized groups**

Working toward social justice is essential for sustainable climate action, as climate change widens existing imbalances. Also, the overall acceptance of climate action measures often depends on their social equity. Therefore, policymakers must foster inclusion of marginalized and vulnerable groups in engagement formats, such as debates. However, the groups are often hard to reach; therefore, alternative methods must be considered. These can, for example, be through credible messengers, sports associations, or a 'Stammtisch.' Further, policymakers should aim to develop equitable and accessible measures and communicate them appropriately; in this way, these groups feel more integrated and involved in efforts to mitigate greenhouse gas emissions. In addition, these imbalances should be acknowledged and discussed with them to recognize their current situation.

### **Communicate transparently**

The communication should be transparent. For example, policymakers should communicate transparently even when a measure is initially perceived as negative. Otherwise, the trust in institutions may decline. Furthermore, transparent communication should reflect social consensus rather than distort it. Reflecting the consensus may help to avoid pluralistic ignorance, as visible in the speed limit debate in Germany. The goals of initiatives should be communicated clearly so that participants are not frustrated and outside observers can understand the reasoning.

### **Recognize interconnections**

Do not view climate change and climate action in isolation, as we now face a polycrisis. It is more crucial than ever to see the interrelatedness of climate action measures with other fields and crises. Even at the local level, measures and their potential for injustice need to be understood within the larger picture. This understanding helps policymakers identify the points where communication can effectively intervene in the policy process. For example, a local car-free block may affect the acceptance of measures

### **Systemic**

### **Applicable**

at the government level. However, these initiatives must be considered and undertaken with care, as they can also have negative effects on the broader picture.

### **Navigate power structures**

Recognize and work with the power structures. Media, lobbying, and politics can have unforeseen effects on public perception of measures. Institutions should not underestimate these power structures. Actors such as media outlets often have active roles in framing and informing the public. By recognizing them as a part of the communication, it is possible to work with them and build sustainable barriers against potential misinformation and resistance to new climate change mitigation measures.

### **Contextualize communication**

Values, norms, and attitudes differ across diverse societies. Therefore, contextual understanding of the underlying interrelated patterns is necessary for communication to be meaningful. Policymakers may do this by framing debates and crafting positive narratives that adapt to the audience's context. Furthermore, translating measures into everyday life situations contextualizes complex measures and helps people understand what they will mean for them. This could, for example, be done by organizing open home days or open balcony days where neighbors can visit homes that already have installed solar panels or a new renewable heating pump.

### **Communicate proactively**

Moving away from defensive communication helps to build trust in society. A first step is to see communication not as the end of the regulatory process but as a catalyst for understanding different groups and for shaping measures with them. Furthermore, by being proactive and bringing in hopeful messages that foster new conversations within society, it helps to form new engagement formats. This proactive approach not only helps to debunk misinformation but also spreads the correct information beforehand.

### **Build long-term structures**

In climate action, it is important to build long-term structures, as understanding the context and intervening takes time. Communication should build resilience over time, not only convey finished measures. Building trust and acceptance for behavioral change requires sustained effort. Therefore, it helps to plan projects with a long-term perspective and to regularly review and adapt the structure as circumstances change. For example, establishing new action groups in climate districts is a long-term investment. Facilitation and support from policymakers and their co-operating institutions should be planned not on short-term funding cycles. These considerations and plans should also be communicated to participants involved to transparently show the duration of support and intention of the communication.

### **Foster participation**

Communicate with them, not just to them. Establishing shared communication among especially vulnerable and marginalized groups is important. This includes, for example, running open workshops with them, giving them the power to develop new formats, and iterating together on the topics to better understand and communicate with them. When working with others, it is helpful to set the right expectations from the beginning. Furthermore, beyond one's own participation, using one's own power to enable others and to participate should be considered throughout the processes. Further, including them beyond the formats is also a crucial step. Ensure everyone, especially under-represented groups, is empowered to participate not only in workshops but also in daily policy conversations. Focusing on the location and the area to facilitate and promote initiatives in neighborhoods where lower-income groups live could help support them and give them a voice.

### **Make the change of behavior visible**

Visualize behavioral change within groups to foster change in values, norms, and attitudes, as trusted community leaders and organizations are a promising source of influence. This visualization may be achieved by providing visual cues,

such as showing how many people have cycled along the street each day, or for vehicles, the environmental badge, or the differentiation of license plates between combustion and electric engines. However, for non-material change, it is more difficult; exploring with participants collectively how to foster positive conversations within their groups could raise the visibility, for example, through art projects or participatory formats such as climate districts or campaigns, but also through initiatives such as open basements, where citizens show how they have transformed their heating or solar systems. Therefore, visualizing a behavior change may also be achieved more implicitly and be part of a long-term structure.

### **Use psychological factors deliberately**

People are more likely to engage with information that aligns with their values, norms, and attitudes. Further emotions can play a role. Negative emotions may trigger helplessness, whereas positive emotions may help people receive and act on information. Framings, including factors such as cost savings, community strengthening, or health benefits, can foster positive emotions. Also, Visions can help here, yet for that, it also has to be shown how it is possible to reach the vision. Using the psychological factors should benefit the audience. Therefore, the framing should be done with care and continuously reflected on, depending on the targeted group, to avoid manipulation.

# Co-design through climate districts on the Municipality level

In contrast to the citizens' council outlined in the previous chapter, a climate district uses a co-design approach that promotes local citizens' climate action through targeted facilitation and support. In Zähringen, this support includes: (1) financial resources, (2) providing space, (3) collaboration with other stakeholders, (4) facilitating workshops, and (5) communicating measures. On the other side, the term "climate district" is often used in urban development (see, for example, Übersicht der Klimaquartiere, n.d.). Now, a climate district is gaining popularity as a participatory initiative to support local action (Antoni et al., 2026; Pilotquartier Netto-Null, n.d.; Unser Klimaquartier, n.d.). These initiatives aim to help districts move towards climate neutrality by reducing GHG emissions and strengthening resilience. They also focus on building a stronger community and improving the quality of life. Institutional structures such as municipalities and NGOs often implement climate action through collaboration.

<https://shifting-perspectives.lennart-schiffers.de/projects/climate-district>



**Figure 17**  
Multiplier workshop  
(Michael Spiegelhalter, Stadt Freiburg 2026). Note. Presentation of the climate district Zähringen.



**Figure 18**  
Multiplier workshop  
(Michael Spiegelhalter, Stadt Freiburg 2026). Note. Iterating and gathering climate actions in themed groups.

**Figure 19**  
Walkthrough by  
AllWeDo of the results from  
the multiplier workshop.  
(Marc Doradzillo / Stadt  
Freiburg2026)



**Figure 20**  
Vision image created  
based on participats input  
at the action and vision  
workshop (Marc Doradzillo,  
Stadt Freiburg 2026). Note.  
The image was modified by  
ChatGPT.



**Figure 21**  
Group elaborations on  
the areas of action by the  
participants at the action  
and vision workshop (Marc  
Doradzillo, Stadt Freiburg  
2026).



**Figure 22**  
Climate district pre-  
sentation by AllWeDo at the  
action and vision workshop  
(Marc Doradzillo, Stadt  
Freiburg 2026).



In the case of the observed climate district Zähringen, the City of Freiburg im Breisgau, AllWeDo, and the Haus des Engagements work together to execute the project (Unser Klimaquartier, n.d.). Because the district is located within the previous research area, Germany, previous research findings can be applied here. Further, the climate district supports the strategies policymakers may use to support climate change mitigation measures and their acceptance. The overall aim of the project is to enable citizens to implement their own projects related to climate change mitigation and community strengthening. Therefore, by enabling citizens, the project may help close the knowledge-action gap discussed earlier in the transportation sector. For that participation and move towards action is in the project initiated through (1) a welcoming event that took place in October 2025, (2) a multiplier event to analyze existing infrastructures on local climate action and ideate on new ideas in January 2026 (Diekmannshenke, 2026a), (3) a vision and action workshop in March 2026 (Diekmannshenke, 2026b), and (4) different moderated activities to form in focused groups climate action initiatives.

### **Participation**

The climate district in Freiburg in Breisgau held one major event, the actions and vision workshop, to convince citizens to participate in additional formats to ideate on possible actions they want to execute. In Zurich, the Pilotquartier Netto-Null - Zürich Binz & Alt-Wiedikon (n.d.) takes a different approach. On one side, they provide a publicly accessible platform to submit ideas and, afterward, vote (Project Ideas - "Contributing to Zurich's Future," n.d.), as well as the possibility to join in person for events such as workshops to ideate or refine possible climate actions citizens could take on (Agenda - Meetings - "Contributing to Zurich's Future," 2025). This hybrid approach taken by the climate district in Zurich may help to increase the participation from marginalized groups within the district (Herlo, 2024, p. 165). Therefore, if online participation in idea development is chosen for future climate districts in Freiburg im Breisgau, a hybrid solution may be favored. However, the adoption may be done with care, as the social context and

voting habits differ between Zurich and Freiburg im Breisgau, given that Switzerland has a more direct democracy. To better understand the context for the stakeholders' discussions with both climate district teams, exchanging valuable experiences may be helpful for both sides. However, with the Rahmenplan (Mitmachen Freiburg, n.d.), a similar online participation already took place in Freiburg im Breisgau. The Rahmenplan was running from 19th February to 12th March 2026, addressing infrastructural change within the district. For that, citizens could hand in ideas and discuss them collectively. Online participation could also help existing groups gain visibility by allowing them to submit ideas and potentially attract new supporters.

### **Transparency**

However, online participation would need to be transparent and clearly communicated, as participants in the action group raised concerns because they did not receive any updates on it after one month. The observations overall amplified findings from previous workshops and analysis of the current state of research. Internal meetings, workshops, and action sessions addressed the lack of transparency regarding project goals, the results of communication initiatives, and their impact. In these cases, the lack of transparency led to a certain mistrust and frustration toward the initiative and its activities, affecting constructive group discussion. Further, the frame of such miscommunication can also persist as an example of a project in Freiburg im Breisgau, which was still brought up by participants years later (Report from 14.04.2026).

### **Long-term view**

Also, action meetings highlighted that building participation and trust is a gradual process; the first meeting for the "My Community" focus area had limited attendance, with only 3 participants (Report from 22.04.2026). The project's 1.5-year duration presents challenges for developing sustainable structures that build trust among citizens. Lessons from a previous climate district in Brühl showed a continued need for support after project completion, yet lacked long-term funding, relying instead on volunteer

efforts (Report from 30.01.2026). In comparison, the climate district initiative in Zurich has set a six-year timeframe (Pilotquartier Netto-Null - Zürich Binz & Alt-Wiedikon, n.d.). Therefore, observing the different effects would be interesting for consolidating how well the actions were formulated and how the initiative affected the overall climate transformation. Furthermore, because of the time differences between the two climate districts, validating the impact of a long-term transformation approach may be helpful for future formats.

### **Local multipliers**

As explained in Chapter Norms and social identity, involving local multipliers such as sports clubs or existing initiatives could enhance communication, as people often place greater trust in them. There is still potential for the project to use these existing structures more effectively to increase participation. However, this involvement of key influencers requires significant resources and a clearly communicated added value for the groups to collaborate.

### **Visions and emotions**

In the vision and action workshop, to visualize the vision, each group of moderators created, in the background, an AI-generated image based on a text-based vision they worked from. In the end, the visions were presented to all the other participants. The images appeared to elicit positive, hopeful emotions among the participants. These emotions may now be crucial to uphold during the following events and, through moderation, enable hope of changing the neighborhood. Therefore, actively supporting the participants in realizing parts of the vision will be important. However, even though it had been communicated that it was just a vision and that there might be mistakes in the action meeting, there was concern that the trees planned for the Zähringerplatz images were missing (Report 30.04.2026).

Public participatory events in the project, such as the Action and Vision Workshop and the meetings of the dedicated action groups, were always open to the public. All citizens of the district Zähringen were informed about the action and vision workshop, for example, via letters and

posters. Translators were provided to enable people who would otherwise be unable to participate due to language barriers to take part in the co-design process. These actions underscore the need to leverage power structures and support marginalized groups' participation to minimize social injustice. The workshops and a previous climate communication lecture (Report from 05.11.2026) showed that the formats are currently primarily engaging older age groups, particularly those aged 40 and above. Therefore, iterating on how to integrate the other age groups and segments may be important for further initiatives to foster a stronger sense of community and potential impact across all segments.

### **Limitations**

Limitations of the observations may include that the observations only occurred only from January to May 2026 due to time constraints, and therefore, it was not possible to observe the full process. The climate district is still ongoing, and only the first action meeting could be visited. Therefore, viewing its further development until the planned end in January 2027 may be interesting. The end also shows that the city and their team's support for the project AllWeDo and Haus des Engagement ends. Viewing how the groups may continue afterward may also be of interest for climate communication, to see if it is possible to uphold the hopeful frame to build actions for climate change mitigation. Furthermore, being from outside Freiburg im Breisgau sometimes led to a lack of local knowledge. However, an outsider's perspective can provide a nuanced view of events, may have fewer local preconceptions about the topics, and should therefore be seen not as a limitation but as a strength of the observation.

### **Summary**

Climate districts may help support local action and amplify behavioral change. Further, the initiatives may benefit from findings in climate communication, as similarities have emerged in their struggles. Also, engaging with the issue of climate change in an accessible way may systematically strengthen acceptance of climate change

mitigation measures. Furthermore, the resilience to misinformation and influences from different power structures. For that, it may be useful to assess acceptance of climate measures before and after a climate district initiative to see the effects of such efforts. This type of validation will be further drawn out in the impact chapter. In conclusion, the efforts appear promising in systematically approaching climate communication to foster local participation in climate change mitigation and adaptation. However, the final impact may still be difficult to measure, as these initiatives are also resource- and time-intensive.



**Figure 23**  
Multiplier workshop  
(Lennart Schiffrers 2026).  
Note. Presentation of the  
climate district Zähringen.

# Observing a youth climate action seminar

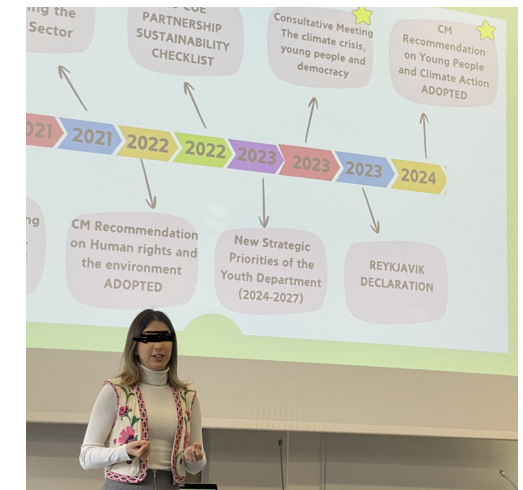
The attended seminar “Equipping Youth with Skills for Climate Action: Youth Engagement and Effective Information Sharing,” held by the European Youth Information and Counseling Agency in collaboration with the Council of Europe, took place in November, from the 11th to the 13th (Alves, 2025). In total, we were 18 participants from 14 countries, in addition to the host, facilitator, note taker, and guests for specific input talks or panel discussions. The main objective of the seminar was to identify ideas for implementing the recommendations on young people and climate action.

These recommendations (Council of Europe, 2024) covered the following key areas: (1) Protecting Rights, (2) Youth Participation, (3) Green Jobs and Education, (4) Youth Workers, (5) Healthcare and Eco-Anxiety, (6) Access to Information, and (7) Tackling Discrimination and Promoting Equity. Similar to the criticisms of the guidelines from Mathias Schmid (2023) in the chapter “Communication guidelines”, workshop participants raised concerns about the strong didactic approach adopted for the Letter of recommendation. Here, especially, it was highlighted that the recommendations are intended for youth and are even less understandable to them (Report 13.11.2026). The problem of



**Figure 24**

Left figure: Presentation of an participants school climate action project (Lennart Schiffers 2025).



**Figure 25**

Right figure: Presentation of the Recommendation on young people and climate action (Lennart Schiffers 2025).

mis- and disinformation among youth was discussed in a panel (Alves, 2025) and aligns with the findings of the combustion engine ban. To further combat the mis- and disinformation, the presented tools also relied on conventional methods, as outlined in the chapter “Pre- and debunking misinformation.” The bridge and the necessity of a systemic approach, as highlighted in the chapter “Prebunking alternatives,” were missing here. Despite that, five different bottom-up initiatives from other participants were presented afterward. The initiatives showed how school initiatives and NGO initiatives targeted at youth were bridging the knowledge-action gap. In the initiatives, understanding the local context and framing positive narratives proved crucial. Furthermore, the participatory and collective aspects of the actions were visible in all projects and also highlighted by the presenters (Report 13.11.2026).

Given the focus on information sharing and engagement, the seminar was highly relevant to climate communication. The seminar supports research findings from previous chapters, such as (1) the relevance of dis- and misinformation, (2) the role of positive emotions, (3) how a collective framing plays a role in taking action, and (4) the segmented communication. However, the projects presented in the seminar also highlight that the approaches cannot be adopted without understanding the local context of the segment, as various factors, such as attitudes, norms, and values, may differ.

# Interactive museum installation on future narratives

At the Kornhausforum in Bern's city center, the exhibition "Was wäre wenn? Vom Spekulieren und Handeln für die Zukunft" ("What if? Speculating and acting for the future") (Kornhausforum | Was wäre wenn?, n.d.) took place from the 28th of November 2025 to the 1st of February 2026. The "morgenZeitung," developed with fellow students and our supervisors, Karin Fink and Florian Hauswirth, sought to answer "What if" by creating an interactive newspaper booth to envision alternative futures by taking on the editor's role on weekends and for special events. Across eight sessions, the results of the interaction with the visitors could be observed. Two further sessions were conducted at the social design conference in Lucerne to test the concept. The format invited visitors and passersby outside the museum to engage in conversation about what they would like to read in a utopian newspaper article. Through the conversations, the editor would create prompts and the first bullet points for the newspaper with the help of a chatbot such as Claude. Afterward, visitors could check whether the list aligns with their thoughts and priorities, or adjust the bullet points before the final article is printed. Once the

<https://shifting-perspectives.lennart-schiffers.de/projects/what-if>



article is printed, visitors can edit it throughout the day by striking out passages or writing notes in the margins. At the end of each day, the final newspaper is printed by copying the edited versions.

## Relevance to the thesis

The installation was relevant to climate communication, as constructive thinking can challenge current standards and identify solutions unconsciously, making it a useful tool for strengthening acceptance of the climate transformation. Furthermore, as discussed in the chapter on pluralistic ignorance by Miller (2023), increasing the visibility of climate change and its solutions by discussing constructive futures helps mitigate pluralistic ignorance. By using a utopian vision and fostering positive emotions, the increase in visibility may be further strengthened. Heitfeld & Thiele (2024) reinforce this point, noting that, besides beliefs, groups also share emotions and amplify them through discussion, leading to similar motivations.

## Outcomes of the installation

The main topics the visitors' utopian articles strived for were: (1) that the climate crisis should be a shared responsibility and the issue itself should not be seen as a siloed issue but rather as a whole, (2) that we within the society should communicate more with each other, (3) that media outlets may want to focus more on positive news, (4) that we could learn from the values that existed in the past and (5) Notably, visitors also emphasized the individual responsibility such as a CO2 calculator which seems to contradict point (1). These results strengthen previous findings, especially for the role of collective framings, the role of positive emotions within advocacy, and the overall role of communication within groups.

## Outlook for future formats

Beyond media outlets, smaller projects such as the "MorgenZeitung" and more specific initiatives that advocate for climate change mitigation and its positive impacts may help foster more frequent and systematic discussion of positive narratives in public discourse. The installation

showed that a utopian newspaper booth can serve as an entry point for a conversation about sensitive, negative issues, such as the climate crisis and its mitigation efforts.

For future formats, it may be interesting to bring the booths to public events, for example, within a climate district such as in Freiburg im Breisgau. The local positioning there could help to understand the public better by understanding their wishes and visions, and translate them into strategies for future events and campaigns. Also, during conferences, the format may be used to collectively iterate on the future of the conference topic. For that, question cards could provide an easier entry point by making it more tangible before the first interaction with an editor.



**Figure 26**  
Generated and edited news articles of the What if installation (Lennart Schiffers 2025). Note. The articles were written with support of claude.



**Figure 27**  
What If installation setup in the Kornhausform in Bern (Lennart Schiffers 2025). Note. Every student had basde on their master thesis its own themed shield.

# Co-elaborating AI and social justice in the combustion engine ban debate

The 10th Environmental Observation Conference took place in Bern on the 27th and 28th of November. The conference target group was mainly Environmental experts from the DACH region (environmental and research institutions), communications experts (authorities, NGOs), media professionals, data officers, and AI experts (Künstliche Intelligenz in Der Umweltbeobachtung Und Berichterstattung, n.d.). Because the overall conference theme was artificial intelligence, the workshop that was held there focused on how marginalized groups can be supported and included in the transition away from combustion engines. It also examined what role artificial intelligence might play in this transition.

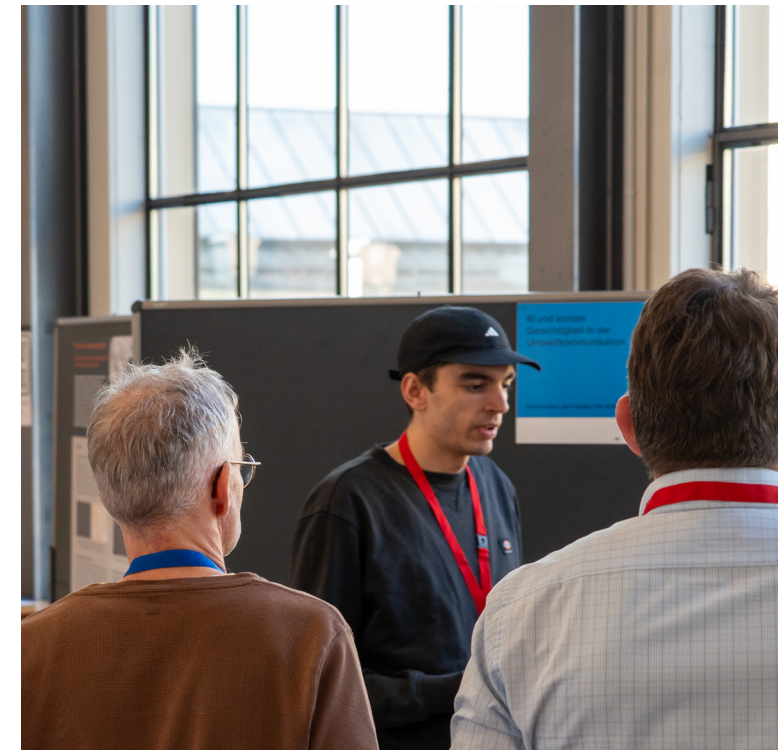
## Workshop outline

The workshop consisted of three sessions and began with a brief presentation of the overall topic, followed by a discussion of the marginalized group's scenario and context. The marginalized group was, in this context, defined as lower-income groups, as in previous measures

<https://shifting-perspectives.lennart-schiffers.de/projects/ai-and-social-justice>



**Figure 28**  
Workshop discussions group 1 (Elias Baumann 2025).



**Figure 29**  
Workshop discussions group 2 (Elias Baumann 2025).



by the German government; people with higher incomes mainly profited from the subsidies. For the workshop, it was not possible to directly include the marginalized groups. Still, the approach was to use existing knowledge and identify gaps in how environmental experts approach them. Afterwards, the mapping was explained and each of the questions, which were the following: (1) “Which AI tools could break down barriers to participation?” (2) “Where does AI increase the risks of exclusion for certain groups?” (3) “Which analog methods work in practice? (Social associations, businesses, local initiatives)” and (4) “What forms of participation would be needed?”

### Outcomes of the workshop

Overall, the outcomes of the three workshops showed that participants struggled to find ways to communicate and involve the group in discussions of climate change mitigation. Therefore, the workshop’s observations amplify the need for policymakers to include marginalized groups more in debates on social justice. However, despite their concern, the groups still came up with many ideas and had discussions within those 30 minutes. The ideas often aimed to make the electric vehicle and its benefits more tangible by showing how they would be used, for example, a scenario-based AI bot, where people could type in their daily driving patterns, or in the analog world by providing pop-up test drives in their neighborhoods. Further, the outcomes support the findings from the chapters “segmentation” and “norms and social identity” by using credible messengers and approaching communication within segments. As the majority of responses focused on everyday interactions in their everyday situations, ranging from the “Stammtisch” to cooperating with local sports associations. The reliance on everyday interaction to reach the group aligns with Herlo’s (2024) findings, which indicate that marginalized groups in social and economic settings may have difficulties with digital participation. Therefore, social participation should be seen as the leverage and the role of an AI tool rather than a supplement or assistant. The need for policymakers to consider ethical considerations in their communication was highlighted by concerns across all three workshop sessions

that the current data the AI is using may widen existing inequalities due to imbalanced training data. The current imbalance is further supported by the author Gabriel (2026), who warns that biased AI training data may worsen it. This concern was strengthened by the rise, within two sessions, of the possibility of a lack of trust in AI. These two findings may correlate and be considered when using AI tools within the process.

The workshop showed that there is still a gap in how marginalized groups are included in discussions of the combustion engine ban for 2035 and in broader climate change mitigation communication. Furthermore, the navigation with Artificial Intelligence should be made with care. For that, the elaboration emphasized findings from Gabriel (2026) that AI may be more used as an assistant than a replacement tool, and that the most crucial part remains in social interactions and in reaching groups effectively. There may be potential for further workshops with these target groups to raise awareness and incorporate the ideas into their daily work. For that, the topic in the workshop itself still needs to be introduced, and, with a longer workshop duration, a reflection on how the participants could integrate it into their work could be incorporated. Nevertheless, in discussions, marginalized groups should not be generalized, as approaches may differ, depending on the group and context. This may also add another layer of complexity to the discussion. Also, it may show the need to target different segments differently based on their behavior.

**Figure 30**  
Workshop discussions group 2 (Elias Baumann 2025).



# Reflective chatbot for the climate communication principles

The goal of the climate chatbot is to find a way to make the principles' didactic nature less rigid. Through an iterative process in which the model's instructions were iteratively adjusted, a reflective chatbot was designed. The climate communication chatbot runs locally on the gemma3:4b\* model. It is designed to be reflective and to build on previous insights into climate communication principles and their limitations. In addition to using an open-source model, it also relies on the climate communication principles from the previous chapter and predefined questions as the basis for responding to user prompts (see Figure 31). The instructions allow for steering the model and leveraging the principles, while the tone and different modes are also defined at this stage.

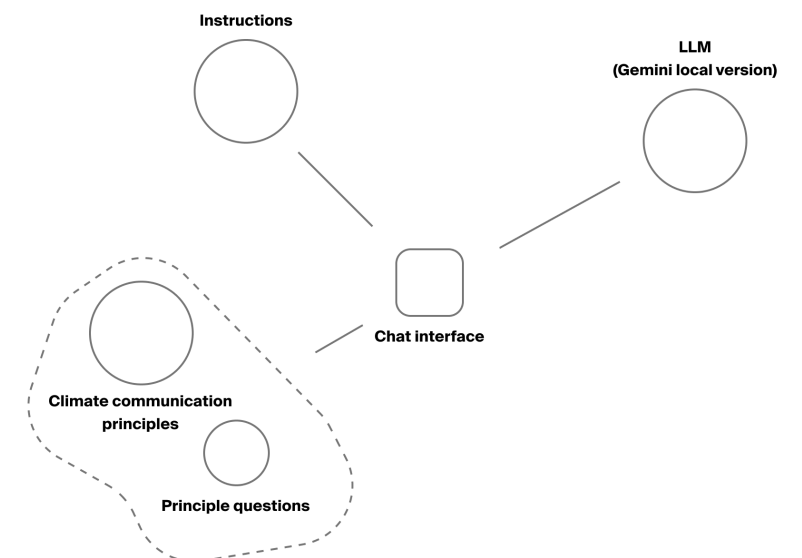
## How it works and comparison to a non-designed LLM version

To outline the chatbot's functions, the prompt "I am conducting a workshop with citizens to define climate measures for the neighborhood and encourage them to implement these measures" will be used to analyze a

<https://shifting-perspectives.lennart-schiffers.de/projects/climate-communication-chatbot>



**Figure 31**  
The infrastructure of the local chatbot. (Lennart Schiffers 2026)



non-designed model and the chatbot's reflective system. First, the section will analyze the non-designed system and afterward compare it to the results of the designed version.

The non-designed system yields an overly descriptive 868-word response (see Appendix B). The response consists of a detailed pre-planning of the workshop, a workshop structure including the schedule and methods, a post-workshop follow-up, and questions to dive deeper into the topic. These details demonstrate that the AI tries to pretend it already knows the author's situation based on the system's data and the pattern similarities with the prompt. However, even with that little information, the AI gives back a detailed list of tasks. Therefore, it may be that the AI is pretending to know the situation and how to navigate within the complex social context in which the workshop with people living in the district is planned to take place. However, in the previous chapter, it was outlined how crucial it is to understand the context in which the communication is situated. Therefore, the chatbot may be designed around this limitation. The non-designed response removes the

# Climate Communication Chat Bot

Given the increasing use of large language models for decision-making, users must respect their capabilities. Therefore, for the overarching project of the “Climate Communication Principles,” the large language model is used to provide reflective questions based on the Principles.

I am conducting a workshop with citizens to define climate measures for the neighborhood and encourage them to implement these measures.

Given my position as the Rigi mountain, let's consider this workshop with citizens.

Considering the long-term stability of this landscape, what inherent values or priorities – beyond simply “reducing emissions” – might the citizens be holding that could unintentionally shape their proposed measures, and how might we gently surface those unspoken priorities to ensure a truly resilient and equitable outcome?

This question seeks to understand the underlying motivations and assumptions guiding the citizens' choices, considering the systemic principles of contextualizing communication and building long-term structures. It encourages us to look beyond immediate action and consider the potential for unintended consequences, promoting a more thoughtful and robust approach to the workshop's objectives.



**Figure 32**  
Early iteration of the chatbot interface and mechanism of its instructions. (Lennart Schiffers 2026)

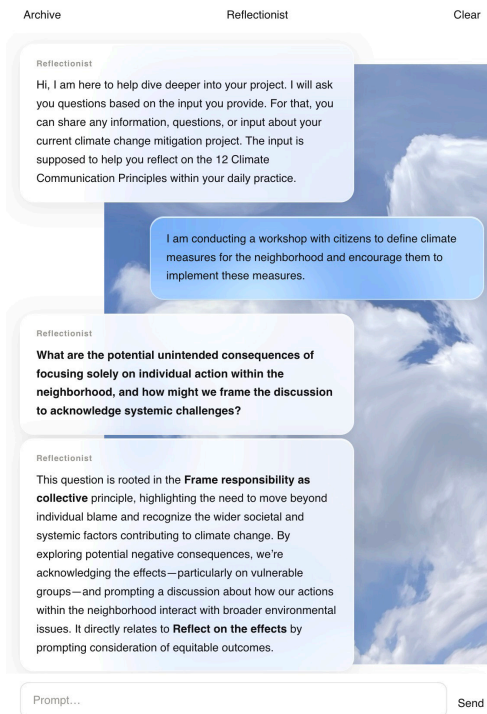
author's need to think and reflect about the setting and the details of designing the workshop, which may be crucial to its success, as they may have valuable implicit knowledge of the situation, the needs of the participants, and the neighborhoods.

Through the principles and instructions, the chatbot now aims to avoid an over-engineered solution by generating questions that prompt policymakers to reflect and decide for themselves. These are based on the principles, and in a second response, the LLM explains why it raises the specific question and how it is linked back to them. This form of response now aims to shift authorship and decision-making back to the policymaker. Establishing a learning environment to incorporate the principles and the question over time without the chatbot in the daily experiences.

## Ethical Considerations

The chatbot aims to build a local, safe environment where data remains on the running device to explore how interdisciplinary knowledge can be applied to policymakers' operational fields. By acknowledging the limitations of LLMs in social contexts and the background that AI should not be used as a replacement but instead as a specialized assistant (Gabriel, 2026), it was decided that the chatbot would raise questions to actively engage in thinking about the climate communication principles. These questions are further linked to normative values to better navigate within climate change mitigation.

**Figure 33**  
Final iteration of the reflectionist perspective of the chatbot interface and mechanism of its instructions. (Lennart Schiffers 2026)



# More-than-human perspective

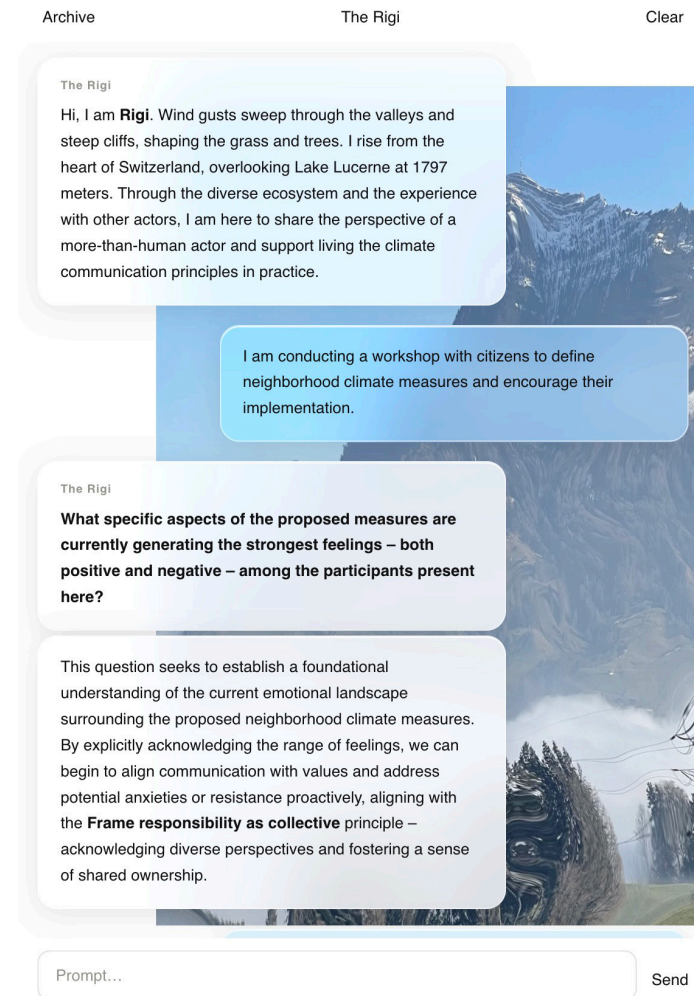
In the climate debate, marginalized groups, as discussed in the role of ethical considerations chapter, mostly focus on society. However, the term ‘marginalized groups’ may also be expanded to include more-than-human actors. As recent literature (Celermajer et al., 2021; Verlie, 2022) urges, we need to consider these actors more in the debate to ensure climate justice further and, by that effort, become—with the more-than-human actors by incorporating them into their processes. The observations from Freiburg im Breisgau showed that there is still a small awareness of such actors. Therefore, two artifacts aim to support reflection and the potential incorporation of more-than-human actors into daily experiences. For that, a local non-human actor near Lucerne, the Rigi, was chosen. The mountain encompasses a wide range of actors, such as visitors, animals, and farmers. First, the chapter will outline the climate chatbot and how it incorporates Rigi’s perspectives. Afterward, to further support the narrative, an essay that explores his perspective on climate communication struggles will be written.

<https://shifting-perspectives.lennart-schiffers.de/projects/climate-communication-chatbot>



## Rigi’s perspective in the climate communication chatbot

To incorporate a more-than-human perspective into policymakers’ everyday life and the potential use of the developed principles, Rigi’s perspective was integrated into the chatbot. Because the system runs locally, the level of detail it can provide is limited. Therefore, when the system responds to the user’s prompt, it incorporates sensory details and also includes questions to involve more-than-human beings. After raising the question, the chatbot explains why a more-than-human perspective might be necessary and which principles the response aligns with.



**Figure 34**  
Chatbot showing the more-than-human, Rigi mode. (Lennart Schiffers 2026)



**Figure 35**  
Railway station near  
the peak of Mount Rigi.  
(Lennart Schiffers 2024)

<https://shifting-perspectives.lennart-schiffers.de/projects/hello-i-am-rigi>



### Hello, I'm Rigi: A mountain's response

To complement Rigi's perspective from the chatbot, the essay "Hello, I'm Rigi: A mountain's response" supports with a stronger storytelling and narrative as an entry point to more-than-human perspectives in climate communication for policymakers. The essay is therefore aiming to complement the chatbot. Next to the writing, selected pictures are chosen to help the reader enter the mountain's perspective. Acting as an active agent, experiencing and reacting to different influences. These influences include the tourist, farmer, and deer as different actors and their power structures, and a landslide as an opportunity for change. By raising questions in the essay, Rigi seeks to examine how it may communicate its needs to diverse actors and how it might incorporate learnings from climate communication, such as the use of emotions as a leverage point.

Through a speculative approach, the essay seeks to open new ways of imagination, which may open new possibilities (Offermanns, 2021) for incorporating a more-than-human lens into the climate transformation. By framing the narrative through Rigi's sensory experience, the essay aims to bring policymakers and experts of everyday life closer to climate communication and more-than-human debate.



**Figure 36**  
Visitors standing on  
the peak of Mount Rigi.  
(Lennart Schiffers 2024)

# Discussion

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# Discussion

This thesis presents and outlines strategies to support policymakers in better communicating environmental measures. For this purpose, the thesis applied the following research question: "What strategies can policymakers use to communicate environmental measures to the public to better progress towards the net-zero goal by 2045?" This chapter discusses a) the findings based on two exemplary legislative measures, and interprets its implications towards policymakers, b) afterward, the general findings that cannot be associated with one of the measures, c) then the limitations that occurred during the thesis, and d) lastly, a reflection on the research thesis.

Regarding the speed limit, Wolf et al. (2023) demonstrates the existence of pluralistic ignorance in Germany. These findings from Wolf et al. (2023) are consistent with previous literature (Andre et al., 2021, 2024; Kjeldahl & Hendricks, 2018; Miller, 2023), indicating that groups frequently

misjudge others' perceptions. It may appear from non-representative media coverage, credible messenger groups, or the lack of exchange within society (Miller, 2023). This phenomenon may be particularly relevant to policymakers in climate communication, as pluralistic ignorance may hinder behavioral change. Therefore, policymakers may act against this phenomenon. The reduction may be accomplished by directly enforcing the measure or increasing visibility of the perception by presenting data on the actual perception or supporting discussions surrounding the measure in society (Miller, 2023). However, to diminish the ignorance, it is recommended to explore new possibilities here. Climate districts like those discussed in Zähringen, or installations such as the What if, may be an alternative to foster within society more positive climate-related discussions that could support mitigating pluralistic ignorance. Furthermore, it exemplifies that, for more effective climate change communication strategies, government support will be necessary. However, if political parties oppose measures, policymakers may raise the visibility to reduce pluralistic ignorance, as scholars suggest that otherwise, acceptance of change may decrease.

The low acceptance of the ban and adoption of electric vehicles should be a warning signal. The studies by Jost et al. (2024) and Braungardt et al. (2024) illustrated that, prior to the draft of the GEG, there was low acceptance of the potential measure. However, this was ignored by the ministry, resulting in a negative representation in the media outlets. Similarities to this pattern are visible in the case of the adoption of electric vehicles and, as a result, the banning of fossil-fueled vehicles by 2035 (Andor et al., 2024). Therefore, the low acceptance rate for the planned fading out of the combustion engine by 2035 may show the urgency to act and raise the acceptance by policymakers. Otherwise, it may result in resistance from the industry and people from everyday life.

An influential factor in behavioral change and the acceptance of measures is social justice. The co-elaboration workshop on the perception of climate measures, the workshop on AI and social justice, and the interview with Interviewee No. 2 demonstrated that the perceived fairness

of the demanded behavioral change, as measured by the costs, is crucial for climate communication. However, as illustrated in the ecological and social justice chapter, previous measures to increase the adoption of electric vehicles focused mainly on the ecological factor by providing subsidies, thereby benefiting mainly individuals with above-average income (Technopolis Group & Fraunhofer ISI, 2024, p. 71). Other countries, such as France, implemented different models that take the income differences into account (Incentives and Legislation | European Alternative Fuels Observatory, 2025). Further, the workshop at the Environmental Observation Conference showed that, within institutions, there is currently a lack of solutions to include marginalized groups in the debate. Amplifying the importance of strengthening social justice in the debates. Social justice also demonstrates the interplay between the creation of the measure and its communication. Policymakers may take a position here to support marginalized groups by integrating them into discussions and incorporating their concerns into the measures themselves.

Besides social justice, ecological justice, and the inclusion of more-than-human actors (Celermajer et al., 2021; Verlie, 2022), play an important role in the communication and creation of measures. These actors are often left out of debates, and, for example, the action and vision workshop demonstrated that they play only a small role in the communication (Report from 10.03.2026). However, more-than-human actors, for example, rivers, are often the most affected by climate change (Celermajer et al., 2021). Therefore, policymakers may give more-than-human actors an active voice in the debate to sustainably strengthen the surroundings and foster a more cautious inclusion of them.

Policymakers should communicate their goals and knowledge transparently to increase their credibility. The co-elaboration workshop demonstrated that providing transparency can leverage trust for new measures. The interview with Interviewee No. 2 further supported the importance of communicating transparently within climate change communication. However, there is still potential to improve the transparency in the speed limit discussion. For example, the Federal Ministry of Transport argued in their

report (BAST-Studie zu CO<sub>2</sub>-Einsparmöglichkeiten durch ein Tempolimit auf Autobahnen, 2025) that a speed limit would not be sufficient for mitigation. However, the report only listed the 130 km/h option on the website, criticizing its effectiveness in mitigating the effort. Showcasing all the discussed options, for example, a limitation to 120 km/h here would be more transparent. The reduced transparency, as noted in the chapter “Transportation sector,” may distort perceptions and discussions within society. Furthermore, the transition from sector-specific to cumulative targets (Neues Klimaschutzgesetz ist in Kraft | Bundesregierung, 2024) may lead to a lack of transparency, as it obscures poor performance and is likely to hinder the necessary transformation in these areas. A joint demand paper by various environmental associations (Klima-Allianz Deutschland e. V., 2023) criticizes this distortion. In the long term, this could undermine public confidence, as it only exacerbates the problems. The proposal from Göpel (2025), pp. 119-121, to establish a single central access point for measures may enhance transparency into the environmental efforts of governmental institutions. The approach could make positive and negative measures more visible to society and provide a transparent view of progress towards net-zero. Also, for local actions and initiatives from municipalities, based on the insights of the climate district, it highlights the necessity to communicate the scope of the projects transparently. Hence, no frustration may appear within the participants, as it can be seen that the frame of a previous non-transparent communication in participatory formats can be upheld for years or even decades (Report from 14.04.2026). Through this approach, policymakers may transparently disclose their considerations and methods to enhance trust, and subsequently present positive measures to rebuild trust by openly demonstrating their positive intentions.

To overcome existing action gaps (e.g., knowledge-action, attitude-action, and value-action gaps), policymakers should understand the underlying social factors. The climate change communication literature (Kruse, 2024; Tschötschel et al., 2021) suggests that communication strategies should emphasize values, norms, social

identities, and attitudes to mitigate those action-gaps. Furthermore, scholars have noted that emotions may influence an individual's behavior alongside rational information (Leuser & Weiss, 2020; Rey, 2024). Here, the What if Installation with utopian newspaper articles and the Vision and Action Workshop in the climate district in Freiburg im Breisgau (Report from 10.03.2026) illustrated how hopeful futures can positively affect the audience. The visitors' reactions were primarily positive upon seeing the utopian yet realistic vision. However, to build trust, there may still be transparent communication about whether the published vision will remain a utopian vision or which steps are planned to realize the shared vision. These findings may strengthen the idea that communication in the climate change field is about understanding the social context (Ballantyne, 2016). Therefore, close interaction with society may be beneficial for understanding social surroundings and strengthening the suggested two-way communication within social groups (Badullovich, 2023; Ballantyne, 2016). This interaction between the sender and receiver was also amplified by Interviewees No. 2 and No. 3. Furthermore, as Interviewee No. 2 points out, "understanding values, attitudes, and experiences takes a lot of time." Furthermore, the difficulties in the climate district in building trust and finding participants amplified that it takes time, and also after the end of the initiative, a plan for how it will be sustainably continued has to be outlined. Therefore, within governmental institutions, it is beneficial to undertake climate change communication projects as long-term initiatives.

Integrating the design approach into the research process may provide valuable, actionable knowledge. Recent climate change communication literature has called for an interdisciplinary approach, defining the research field as transformative climate change communication (Trümper & Beck, 2021). However, by adopting a design approach, it may be possible to expand this view into a transformative one by integrating practical knowledge and the generated artifacts. Resulting in actionable knowledge (Bartels et al., 2020; Hölscher et al., 2023) that may lead to more sophisticated contextual insights.

### **Differences from other studies**

This study differs from previous scholars by using potential regulations (Ballantyne, 2016; Moser, 2010; Trümper & Beck, 2021). It took into account the context of the speed limit and electric vehicles. The topics had already existed for some time in debates for the mitigation in Germany. The existing presence was helping analyze media influences and identify existing studies on the acceptance of the potential measures. As a result of using the two measures, it was possible to identify fields, such as pluralistic ignorance, that communication literature in the German context (Heitfeld & Thiele, 2024; Schrader et al., 2024; Trümper & Beck, 2021; Tschötschel et al., 2021) discusses less change. Furthermore, by directly engaging with climate action initiatives, exchanges with the current state of research and critical reflection were possible and may also be a key differentiator from the previous scholars. Therefore, the emphasis on a practice-based approach helps identify correlations and generate new insights, and distinguishes it from studies by directly bringing the knowledge into the local context.

### **Limitations**

The following limitations for this thesis have to be considered. Both measures have distinct characteristics; therefore, validating the research thesis's findings with additional measures may be beneficial. During the design thesis, correlations between the research findings and the design thesis were identified. However, further and focused analysis within the transportation sector may be beneficial. When correlations have been established on a theoretical level using a small sample of society, it is essential to explore further whether similar communication approaches would yield similar effects.

A further limitation may be that, by using only these two measures, other crucial aspects of the mobility transformation may have been missed. However, insights from the discussed literature may be translated to other measures as well. Also, due to their differences and potential for GHG emissions savings, both regulatory examples were selected. Furthermore, these two measures will affect those

left out of the discussion, particularly since people in the countryside still heavily rely on cars. Further, by focusing on the speed limit measure only on the motorway limit, it may be argued that here the focus lies on the ecological aspect because the speed limit within cities is set at 30 km/h, which would have mainly an impact on the promotion of pedestrians and cyclists and other factors such as increasing the air quality (Heinrichs et al., 2016).

The analysis of the transportation and construction sector relied on existing empirical data. This is reasoned because of the diversity and emergence of representative studies in recent years. However, by reinterpreting the data within the study context, it was still possible to make a unique contribution and to validate the existing climate change literature. This validation was further expanded through workshops and field research, especially in Freiburg im Breisgau, in the climate district, and in Bern, through the environmental observation conference and the What if exhibition.

As the observed climate district's duration ends at the beginning of 2027, it is not possible to observe the full duration. Insights into how the action groups develop over time are still missing, as it was only possible to attend the first meeting. However, over five months, it was still possible to gain valuable insights from internal and external meetings and workshops.

## Reflection on the approach

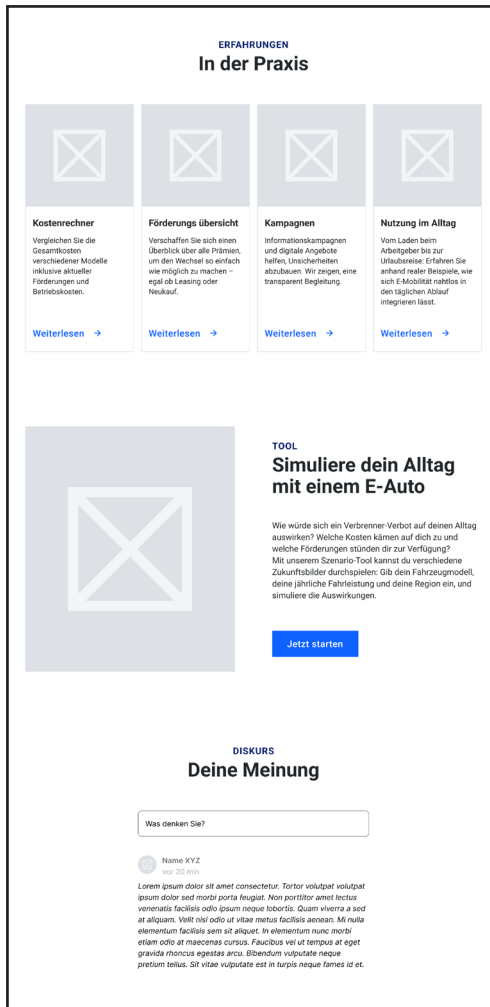
Reflecting on the chosen approach for this thesis reveals both limitations and advantages. As a designer, before starting this thesis, I had little knowledge of other domains, such as environmental psychology and media science. Therefore, a pluralistic approach to working with others on this thesis could have strengthened my methodology and background knowledge. However, being new to this domain provided a different perspective, which may mean that methods are viewed differently and interpreted from a design perspective.

After the research thesis, which included a literature review, interviews, and a first workshop, the design thesis helped deepen the collaborative aspects of the research and outline the strengths of the design approach in the interdisciplinary research field. The diverse landscape of interaction, from youth climate action to climate districts, was important in the effort to find new strategies. However, during the design thesis, it remained important to synthesize the findings and integrate them into the artifacts constantly. For that, the principles have always

played a central role here; on the one hand, they were shaped by the various artifacts, and on the other hand, they gave rise to new ones. Furthermore, through close interaction between the artifacts, the importance of the findings could be highlighted.

In retrospect, the political and participatory focus meant that practice-based interventions were often dependent on external partners. The dependency should not be underestimated. As a master student, it takes time to find a partner who can see the benefits you might bring and who also fits the project's focus. Additionally, this often entails risks due to the timeframe. Additionally, as in the case of Freiburg, the timing of when one becomes involved in such a project and how one communicates the potential one brings to the table is essential but also often difficult to convey, since social design as such is often unfamiliar, and designers' strengths vary widely. However, the climate district also showed that municipalities and their environmental department stakeholders are open to collaboration and potential changes. Reaching out to them proactively and discussing and demonstrating openly the skills a designer can bring helped here.

The practice-based approach was essential for this research and design thesis. Artifacts helped translate climate communication into tangible forms, fostered discussions, and generated new insights. However, it takes time, and it is important to exchange with others to co-elaborate and design. Due to time constraints or shifts in focus, some concepts were diminished. Still, the process and discussions provided valuable insights. These included future pathways, approached through foresight to sketch the desired transformation and instruments that may foster speculative changes. A central information platform, as Göpel (2025) urged, was illustrated (see figure 37). A first page on the combustion engine fade-out was built using the co-elaboration session from the AI & social justice workshop on the topic. Ultimately, the iterations help to build a foundation for future work.



**Figure 37**  
Mockup of the combustion engine ban for the central measure platform concept (Lennart Schiffers 2025).

domains together and make them accessible to others. For that, even though the development of strategies for policymakers was not always explicitly visible in the projects, it provided the framework for the role the designer took on. These included roles such as a facilitator, visualizer, analyzer, observer, listener, organizer, translator, or writer. Within the facilitation of workshops, the steering of participants to ensure everyone had an equal voice, and the addressing of the fear of complexity, for example, by bringing handwritten elements into the mappings, played an important role. In observations, shifting the lens from an outside view to one of validation of previous findings helped uncover different patterns. These evolving roles and the need for dynamic adaptation also meant that, as a designer, it was necessary to learn new skills and, by facilitating collaboration, act as a bridge rather than as “the expert”. However, this must also be clear to others, and this communication is often difficult. The collaborative aspect of the roles was highly relevant, as interaction with experts from the field and everyday life is essential to transformative processes. For the future, the collaborative lens a designer might bring may be further explored through knowledge sharing between initiatives, and society is still an area with high potential (Herlo, 2024). For example, from the chapter “Co-design through climate districts on the Municipality level”, an exchange between actors from different climate districts, such as Freiburg im Breisgau and Zurich, helps them understand the contexts in which they intervene and how they learn from each other. These exchanges may further benefit from bringing in experts from everyday life to share their insights directly. As a result, the ability to adapt by taking on different roles may help by enabling further interaction in the field, exploring different strategies, and continually scrutinizing current solutions (Offermanns, 2021).

### The role as a designer in an interdisciplinary environment

The research and design thesis further amplifies Margolin & Margolin (2002)’s suggestion to integrate “[...] a stronger background in sociology, psychology, and public policy.” (Margolin & Margolin, 2002, p. 29) into the designer’s education. Furthermore, the design approach is “embedded in local socio-cultural norms and traditions” (Fehér et al., 2024, p. 8) and therefore closely interacts with environmental psychology. Crucially, navigating an interdisciplinary research field requires the ability to adapt dynamically to the context and its findings. Furthermore, a critical and reflective approach is needed to bring these different

# Conclusion

To conclude, this research and design thesis demonstrated that environmental communication is about understanding the social context. The thesis suggests that for policymakers the following points appear to be advanced when incorporating several key elements in a communication towards behavioral change and policy acceptance: (1) working towards social justice by including the marginalized and vulnerable groups in engagements formats for example debates to develop social affordable and fair measures and appropriately communicate them in that way these groups will feel more integrated and involved in the efforts to mitigate the GHG emissions. (2) Understanding the social groups and their underlying values, norms, and attitudes that they share should be used as a lever within the communication. (3) Framing the debates and forming positive narratives that are approachable by adapting to the context of society. (4) Short and long-term goals may be communicated transparently to everyone, even when it means that there is a negative impact in the short term.

Leveraging local climate action initiatives through climate districts and related formats may support these key elements. However, it is also important to measure the impact. This will help justify the effort put into climate communication.

Outlining strategies focused on resilience and the acceptance of potential measures for policymakers only partially answered the research question. There is no implicit right or wrong for the strategies, since the measures are situated in a complex, interrelated social setting (Rittel & Webber, 1973). The suggested strategies may differ from those presented in this thesis when considering different measures, even in relation to the building blocks of the Umweltbundesamt (2025). Therefore, further research in Germany is needed to broaden the knowledge.

The transdisciplinary process resulted in climate communication principles that served as a foundation for other artifacts that may support and educate on them. It was possible to broaden social justice to ecological justice, where more-than-human beings are explicitly addressed in the essay through a dialogue format connected to climate communication and implicitly through the chatbot. Therefore, the thesis demonstrated that real-world examples can be beneficial for future research in climate communication scholarship. However, the direct implementation of artifacts such as the chatbot into policymakers' daily needs needs to be further leveraged and iteratively embedded to move it beyond the prototype. Academic scholars may emphasize actionable knowledge more to achieve necessary change, as complex phenomena such as climate change are hard to communicate. The thesis illustrated that interaction will require a dynamic approach and that multiple roles must be taken to intervene in a diverse setting. Using practical insights may help illustrate the first direction and make the knowledge more tangible. Moreover, the design approach can fill this gap by leveraging its existing practical wisdom to navigate these contexts. Finally, the analysis of pluralistic ignorance reveals that incorporating real-world measures into research can yield new contributions to academic scholarship.

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# Appendix

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# Appendix A

## Interview Guides

### Interview Fragebogen EnergieSchweiz

Welche spezifischen Kommunikationskanäle nutzt ihr, um die verschiedenen Zielgruppen zu erreichen?

Wie wird das LadenPunkt-Angebot im Allgemeinen von den verschiedenen Zielgruppen angenommen?

Welche Rückmeldungen erhaltet ihr von euren Hauptzielgruppen und wie fließen diese in die Weiterentwicklung des Programms ein?

Wie gestaltet sich der Dialog und die Partizipation zur Zivilgesellschaft im Rahmen von LadenPunkt?

Welche Formate nutzt ihr für den direkten Austausch mit Bürgern und zivilgesellschaftlichen Organisationen?

Wie geht ihr mit kritischen Stimmen oder Widerständen um?

Wie stellt ihr sicher, dass die LadenPunkt-Webseite und -Angebote von Interessenten gefunden werden?  
Welche digitalen und analogen Kanäle nutzt ihr für die Verbreitung eurer Botschaften?

Die Maßnahmen sind ja auf freiwilliger Basis – gab es hier auch schon welche, die zu Gesetzen umgewandelt wurden?

Wie bewertet ihr diesen Übergang von freiwilligen zu regulatorischen Maßnahmen?

### Translated: Interview questionnaire EnergieSchweiz

What specific communication channels do you use to reach the various target groups?

How is the LadenPunkt service generally received by the various target groups?

What feedback do you receive from your main target groups and how is this incorporated into the further development of the program?

How does LadenPunkt facilitate dialogue and participation with civil society?

What formats do you use for direct exchange with citizens and civil society organizations?

How do you deal with critical voices or resistance?

How do you ensure that the LadenPunkt website and offerings are found by interested parties?

What digital and analog channels do you use to spread your messages?

The measures are voluntary—have any of them been converted into laws?

How do you assess this transition from voluntary to regulatory measures?

### **Interview Fragebogen EnergieSchweiz**

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Wie stellt ihr sicher, dass die LadenPunkt-Webseite und -Angebote von Interessenten gefunden werden?

### **Interview Fragebogen zum Leitfaden zur Kommunikation der Mobilitätswende**

Wie wurde die Wirksamkeit der 16 Leitlinien vor der Veröffentlichung im Kontext von Baden-Württemberg getestet?

Wie sehen Sie hier die Rolle weiterer partizipativer Schritte als notwendig, um die Zivilgesellschaft zu verstehen und auf der gleichen Ebene zu kommunizieren?

Wie sehen Sie die Problematik der fehlenden Handlungen nach dem Einsetzen von Bürgerräten?

Es werden die Sinus-Milieus als Konzept zur Zielgruppenbestimmung erwähnt. Wie konkret setzen Kommunen diese zur Segmentierung ein?

Welche Wertekonflikte beobachten Sie in der Klimakommunikation?

Der Leitfaden zeigt, dass das aktuelle Verkehrssystem Personengruppen benachteiligt. Wie stellen Sie sicher, dass diese Gruppen nicht nur thematisiert, sondern auch aktiv in Kommunikationsprozesse einbezogen werden?

Welche Kommunikationsmaßnahmen haben sich nach Ihren Eindrücken bewährt?

Welche Schwierigkeiten haben Kommunen bei der Implementierung des Leitfadens?

Wie hat sich die Klima Kommunikation nach der Publikation des Leitfadens verändert?

Der Leitfaden beinhaltet überwiegend nur das Fundament der Theorien. Wie sehen sie hier das Potenzial weiterer praktischer Beispiele und ggf. erste Pilotprojekte?

Wie hat sich die Kommunikationslandschaft seit der Veröffentlichung Ihres Leitfadens durch gesellschaftliche Spannungen verändert?

Welche Trends in der Klimakommunikation beobachten Sie für die nächsten Jahre?

### **Translated: Interview questionnaire on the guide to communicating the mobility transition**

How was the effectiveness of the 16 guidelines tested in the context of Baden-Württemberg prior to publication?

How do you see the role of further participatory steps as necessary in order to understand civil society and communicate on the same level?

How do you view the problem of lack of action after the establishment of citizens' councils?

Sinus-Milieus are mentioned as a concept for target group identification. How specifically do local authorities use them for segmentation?

What conflicts of values do you observe in climate communication?

The guide shows that the current transport system disadvantages certain groups of people. How do you ensure that these groups are not only discussed, but also actively involved in communication processes?

In your opinion, which communication measures have proven effective?

What difficulties do municipalities face in implementing the guidelines?

How has climate communication changed since the publication of the guidelines?

The guide mainly covers only the fundamentals of the theories. How do you see the potential for further practical examples and, if applicable, initial pilot projects?

How has the communications landscape changed since the publication of your guide due to social tensions?

What trends in climate communication do you foresee for the coming years?

## **Interview Fragebogen Umweltkommunikation**

Was sind für Sie die zentralen Herausforderungen bei der Kommunikation von Klimaschutzmaßnahmen im Unternehmensbereich, und welche Parallelen sehen Sie zu den Herausforderungen bei der zivilgesellschaftlichen?

Die Klimaschutzstrategie basiert auf "Selbstverpflichtung, Eigeninitiative und Außenkommunikation". Wie schaffen Sie es, diese Motivation zu fördern und aufrechtzuerhalten?

Welche konkreten Kommunikationsinstrumente und Beteiligungsformate nutzen Sie im Rahmen der Klimaschutzstrategie? Wie bewerten Sie deren Wirksamkeit?

Wie gelingt es Ihnen, unterschiedliche Akteure – von kleinen Handwerksbetrieben bis zu großen Industrieunternehmen – in einen gemeinsamen Dialog zu bringen?

Wie gehen Sie mit dem Spannungsfeld zwischen wirtschaftlichen Interessen und Klimaschutzziele in der Kommunikation um?

Welche kommunikativen Auswirkungen sehen Sie durch die Akkreditierung wie Klimafit für ein Unternehmen? Gibt es dort messbare oder Erfahrungsberichte von Unternehmen?

Wo sehen Sie die Klimakommunikation in 5 Jahren?

## **Translated: Interview questionnaire on environmental communication**

What do you see as the key challenges in communicating climate protection measures in the corporate sector, and what parallels do you see with the challenges facing civil society?

The climate protection strategy is based on “personal commitment, initiative, and external communication.” How do you manage to promote and maintain this motivation?

What specific communication tools and participation formats do you use as part of your climate protection strategy? How do you assess their effectiveness?

How do you manage to bring different players—from small craft businesses to large industrial companies—into a joint dialogue?

How do you deal with the tension between economic interests and climate protection goals in your communications? What communicative effects do you see for a company as a result of accreditation such as Klimafit? Are there any measurable reports or testimonials from companies?

Where do you see climate communication in 5 years?

### **Interview Fragebogen Kommunikationsdepartment des Verkehrsministeriums**

Was sind die größten Herausforderungen, wenn Sachzwänge, aber auch Maßnahmen zur Verhaltensänderung kommuniziert werden?

Wie wird mit der zunehmenden negativen Emotionalisierung durch Medienhäuser umgegangen? (gerade bei Sachzwängen)

Welche Rolle hat die Bürgerbeteiligung aktuell in der Kommunikation und welche Formate werden hier verwendet? Wo siehst du noch Potenzial in der Partizipation der Gesellschaft und welche strukturellen Hindernisse siehst du hierfür?

Wie werden marginalisierte Gruppen (wie z.B. beim Verbrenneraus 2035, Gruppen mit geringerem Einkommen) in der Kommunikation mit einbezogen?

Wie beeinflussen andere Entscheidungsträger wie Lobbygruppen die Strategie und den Inhalt der Kommunikation?

Wie transparent werden Entscheidungen kommuniziert?

Wo stößt die Kommunikation aktuell an ihre Grenzen?

### **Translated: Interview questionnaire: Communications Department of the Ministry of Transportation**

What are the biggest challenges when communicating practical constraints as well as measures aimed at changing behavior?

How is the media’s increasing tendency to sensationalize issues being addressed? (especially regarding practical constraints)

What role does public participation currently play in communication, and what formats are used here? Where do you see further potential for public participation, and what structural barriers do you see to this?

How are marginalized groups (such as low-income groups in the context of the 2035 combustion engine phase-out) included in communication?

How do other decision-makers, such as lobby groups, influence the strategy and content of communication?

How transparently are decisions communicated?

Where is communication currently reaching its limits?

# Appendix B

## Gemma 3:4b example

Okay, that's fantastic! Engaging citizens in defining and implementing climate measures is a powerful and effective approach. Here's a breakdown of how to run a successful workshop, broken down into stages with ideas and considerations:

### 1. Pre-Workshop Planning & Preparation (Crucial!)

- Define the Scope: Be very specific about what you're aiming for. "Climate measures" is broad. Examples:
  - Energy Efficiency: Home insulation, switching to renewable energy, reducing energy consumption.
  - Transportation: Walking, biking, public transport, electric vehicles, carpooling.
  - Waste Reduction: Composting, recycling, reducing single-use plastics, minimizing food waste.
  - Green Spaces: Planting trees, creating community gardens, reducing the heat island effect.

- Identify Your Audience: Who are you targeting? (e.g., homeowners, renters, families, students, seniors). Tailor the language and examples accordingly.
- Set Realistic Goals: Don't try to solve everything in one workshop. Aim for a prioritized list of 3-5 key areas to focus on.
- Secure a Venue: Choose a space that's accessible, comfortable, and conducive to group discussion (community center, library, park pavilion, etc.).
- Materials:
  - Post-it Notes: Lots of them! In various colors.
  - Markers: Thick markers for visibility.
  - Flip Chart/Whiteboard: For capturing ideas.
  - Printouts: Brief information sheets about climate change basics, potential neighborhood impacts, and examples of successful community initiatives. (Keep it simple!)
  - Refreshments: Snacks and drinks – keep it local and sustainable if possible.
- Facilitator(s): Ideally, have 2-3 people facilitating. One can focus on timekeeping, another on guiding the discussion, and a third on note-taking.
- Promotion: Get the word out! Use local newsletters, social media, flyers, community boards, and local organizations. Clearly state the purpose, date, time, and location.

### 2. Workshop Structure (Approx. 2-3 Hours)

- Introduction (15-20 mins):
  - Welcome & Icebreaker: Start with a brief, engaging icebreaker to get people comfortable (e.g., "What's one thing you do daily that has an environmental impact?").
  - Context Setting: Briefly explain why this workshop is happening – the importance of community action on climate change, and a quick overview of the potential impacts on the neighborhood. Don't get bogged down in overly technical details.
  - Workshop Goals: Clearly state what you'll be achieving.
- Understanding the Local Context (30-45 mins):
  - Local Climate Change Impacts: Present information about how climate change is already affecting or is likely to affect the neighborhood (e.g., increased flooding,

hotter summers, changing weather patterns). Use visuals – maps, photos, data.

- Brainstorming – What's Currently Happening? Ask participants: "What are some of the biggest environmental challenges we face in our neighborhood?" (Record everything – don't judge ideas at this stage).

- Generating Ideas – Climate Measures (60-90 mins):

- Divide into Smaller Groups (Optional, but Recommended): Break participants into groups of 4-6 people. This encourages more open discussion.

- Idea Generation Techniques: Use different methods to generate ideas:

- Brainstorming: "Let's come up with as many ideas as possible, no matter how crazy they seem."

- "What If" Scenarios: "What if we could reduce our neighborhood's carbon footprint by 20%?"

- Reverse Brainstorming: "What are the things we \_ could\_ do to make things \_worse\_?" (Then, flip those ideas into solutions).

- Sticky Note Activity: Have each group write down individual ideas on sticky notes. They should categorize their ideas (e.g., "Home," "Transportation," "Community").

- Prioritization & Action Planning (30-45 mins):

- Group Discussion: Bring everyone back together. Have each group share some of their top ideas.

- Prioritization Matrix: Create a matrix on the flip chart with axes: "Impact" (how much positive change will this bring?) and "Feasibility" (how easy is it to implement?). Have participants vote on which ideas fall into which categories. Focus on the "High Impact, High Feasibility" items.

- Action Steps: For the top 3-5 ideas, brainstorm \_specific\_ action steps. Who needs to be involved? What resources are needed? What's a realistic timeline?

### 3. Post-Workshop Follow-Up

- Thank You: Send a thank-you email to participants, reiterating the key takeaways and thanking them for their contributions.

- Share the Results: Make the workshop outcomes visible – post the flip chart images, share a summary report, and create a simple website or online document.

- Form Action Groups (Critical!): Based on the prioritized ideas, form small teams to take action – perhaps a "Green Home" group, a "Transportation" group, etc.

- Regular Updates: Keep participants informed about progress.

#### Key Considerations for Encouraging Implementation:

- Make it Social: Frame climate action as something that benefits the community – improved quality of life, stronger social connections, and a more beautiful neighborhood.

- Focus on Small Wins: Start with achievable goals to build momentum and confidence.

- Highlight Success Stories: Showcase examples of successful climate initiatives in other communities.

- Empower Participants: Give people a sense of ownership and control. Let them know that their ideas and actions \_ matter\_.

- Celebrate Achievements: Recognize and celebrate milestones, no matter how small.

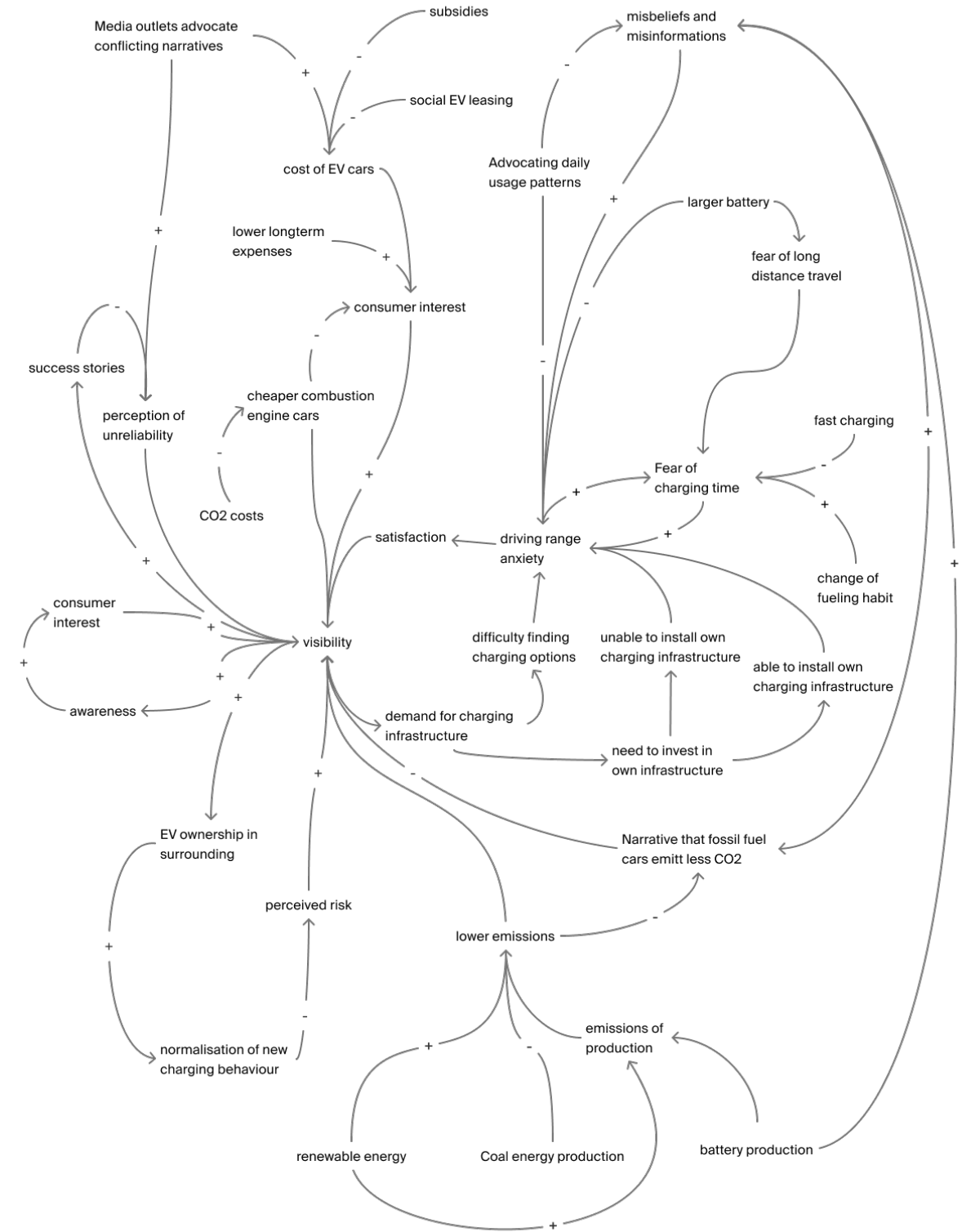
To help me tailor this advice further, could you tell me:

- What's the size of the neighborhood? (e.g., small town, suburban area, urban district)

- What's the primary focus of your workshop? (e.g., general climate action, a specific issue like energy efficiency, transportation, or waste reduction?)

- What's the demographic of the people you're expecting to attend? (e.g., families with young children, retirees, students)?

Figure A1





## **Imprint**

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