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Conducting Surveys on Climate Change Adaptation in Local Authorities: Practical Recommendations from Eight Research Projects in Germany

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Conducting Surveys on Climate Change Adaptation in Local Authorities

Abstract

Successful adaptation to climate change depends fundamentally on the efforts of local authorities. Therefore, there is a growing interest in whether, how, and to what extent municipalities and counties are adapting to climate change, and what drives or hinders such action. However, data on local adaptation action, its determinants, and consequences are often not available. Therefore, researchers are increasingly surveying local governments and administrations to collect such data and address these questions. Doing so produces many opportunities, but also specific challenges, that are not well reflected in the literature. Drawing on firsthand experience from eight recent surveys conducted in Germany, this article examines the potential and challenges of using surveys in the study of municipal adaptation to climate change. Challenges often arise from the novelty and cross-cutting nature of climate change adaptation as a local government issue, and from the characteristics of the target group, such as the institutional diversity and the often unclear responsibilities within local authorities. These challenges include identifying and sampling local authorities, identifying and contacting respondents, ensuring data protection, designing questionnaires, increasing response rates, and validating and analyzing the data. Drawing on practical research experience, this paper discusses strategies for overcoming these challenges and offers guidance for conducting surveys on local climate adaptation.

Keywords climate change adaptation; methodology; survey; questionnaire; municipality

1. Introduction

Climate change is already affecting and will increasingly change weather patterns worldwide, including more frequent and intense extreme weather events, such as heavy rainfall, heat waves, droughts, and severe storms (Intergovernmental Panel on Climate Change [IPCC], 2023). These developments have a wide range of severe consequences, such as multiple health effects and damage to physical infrastructure. In addition to mitigating climate change, it is therefore a high priority to protect and prepare people, infrastructure, and assets from the adverse effects of climate change that are already occurring and will continue to intensify. As climate change impacts vary locally and are felt on the ground, adaptation action needs to be taken locally. Local authorities, that is, the governments and administrations of municipalities and counties, are key actors in this endeavor due to their extensive responsibilities and close relationship with affected communities (IPCC, 2022). Interest has therefore grown in whether, how, and to what extent local authorities are (not) engaging in climate adaptation, and what drives and hinders such (in)action. In addition, scholars and policymakers are interested in how successful and effective adaptation actions are (Biesbroek et al., 2018; Reckien et al., 2018; Rogers et al., 2023; van der Heijden, 2019). This includes how different public interventions, such as providing information and financial resources, are implemented and perceived, and how local authorities and communities may be better supported in their adaptation efforts (Schulze, 2024).

The state, determinants, and consequences of local climate adaptation are increasingly examined in terms of case studies (e.g., Burch, 2010; Desthieux & Joerin, 2022; Haupt et al., 2022; Schäfer, 2015; Schmidt & Wagner, 2023; Simonet & Leseur, 2019) and, for at least the last 15 years or so, also via large-n comparisons at national, regional, and local levels (Aylett, 2015; Cannon et al., 2023; Lesnikowski et al., 2019; Olazabal et al., 2019; Otto, Göpfert et al., 2021; Reckien et al., 2018, 2023; Schulze & Schoenefeld, 2023; Shi et al., 2015). The latter permits exploring broad adaptation patterns across space and time and generalizable conclusions (Schoenefeld et al., 2022). Comparative studies with large numbers of observations typically use two types of data collection approaches (Biesbroek et al., 2018; Ford & Berrang-Ford, 2016; Krause et al., 2024). The first encompasses all approaches using archival data and public records such as climate adaptation plans (e.g., Otto, Kern et al., 2021; Pietrapertosa et al., 2019; Reckien et al., 2018, 2023; Stults & Woodruff, 2017) or data from existing databases (Araos et al., 2016; Lesnikowski et al., 2019). The second type, which is the subject of this article, concerns surveys of local officials, such as individuals representing municipalities and counties as either staff, elected, or appointed officials (e.g., Aylett, 2015; Bausch & Koziol, 2020; Buschmann et al., 2022; Kalafatis, 2018; Patterson, 2021; Shi et al., 2015).

According to a literature review conducted by Biesbroek et al. (2018), the survey approach is the most common method for large-n adaptation policy research at the local level. Surveys can generate data and

results rather efficiently and track climate adaptation in a standardized way that goes beyond the mere content of policy documents (Ford & Berrang-Ford, 2016; Patterson, 2021). For example, surveys can collect data from local authorities that do not have an adaptation plan or other records in databases, which is often the case for smaller municipalities. They can also provide insights on issues of high interest to adaptation research that are hardly documented in existing databases, such as the implementation and success of adaptation measures or the processes and perceptions of adaptation at the municipal level.

However, tapping the full potential of surveys of local authorities on climate adaptation involves several methodological challenges. According to Biesbroek et al. (2018), the main challenges are identifying suitable respondents, translating the complex topic of climate adaptation into relatively simple and closed survey questions, considering possible social desirability biases, and finding local-level data to explain varying adaptation outputs and outcomes. Biesbroek et al. (2018) also note that of all 72 studies they reviewed, one-fifth do not mention methodological challenges, and half of the articles do not suggest improvements. As publications tend to focus on the survey results, there is only very limited guidance on how to conduct surveys on climate adaptation in local authorities. The general survey literature cannot fill this gap either, as it tends to focus on the individual or household level, largely neglecting local authorities as a target group (e.g., Dillman et al., 2014; Vanette & Krosnick, 2018). Issues discussed in the sparse literature on local government surveys include increasing survey fatigue among target groups, particularly in Europe; the impracticability of providing financial rewards, which are common in surveys of other target groups; strict IT security regulations that may affect access to online questionnaires, and, in some contexts, diminishing trust in research due to political polarization (Krause et al., 2024). However, contributions dealing specifically with the practical challenges of surveying local authorities on climate adaptation and providing recommendations are still missing.

This article contributes to filling this gap by focusing on the research practice of conducting surveys of climate adaptation in local authorities and offering recommendations based on practical research experience. We specifically draw on our experiences gained as principal investigators and researchers in the context of eight recent projects, which surveyed large numbers of German local authorities and officials on climate adaptation. We thus draw on a uniquely deep and broad pool of firsthand, practical knowledge from realized surveys to contribute to the existing literature. In particular, we show how the specifics of the research topic (e.g., the cross-sectoral nature of adaptation) and the target group (e.g., the diversity and unclear responsibilities within local authorities) contribute jointly to seven general challenges with relevance beyond the German context. We also discuss the advantages and disadvantages of different survey approaches to address these challenges, provide recommendations, and outline future developments.

2. German Local Authorities and Climate Change Adaptation

In Germany, adaptation to climate change first emerged in the mid-1990s, for example, in federally funded local projects. At the national level, the German Adaptation Strategy institutionalized the practice in 2008, positioning Germany as an early climate adaptation leader (Massey et al., 2014). At the local level, climate adaptation has been mainly a voluntary task for municipalities and counties. Against the background of the voluntary nature of municipal climate change adaptation and local authority independence to govern their affairs in Germany (Ruge & Ritgen, 2021), there are significant differences in the adaptation efforts of German municipalities and counties, with larger cities tending to be more active, for example, due to greater local capacities and more access to support than in their smaller counterparts (Friedrich, Otto et al., 2024; Kern et al., 2023; Otto, Kern et al., 2021; Schoenefeld et al., 2023; Schulze, 2024). Climate change adaptation is often a relatively new field for smaller towns and counties.

In addition, the 16 federal states of Germany (German: *Bundesländer*) differ in their state-level adaptation strategies, with some providing incentive structures and regulations for local climate adaptation in addition to the national level while others do not (Eckersley et al., 2023; King, 2022). The so-far non-mandatory character of local climate adaptation has changed with the first national climate adaptation law, which came into force in July 2024 and requires local or regional adaptation planning.

The German administrative bodies vary widely in size and the administrative level they represent. For

example, there are independent cities, municipalities belonging to a county, associations of municipalities (German: *Gemeindeverbände*; groups of small municipalities), and counties (German: *Landkreise*). Not all of these categories are equally represented in the 16 German federal states. In addition, three federal states consist of only four large cities (Berlin, Bremen/Bremerhaven, and Hamburg). Given Germany's federal structure, tasks are allocated across these different governance levels. Thus, the responsibilities for climate adaptation differ among these administrative units. Within local authorities, climate adaptation is a cross-cutting issue that touches on different sectors and municipal departments, such as environment, urban development, land use planning, and health. Some (especially larger) municipalities have a specific department/unit or person to coordinate adaptation to climate change. Thus, knowledge of and responsibility for climate adaptation may be spread across the local administration and vary from one municipality or county to another in Germany.

3. Eight Recent Surveys of Climate Adaptation in German Local Authorities

Surveys have become an increasingly popular method of investigating the state of climate adaptation in local authorities in Germany. Some target the entire country (Friedrich, Stieß et al., 2024; Hasse & Willen, 2019; Kenkmann et al., 2021), while others focus on certain regions or federal states (Baden-Württemberg: von der Forst et al., 2020; Bavaria: Bausch & Koziol, 2020; Buschmann et al., 2022; von Streit et al., 2024a; Hessen: Schoenefeld et al., 2023; Schulze et al., 2022; Rhine-Neckar region: Stadtherr et al., 2020; Saxony, Saxony-Anhalt, and Thuringia: Tafel et al., 2024). In this article, we draw on practical experiences from eight recent survey projects conducted by the authors of this article between 2020 and 2024. All surveys targeted local authorities to collect information on their climate adaptation actions and policies (see Table 1). The projects vary in terms of their target region(s), the level and number of local authorities they surveyed, the (targeted) respondents within the municipalities and counties, and their study designs (see Table 1).

Table 1 Overview of the Eight Survey Studies

#	Year	Study area[1]	Mode	Duration, reminders	Population	Contact persons	Valid cases (response rate)	Funding[2]	References
1	2020/2021	HE	Paper and pencil; online	26.10.2020-15.02.2021 1 reminder; (email) and phone	All 422 Hessian municipalities and 21 counties	Mayors; climate managers/department heads and similar	229 (52%)	Fritz Thyssen Foundation	Schoenefeld et al. (2023); Schulze & Schoenefeld (2023); Schulze (2024); Schulze et al. (2022)
2	2021	TH, SN, ST	Paper and pencil	4 weeks 1 reminder	115 municipalities in 3 counties	Mayors (who could forward the survey to staff members)	61 (53%)	BMBF/BMFTR	Tafel et al. (2024)
3	2021	GER	Online	4 weeks 1 reminder	104 municipalities (all German, county independent municipalities with >50,000 inhabitants and all municipalities with >100,000 inhabitants)	Municipal employees at all levels dealing with climate adaptation and urban planning	101 questionnaires from 59 cities (57% based on municipalities)	BMBF/BMFTR	Huber et al. (2022); Otto et al. (2022, 2025)
4	2021/2022	BY	Online	3 weeks 1 reminder	All 125 municipalities of five counties	Mayors and, if available, Climate Mitigation Officers	70 (56%)	BMBF/BMFTR	von Streit et al. (2022, 2023, 2024a, 2024b)

5	2022	HE	Online	5 weeks 2 reminders	All 422 Hessian cities and municipalities and 21 counties	Municipal employees at all levels dealing with climate adaptation	175 questionnaires; several questionnaires per unit possible, thus response rate cannot be clearly determined	HNLUG	Friedrich & Rossow (2023); Rossow et. al. (2025)
6	2023	GER	Online	5 months no reminder, the questionnaire remained active until the end of qualitative data collection	300 municipalities from all federal states and spatial types directly contacted via email, additional municipalities were reached via professional platforms and mailing lists	Municipal employees at all levels in the field of climate change mitigation and climate change adaptation	132 questionnaires; several questionnaires per unit possible thus the response rate cannot be clearly determined	BMBF/ BMFTR, EU	
7	2023	GER	Online (invitation by mail and online)	6.5 weeks 2 reminders	4,691 municipalities of Germany as stratified sample: all independent cities, counties, municipal associations and all municipalities/cities that belong to a county and are not organized in municipal associations	Person(s) responsible or able to speak on the topic of climate adaptation, also implies mayors or department heads depending on the size of the municipality	1,062 (23%)	UBA	Friedrich, Stieß et al. (2024)
8	2024	TH, SN, ST	Online	4 weeks 2 reminders	All 1,307 municipalities and municipal associations in 3 federal states	Mayors and representatives of administrative associations (who could forward the survey to staff members)	324 (25%)	BMBF	Tafel et al., (2024), Zorn & Schäfer (this issue)

Note. [1] GER: Germany (all federal states); BY: Bavaria; HE: Hessen; SN: Saxony; ST: Saxony-Anhalt; TH: Thuringia; [2] BMBF/BMFTR: Federal Ministry for Education and Research/Federal Ministry of Research, Technology and Space; HNLUG: Hessian Agency for Nature Conservation, Environment and Geology; UBA: Federal Environmental Agency; EU: NextGenerationEU.

The sample sizes of the eight surveys range from 70 [Study 4] to 1,062 [Study 7; the numbers in square brackets refer to the numbering of the eight studies in Table 1].

The findings and recommendations presented below draw on the experiences of the authors as principal investigators or contributors to the projects listed in Table 1. The corresponding insights were developed in several steps (see Figure 1): First, we shared our experiences with a view to conducting surveys in municipal adaptation research and discussed them as a group. Based on this discussion, we identified seven specific areas where challenges had arisen. Second,

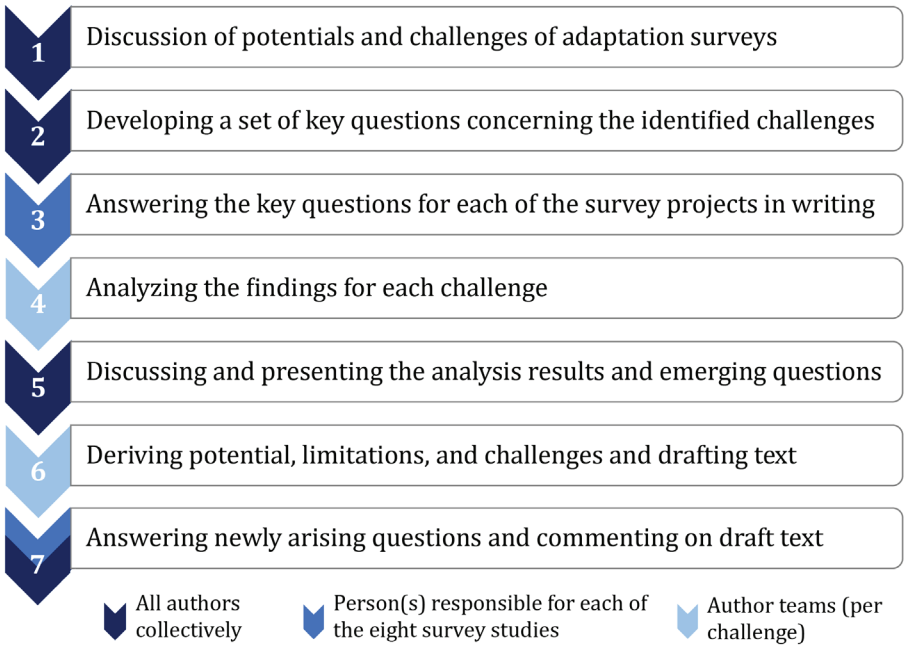
we drafted a set of questions to collate information related to these challenges from the participating research teams in a structured way. The draft questions were discussed by all authors and then summarized in a structured list of questions pertaining to each challenge (see Appendix for these questions). Third, each project/author team answered all questions. Fourth, the written answers for each of the seven challenges were evaluated and written up by seven smaller author teams (mixed across projects), including recommendations and unresolved aspects. These findings were again presented and discussed with the entire group of authors before drafting the subsections of this article. Finally, new questions about the experiences of the eight survey studies were answered, and the article was finalized after several rounds of discussion and commentary by all authors. The results of this process and insights from the literature form the basis of the following sections.

4. Methodological Lessons from Eight Local Surveys of Climate Adaptation in Local Authorities

4.1 Potential of Surveying Local Authorities on Climate Change Adaptation

Surveys of municipal authorities on climate adaptation offer a unique opportunity to gather insights about the entire local administration and its component parts, contributing to a holistic understanding of municipal adaptation efforts. These surveys hold considerable methodological and empirical potential and can compensate for the deficits of other methods, such as content analysis of policy documents, websites, or database entries. For example, surveys can often reach more local authorities than desk-based and/or qualitative approaches—especially with online surveys.

Figure 1 Overview of Steps in the Lesson-Drawing Process



Note. Source: Own illustration.

One key advantage of surveys is that they can provide information on municipalities or counties not documented elsewhere (Krause et al., 2024), such as in climate adaptation plans or database entries. Surveys are thus particularly suitable for collecting data on the adaptation efforts of smaller and less active municipalities, especially those without plans and/or with a limited online presence. Therefore, administrative surveys can produce valuable and comparable data on adaptation for different levels and sizes of local authorities (e.g., counties, cities, city districts, towns, etc.). Of the eight survey studies, all but one focused on, inter alia, municipalities with fewer than 50,000 inhabitants [1, 2, 4, 5, 6, 7, 8], and four studies included, for example, both municipalities and counties [1, 5, 6, 7]. Especially regional studies can facilitate a more profound understanding by allowing for more specific questions (e.g., using certain funding instruments that are only available nationally or at the federal-state level). In contrast, in international surveys, the questions are typically rather generic, and some response options are vaguely defined to apply to diverse cities worldwide (Shi et al., 2015). The eight studies examine local authorities from all of Germany [3, 6, 7] or selected federal states or counties [1, 2, 4, 5, 8].

Another advantage of surveys is that the information obtained can go beyond policy formulation and include an assessment of policy implementation (e.g., collaboration, funding, feasibility, resource availability), given that the latter stage remains hugely challenging and often poorly documented. Assessing the implementation status is important because the literature identifies significant gaps in the implementation of adaptation plans (Lee & Kim, 2018; Rogers et al., 2023). In addition, it can be asked about the internal processes of taking adaptation action and the perceived success and effects of implemented measures which are hardly documented in adaptation plans. All eight surveys thus included questions about the motivation or the drivers of and barriers to successful implementation.

Surveys can also generate data on respondents' worldviews and perceptions (Kuhlmann & Seyfried, 2020). Such insights include attitudes, local conditions, and self-assessments concerning adaptation, which go beyond purely factual information. Most of the eight studies gathered insights into the awareness of local climate change and extreme weather events [2, 4, 5, 6, 7, 8]. These actor-centered assessments can be used as dependent or independent variables in ensuing analyses.

Finally, surveys can generate increased attention to the effects of climate change and create learning effects or even behavioral change among respondents, for example, by outlining potential local climate adaptation actions. Such potentials of surveys have been described as the "mere measurement effect" (e.g., Morwitz & Fitzsimons, 2004). Surveys could also deliberately inform their participants about climate adaptation opportunities, provided that this does not lead to unintended question ordering effects (Dillman et al., 2014) and that it does not inform about issues that appear later in the questionnaire. In addition, municipalities or counties interested in further interaction and exchange, such as workshops, could be recruited in a way that respects data privacy. For example, the results of Study 1 were used to identify potential interview partners.

4.2 Particularities, Challenges, and Recommendations

Despite the potential of surveys to provide relatively quick insights into large numbers of sites, conducting surveys is "often a laborious and time-consuming task" (Krause et al., 2024, p. 1095). In all eight studies, the survey projects needed considerably more time (and additional resources) than expected. Besides this general aspect, seven main challenges emerged in relation to the research topic on the one hand and to local authorities as a specific target group (as opposed to, e.g., households) on the other hand during the research process in the eight studies (see Figure 2). It is noteworthy that all seven challenges arise from several characteristics of the issue and the target group, with the cross-cutting nature of climate change adaptation, the novelty of this topic at the local level, and the diversity of the target group being particularly challenging. The categorization serves to illustrate the challenges and their underlying causes, whereby the particularities often overlap in practice. In the following sections, we present the seven challenges with information on our practical experiences, advantages, and disadvantages of different approaches to dealing with the challenges, as well as recommendations.

4.2.1 How to Select Local Authorities?

Surveys can cover a wide variety of local authorities, including those of counties, municipalities, or even city districts. They can focus on very different (total)

Figure 2 Seven Main Challenges Surveying Local Authorities on Climate Change Adaptation and Their Causes

	Particularities leading to methodological challenges	Challenges*						
		1	2	3	4	5	6	7
Local climate change adaptation as research topic	Cross-cutting topic due to diverse possible climate change adaptation impacts and local activities	X	X	X		X	X	X
	Rather new for many local governments and partly little and unevenly distributed knowledge		X	X		X	X	X
	Complex topic; still limited academic knowledge on local impacts, understandings, and activities					X	X	X
Local authorities as target group	Administrative levels: partly different structures between federal states and unclear responsibilities	X	X					X
	Various organizational and hierarchical structuring (related, e.g., to size); partly unclear responsibilities	X	X	X	X	X	X	X
	Partly missing or outdated contact details and limited data for sampling and explanation	X	X				X	X
	Data protection regulations and the desire for employee anonymity in a shared working environment with potentially different values and perceptions		X		X	X	X	X
	Partly high workload and frequent survey requests						X	

* 1) Select local authorities (4.2.1)
2) Identify suitable respondents (4.2.2)
3) Contact potential participants (4.2.3)
4) Ensure data protection (4.2.4)
5) Design a good questionnaire (4.2.5)
6) Achieve high response rate & robust data (4.2.6)
7) Analyze and validate data (4.2.7)

Note. Source: Own illustration.

target populations, including smaller regions or a limited number of counties [2, 4], single federal states [1, 5, 8], or all of Germany [3, 6, 7]. However, instead of surveying total populations of local authorities, researchers can also use random or stratified sampling based on specific criteria such as the size, region, and adaptation level of potential participants (the latter requiring prior knowledge). Patterson (2021) argues that random sampling is often difficult in local adaptation research because of highly heterogeneous distributions of experts and cases. For example, variations in administrative competencies, structures, and responsibilities, even within federal states, can result in responses from different administrative positions and levels. Therefore, surveying local authorities on adaptation requires "well-founded, systematic, and justified design decisions," which may also combine elements of random and non–random sampling (Patterson, 2021, p. 13).

Our own experiences reveal several challenges when sampling participants. For example, identifying the appropriate administrative level can be challenging when responsibilities for adaptation remain unclear. This is even more problematic when surveying municipalities from different federal states with different administrative structures and responsibilities. For example, in many German states, municipalities form associations of administrations that also assume some adaptation responsibilities. Some municipalities, but not others, may also delegate specific adaptation tasks to a larger neighboring municipality. However, this does not necessarily mean the higher level has more local adaptation knowledge and expertise.
Data for sampling can often be obtained from official statistical offices, which provide, for example, lists of municipalities and even contact details. However, small and medium–sized municipalities may sometimes lack sufficient contact information (e.g., postal

and email addresses), making it more challenging to include them in the sampling frame in the first place. It is essential to check the timeliness of the data, as contacts and details change regularly, for example, because of local elections or administrative staff turnover.

These observations lead to three recommendations. First, it is essential to carefully assess which level of government is responsible for which adaptation-related decisions and actions, especially if the goal is to compare regions and states. Second, where formal administrative powers are delegated to higher levels, researchers need to reflect on whether the responsible units are also those with the most expertise and take decisions on which level to involve if this is not the case. Finally, the selection of participants and the number of potential local authorities must correspond with the available resources.

4.2.2 Who Should Receive the Questionnaire?

A key challenge for surveys of local authorities is whom to approach, given that municipal administrations are quite diverse organizations structured in multiple formal and informal hierarchies, thematic clusters and responsibilities, specific departments, and others. As a rule of thumb, larger municipalities are more likely to have more specialized units (e.g., departments, working groups), which may include a dedicated administrative department for climate adaptation, whereas this is usually not the case for smaller municipalities and cities (Biesbroek et al., 2018). Because climate change adaptation is a cross-cutting issue, knowledge and responsibility for this work area can be spread across local governments of all sizes.

In general, there are two strategies to identify appropriate contact persons for local authority surveys: either based on formal hierarchy [1, 2, 4, 8] or thematic responsibility [3, 5, 6, 7]. Both strategies have their advantages and disadvantages. In the hierarchy-based approach, the strategy is often to start with top officials, such as the head of the public administration, usually the mayor, or other high-level officials with broad management responsibilities. These officials may be able to complete the questionnaire themselves but, in many cases, must rely on the expertise of other employees with specific knowledge from lower administrative levels. One advantage of the hierarchy-based approach is that top-level officials are usually easier to identify. Especially in smaller municipalities, contacting the mayor may be the only option if no dedicated responsibility for climate change adaptation can be identified in the public administration (see Biesbroek et al., 2018). Moreover, selecting top officials can enhance the perceived relevance of the survey so that lower administrative-level personnel feel more committed to responding, which increases the response rate (see Section 4.2.6). However, requests to participate in a survey by a superior could not only influence response behavior, but also jeopardize the voluntary nature of participation. If individuals feel obligated to respond, they may not be motivated to provide detailed answers or give answers they think their superiors may want to see (social desirability bias; see Krumpal, 2013). Furthermore, top officials can also act as gatekeepers and decide not to forward a questionnaire, for example, because they do not want to increase their employees' workload or because they are concerned about the public image of their municipality. Especially if they feel that their municipality has not done enough to adapt to climate change, they may not be willing to disclose this, even in an anonymous survey. Thus, contacting the top level could also lead to lower response rates.

The second strategy identifies individuals most directly responsible for adaptation, such as climate managers (see Bickel et al., 2020; Kenkmann, 2024). However, finding the relevant people and their contact details in local administrations can be time consuming, requiring internet queries or even personal phone calls and often preexisting knowledge. Often, there is not (yet) a single person responsible for coordinating adaptation. Therefore, given the cross-cutting nature of adaptation, initially identifying multiple potential respondents appears to be an appropriate strategy. In this way, the knowledge and experience of multiple relevant public employees can be incorporated into the survey and thus lead to a more comprehensive understanding. What is essential, however, is to ask for a coordinated response if the goal is to generate one questionnaire per local authority. This strategy thus also carries a particular risk that the responses may be biased or embellished if respondents feel they cannot respond freely, given that others are also involved. When choosing a contact strategy, clarifying the overall objective of the project can assist in choosing the most promising approach for the survey. In particular, it is crucial to consider the diversity of climate adaptation efforts and how they are located within municipal administrations.

4.2.3 How to Contact Potential Participants?

When approaching local authorities with a survey, one should bear in mind that responding represents an additional burden for employees with limited time, which is even larger due to any necessary coordination effort between persons or departments. As there are frequent requests to participate in surveys and participation is typically voluntary, it is essential to approach potential respondents in a way that motivates them to participate.

A well-designed cover letter inviting potential respondents is a key motivator (Dillman et al., 2014, p. 374; see the cover letters of Studies 1, 3, and 4 as examples in Otto et al., 2026). Generally, the cover letter should be no more than one [1, 3, 4, 6; see also Dillman et al. 2014) or two pages long [2, 5, 7, 8], well-structured, and easy to read. It does not need to include all context information, as a reference can also be made to further links and the landing page of the online survey, which can provide information that is not essential for the initial contact. The content of the text should be well thought out, as should the decision on how to send it—by email [3, 4, 5, 6,], paper mail [2, 8], or both [1, 7]. A combination of email and paper mail is recommended to contact municipalities in order to minimize the risk of losing respondents, for example, because emails are overlooked or arrive in the spam folder (see Krause et al., 2024). Sending a letter by regular mail also allows adding a print version of the questionnaire. However, this approach generates higher costs for printing and mailing, so only two of the eight studies [1, 2] proceeded in this mode.

If researchers anticipate that climate change adaptation is not very well known as a term among the target group (e.g., among small municipalities), they could underline the relevance of the study by referring to local impacts, such as extreme weather events and gradual climate impacts in the cover letter [4, 8]. Considering the often high workload of the target group, the cover letter should also realistically state how long it usually takes to complete the questionnaire and until when participation is possible. Doing so allows for reliable planning of the respondents, especially if further information needs to be obtained elsewhere, and may reduce the number of survey-related queries. The cover letter design also influences whether the recipients consider participation trustworthy. Key information in cover letters includes, for example, highlighting brief background information on the survey, the research project, the institutions involved, and contact details for potential queries. Doing so enhances transparency and trust (see Dillman et al., 2014, p. 379), which can be further strengthened by a brief reference to data handling (see Section 4.2.4). Accompanying letters of recommendation from state authorities or umbrella organisations representing local authorities, as included in [1, 2, 4, 5, 7, 8], can be particularly helpful if the municipalities recognize and trust these institutions and organizations. Of course, while doing so, municipalities need to understand to what extent these endorsing organizations later have access to results. This aspect makes the issue of data protection all the more important (see Section 4.2.4).

Some studies suggest that a personalized cover letter, which can be sent via bulk email, may contribute to ensuring that the survey gets into the right hands [5, 7]. This is particularly important for a cross-cutting issue such as climate adaptation, where coordination between different departments and/or people in a local administration is important. If the cover letter is sent to a general address, for example, because no specific contact person is known, it should include clear instructions on how to forward the questionnaire to the right person(s). In addition, it may explain and emphasize the importance and benefits of the survey for the municipality. Study 7, for example, pointed out that the survey is intended to provide important information for strengthening municipal activities in further developing the German Adaptation Strategy. Another option offered to participants was to receive customized information or results afterwards [3] or the possibility of collaboration [5].

Short reminders should be sent before the deadline after inviting the municipalities to participate in the survey. To increase motivation to join, they can mention how many municipalities have already participated [5, 7]. In addition to written reminders, telephone inquiries can increase the response rate (see Section 4.2.6).

4.2.4 How to Ensure Data Protection?

Data protection and anonymity pertain to research ethics (Henn et al., 2022) and are crucial considerations in surveys in local authorities. From our experiences, there may be varying interpretations of what constitutes personal data under the EU's General Data

Protection Regulation (GDPR; e.g., email addresses with or without an individual's name). To resolve such issues, researchers need to consult data protection authorities and representatives early, as resolving issues can take much longer than anticipated. One result of these consultations should be an adequate declaration of consent at the beginning of the survey.

Usually, respondents of municipal surveys answer the questions for and in the representation of their municipality and its activities. This can be a single person but also several employees, for example, from different areas of administration and responsibility (see Section 4.2.1 and 4.2.2). Depending on the design of the questionnaire (see Section 4.2.5), it may also include assessment questions which, unlike factual questions, are based on personal values and perceptions. Therefore, researchers need to decide which questions on the local authority and the respondents should be included in the questionnaire, considering data protection regulations and potential impacts of (non-)anonymity. There are at least three approaches to dealing with anonymity in surveys in municipalities and counties, considering the data collection and publication. First, researchers can guarantee complete anonymity by not collecting information allowing the person and/or municipality to be identified. This method likely minimizes response bias due to social desirability. However, it restricts further analysis and future longitudinal studies and, thus, was not followed by any of the eight studies. Second, collect voluntary information and offer anonymity upon request, providing respondents the choice of what information they disclose (e.g., size of the municipality, municipality name, position within the administration) [2, 3, 4, 6, 8]. While this approach offers flexibility, it may limit further data analysis depending on the voluntary information provided, and steps in data cleansing are necessary (e.g., Riach & Glaser, 2024). Third, researchers may use a mandatory identifier, allowing for comprehensive data analysis but risking response bias or survey dropouts. One solution for these problems might be to collect the identity of the local authorities but to guarantee that only aggregate data will be published or shared, if at all, which does not permit any identification of individuals or municipalities [1, 7, partly 5], (e.g., Buschmann et al., 2022). Exploring how (non-)anonymity affects survey responses could provide valuable insights.

4.2.5 How to Design a Good Questionnaire?

Challenges in constructing a questionnaire for local climate change adaptation mainly result from the fact that it is still a relatively new and cross-cutting policy field. Our experience shows that the academic understanding of adaptation does not necessarily correspond with that of the local administration and with everyday administrative practice. Academic knowledge of local adaptation (e.g., implemented adaptation measures or barriers to adaptation) is still limited, which, in turn, hampers the development of standardized questions and may tempt researchers to design very broad and long questionnaires. As many municipalities, especially small and medium–sized, do not have specialized staff responsible for the cross-cutting topic of climate adaptation (see also Section 4.2.2), individuals from various departments should be able to understand and complete the questionnaire.

Based on our experience, we highlight important elements of questionnaire design and derive three lessons learned. First, our studies showed that question wording is crucial in administrative surveys (see also Kuhlmann & Seyfried, 2020). Questions should be adapted to the language and knowledge level of the respondents and be as specific as possible (Krosnick & Presser, 2010). Therefore, definitions and concise wording are key. Frequently defined terms in our survey were adaptation, mitigation, extreme weather events (e.g., heavy rainfall or pluvial flooding), and adaptation measures. Several studies [4, 6, 7] used the mouse-over function (an item that pops up when the cursor moves over it) to explain terms, which only slightly interrupts the respondents' reading flow. However, our surveys still revealed comprehension problems and misunderstandings. For example, the term *adaptation* led to confusion in seven of our surveys. Comprehension problems were particularly evident in questions about adaptation measures with semi-open and open response options. In four studies [3, 4, 5, 7], measures were stated that are clearly attributable to climate mitigation (e.g., municipal heat supply planning). We also encountered misunderstandings regarding integrated climate mitigation and adaptation plans. One study [1] found that while integrated concepts were mentioned, some of the reported plans only addressed climate mitigation and energy, not both mitigation and adaptation. We therefore strongly recommend that researchers explain, and if both subjects are addressed, clearly separate adaptation and mitigation in their questionnaires. An-

other possibility to avoid confusion is grouping questions on adaptation and mitigation together.

Concerning question types, we recommend using semi-open questions to explore this new research field for all areas when the potential range of responses can be reasonably approximated (akin to closed questions) but remains indeterminable with absolute certainty (similar to open questions). As no standardized catalogue of (local) adaptation measures exists, all our surveys used semi-open questions, allowing municipalities to add their own points. The same applies to potential drivers of and barriers to adaptation. At the same time, it became apparent that certain measures such as flood protection or building insulation are often not considered adaptation actions in municipal practice. Therefore, defining the conceptual contours of adaptation (Dupuis & Biesbroek, 2013) and asking as precisely as possible about individual adaptation measures is essential. Otherwise, some adaptation actions might be missed. Open questions were predominantly used at the end of the questionnaires to permit municipalities to raise issues that were not addressed or to comment on the questionnaire. Such remarks by respondents provide researchers with feedback on their questionnaire and opportunities for improvement (van Thiel, 2014).

Second, drawing on existing questionnaires can help to establish structured and comparable research instruments on local adaptation. However, this opportunity is hampered by the fact that only a few questionnaires are publicly available. For the German context, only the study of Hasse and Willen (2019) was accessible for the development of our questionnaires, and most of us considered this study for our survey projects (meanwhile, those available for the German context are: Friedrich, Stieß et al. [2024, 7], Riach & Glaser [2024], and von Streit et al. [2024b, 4], and for the international context: Cheng et al. [2021]).

Third, a pretest is necessary to evaluate the filtering, length, and comprehensibility of the questionnaire. If diverse administrative bodies (e.g., municipalities and counties) are addressed, filter questions should be included to avoid asking respondents questions that do not apply (Krosnick & Presser, 2010). All eight studies conducted pretests, but mostly with local authority stakeholders, who were involved in the research projects to varying extents. Based on our experiences, we recommend selecting more diverse respondents, for example, from different municipality sizes, administrative levels, and departments. Besides conventional or cognitive pretests (Lenzner et al., 2016), organizing workshops with representatives of local authorities is another option to discuss and test the questionnaire.

4.2.6 How to Achieve a High Response Rate and Avoid Nonresponse?

High response rates are key to enabling extensive knowledge gain and conducting certain (statistical) analyses (van Thiel, 2014). However, as local authorities receive more surveys, scholars have noted an increasing survey fatigue (Krause et al., 2024). Although we cannot track this decline in our studies, we have experienced people responding to our requests that they do not have enough time or expertise to be surveyed [3]. In the context of climate adaptation surveys, response rates could also decrease where internal coordination is necessary to answer questions and where respondents are unfamiliar with the topic. The response rates of the eight surveys conducted by the authors range from 23% to 57% (see Table 1). In the literature, surveys of climate adaptation among local authorities report very different response rates (e.g., 25% [Wood et al., 2014], 52% [Shi et al., 2015], and 79% [Patterson, 2021]).

There are many strategies to reach high response rates in general (e.g., Dillman et al., 2014). However, some remain impossible when surveying local authorities, for example, financial rewards (Krause et al., 2024). Our experience suggests that the timing of the survey, considering, for example, holidays, (local) election campaigns, and other ongoing surveys is crucial. In terms of survey duration, four to six weeks appear to be appropriate, for instance, with an initial four weeks and an extension of another two. Three projects [3, 4, 7] provided detailed data on the timing when questionnaires were received. Their data show that daily return rates dropped considerably a few days to one week after the start of the survey. After sending reminders, daily return rates increased to at least half of their initial value. In one case with two reminders [7], the second one showed a similar effect. These reminders, ideally, are only sent to those who have not yet responded. In online surveys, personalized links in compliance with data protection may be one option to do so. While Krause et al. (2024) recommend even more than two to three reminders, they should persist but not pester the (remaining) potential participants. In addition to reminders, some stud-

ies show that a change in surveying mode, for example, from telephone to online, can boost the response rate (Cheng et al., 2021; Kenkmann et al., 2021).

In addition to the number of responses, there might be differences in the distribution of responses related to the characteristics of local authorities, such as their size and capacity, as shown by Amundsen et al. (2010). Indeed, all eight studies referred to in this article found higher response rates among larger cities. For example, in a nationwide survey [7], only 16% of the municipal associations, typically representing small municipalities, responded. In comparison, the response rate was 63% among county-independent cities, which usually boast more than 100,000 inhabitants. This might be because larger cities often have more dedicated personnel for climate change adaptation and are often longer familiar with this topic (Kern et al., 2023; Otto, Kern et al., 2021). In addition, regional differences can occur. For example, the nationwide surveys found that local authorities from North Rhine-Westphalia were more likely to participate than those from other federal states [3, 6, 7]. This can probably be explained by the fact that many larger cities are located in this federal state and that the latter is rather considered an adaptation leader. To reach municipalities and counties that may be less likely to respond, additional incentives (e.g., in the form of knowledge), an extended survey period, or stratified sampling could be helpful, but it was not tested in the eight surveys. To better understand potential response biases, a question could be added where respondents can indicate why they chose not to participate or why they dropped out.

In this context, it is important to note that nonresponse does not automatically cause inference problems. In particular, results can often be checked and adjusted using external data sources such as structural and demographic variables. However, endogenous sample selection, which inherently depends on the research question, is more problematic. For example, suppose the research interest is in the adaptation efforts or actions of local authorities. In that case, bias may arise if the more active authorities are also more likely to respond to the survey. In this case, it is particularly difficult to estimate whether there is a sample selection bias and, if so, how high it is because there is typically a lack of relevant external data indicating the municipal climate adaptation activity level. However, sometimes proxies may hint at the degree of potential bias. For example, in Study 1, members of a regional climate network were more likely to respond to the survey than nonmembers, which could be interpreted as a sign of a bias towards more active municipalities. In another study [3], survey responses were compared to findings from archival research using the same city sample (Otto, Kern et al., 2021). The comparison showed that 75% of the cities categorized as "very active" by the archival approach participated in the survey, but only 34% of those that were categorized as "not yet active."

In any case, the analysis and the interpretation of results should always reflect upon and make transparent potential selection biases (van Thiel, 2014). Differences between a survey sample and the target population should be explored and adjusted where external data are available (e.g., by adding relevant control variables in multivariate analyses). Doing so requires, on the one hand, that survey answers are linked to information on the local authority, such as the name (non-anonymous approach, see Section 4.2.4), and on the other hand, that knowledge and relevant data capture the diversity of local authorities, such as their size, administrative level, capacity, regional and geographic location, organizational and administrative structures, and interests. Scholars should also be aware of endogenous sources of selection bias and, where possible, try to determine its direction and strength (Schulze, 2024). Proxies reflecting adaptation activity or vulnerability may help in this context. Sample selection models such as the Heckmann correction (Wooldridge, 2013, p. 622) and weighting (van Thiel, 2014) may also be considered in the analysis of potentially biased data.

4.2.7 How to Analyze and Validate Survey Data?

There are various methods to analyze survey data. Survey data have been used to create indices and rankings of local adaptation actions (e.g., Bausch & Koziol, 2020; Nohrstedt & Nyberg, 2015; Schulze & Schoenefeld, 2023; Wood et al., 2014; [1, 2]). Others have analyzed the content of open-ended questions [3]. There are various methods to describe the collected data and test hypotheses about potential determinants and outcomes of adaptation (or the lack thereof). The most common ones are frequency distributions, correlations, and (multivariate) regression analyses using additional variables reflecting, for example, the socio-economic characteristics of municipalities. These methods were all applied in the

eight presented studies. Survey data and statistical models can also be used to select cases for individual and group interviews [1]. When the surveyed cases include geo-references, spatial analysis can be helpful in understanding geographic patterns of climate adaptation.

Analyzing adaptation survey data can present several challenges. First, sample sizes can sometimes be quite small due to low response rates (e.g., n<100) as the number of the target group is not as big as in the case of population surveys (see Table 1 for sample sizes of the eight studies). Filtering questions can generate smaller sub-samples, even in surveys with larger responses.

Second, establishing comparability across different administrative units and levels (e.g., states, administrative communities, municipalities) can be particularly challenging when surveys cross federal state or even national boundaries (Schoenefeld et al., 2023; see Section 4.2.1). Third, response quality can be a concern, and its systematic evaluation using established metrics such as item response variability and response inconsistency ratios (see, e.g., Leiner, 2019; Ward & Meade, 2023) has yet to be more widely applied in the context of adaptation surveys. Validating survey responses is generally challenging because, as already mentioned, surveys of local authorities typically collect adaptation data that is not readily available elsewhere, and it depends on whether the local authorities are anonymous or not (see Section 4.2.4). The most common opportunities for validation arise where responses relate directly to prominent documents and instruments, such as the existence of climate and heavy rainfall maps and adaptation plans (e.g., Schulze & Schoenefeld, 2023; [1, 3]). When such documents are used to validate survey responses, it is important to check their creation dates and timelines and document discrepancies. These discrepancies can arise if people with a comprehensive overview of local climate change adaptation are missing and answers are not internally coordinated. Aggregating (e.g., averaging) multiple responses to opinion questions (e.g., on perceived challenges) from the same local authority, selecting responses based on (expected) data quality and expertise, or asking explicitly for coordinated responses from individual authorities can improve data quality. In addition, it is generally important to clarify that the results are based on questionnaire responses, even where factual responses are reported. For example, based on survey results, researchers should write that municipalities have reported having experienced extreme weather events instead of stating that such events have happened in their municipalities.

5. Discussion and Conclusion

Surveys hold extraordinary potential for gaining insights into how a large number of municipalities and counties adapt to climate change, which is why they are increasingly used for this purpose (e.g., Aylett, 2015; Bausch & Koziol, 2020; Buschmann et al., 2022; Kalafatis, 2018; Patterson, 2021; Shi et al., 2015). Given this potential, the lack of knowledge about how to conduct surveys of adaptation among local officials is remarkable. In this article, we have drawn lessons from eight recent survey projects conducted in Germany, focusing on the advantages and methodological challenges of surveying local authorities on climate change adaptation. We also provide practical recommendations on how to deal with these challenges to inform future research. Therefore, this article goes beyond the existing literature, which offers only limited guidance. The issue of climate change adaptation is also particularly well suited to illustrate the challenges of local authority surveys because it is a relatively new issue that cuts across established local administrative structures. While some of the issues raised may be specific to the German context and climate change adaptation, many of our findings and recommendations are applicable to different regional and multilevel contexts and social-empirical research questions.

All of the referenced surveys were able to collect data from a larger number of cases on several issues that are of high research interest but not easily obtained through other methods, including information on the implementation of climate adaptation policies or perceptions of climate change (adaptation). The surveys proved to be particularly useful for collecting data from smaller municipalities and where archival research methods have limitations. While surveys provide the opportunity to inform participants about climate change adaptation issues, this was not an explicit goal of the eight projects, and in only one case were the survey results used to identify potential participants for further (qualitative) research. While conducting interviews, focus groups, or observations on adaptation to climate change in local authorities may provide even more detailed insights

than surveys, for example, on the reasons for (non-) action or the (non-)success of measures and the exchange with local authorities is even closer, these approaches are very time-consuming and therefore not applicable to a large number of cases. However, they can be a very valuable and complementary addition. Alongside the opportunities of local administrative surveys, we also identified seven major challenges: 1) selecting local authorities, 2) identifying suitable respondents, 3) contacting potential participants, 4) ensuring data protection, 5) designing a good questionnaire, 6) achieving a high response rate and high data quality, and 7) analyzing and validating the data (see Figure 2). These challenges are also applicable (in varying degrees) to adaptation surveys elsewhere and surveys of local authorities more generally. For example, in their literature review, Biesbroek et al. (2018) also list identifying appropriate respondents, constructing a well-designed questionnaire, and validating the results as major challenges in this research area. However, while most articles focus on presenting research findings and hardly reflect methodological challenges, this article has explicitly focused on the seven challenges, potential solutions, and recommendations to inform future research practice. Table 2 summarizes our main recommendations to be considered in future survey projects concerning each of the seven challenges.

Table 2 Selected Recommendations for the Seven Main Challenges

Main challenges	Selected recommendations (for details, see the specific sections in 4.2)
Selecting local authorities	Determine which level is responsible for which decisions and actions. Consider whether the responsible units are knowledgeable. Adjust the selection of participants to the available resources (e.g., by sampling).
Identifying suitable contact persons	Determine which level is responsible for which decisions and actions. Decide whether to identify respondents based on formal hierarchy or thematic responsibility, reflecting on the (dis)advantages of both strategies. Consider the diversity of adaptation actions and associated responsibilities.
Contacting participants	Decide how to contact potential participants (by post, phone, online), taking into account the (dis)advantages. Use a well-designed cover letter that provides the information needed to be transparent, build trust, and understand the relevance of the survey. Include clear instructions on who should answer the survey and consider whether you want a coordinated response from the local authority or different perspectives.
Ensuring data protection	Consult data protection authorities and representatives at an early stage. Decide on a level of anonymity, considering data protection regulations and the potential impacts of (non-)anonymity (e.g., for the selection of questions).
Designing a good questionnaire	Use language that is easy to understand for local government employees; use pilot testing to verify this is the case. Use definitions and precise wording. Bear in mind that respondents may confuse climate change mitigation and adaptation, thus, ask as precisely as possible about individual adaptation measures. Use semi-open questions. Draw on existing questionnaires and think about making your questionnaire publicly available. Select a diverse set of (municipal) respondents for pre-testing.
Achieving a high response rate and high-quality data	Choose the timing of the survey carefully. Aim for a survey period of a few weeks with one or two reminders. Consider strategies to reach local authorities who are less likely to respond. Examine the differences between a survey sample and the target population.
Analyzing and validating data	Choose a method of analysis that is appropriate to your data (sample size). Decide whether and how you want to validate responses, for example, on the existence of specific policies. If applicable, aggregate multiple responses from the same local authority. Present your findings as questionnaire responses rather than facts.

In summary, the seven challenges are, inter alia, caused by the cross-cutting nature of climate change adaptation, the complexity and novelty of the issue, the diversity of administrative structures, and unclear responsibilities across administrative levels and within local governments. As the climate continues to change and local authorities need to respond, local authorities will likely become increasingly familiar with adaptation in the coming years. In Germany, this process is likely to be strengthened by the recently enacted national climate change adaptation law (Federal Climate Adaptation Act, German Federal Government [*Die Bundesregierung*], 2023), which obliges the federal states and municipalities to prepare adaptation plans. Moreover, the increasing employment of climate adaptation managers funded by the German Federal Government may lead to more explicit responsibilities and more resources and interest in responding to adaptation surveys.

Irrespective of these developments, the research community should reflect more intensively on countering survey fatigue among local authorities (Krause et al., 2024). To this end, more exchange and collaboration among researchers would be useful. This article took a step in this direction. However, our approach also has some limitations. All but one of the survey studies considered were completed before our joint analysis and discussion started. The findings presented depend on the quality of the documentation and researchers' recall of the survey process. In addition, because we conducted the original studies and later reflected on our approaches, we may not have been as objective as external evaluators would have been. Next, we acknowledge that selecting the eight studies on which the results are based is restrictive and that including other studies may have led to (slightly) different results.

More discussions between survey projects, which are in the original research phase, might be beneficial. This could include sharing information about planned or completed surveys (in the same region), harmonizing the wording of (core) questions, combining questions into joint surveys, and sharing and publishing questionnaires and datasets. By taking these steps, we can learn from each other's survey projects and improve questionnaires and survey processes. Ultimately, this exchange and collaboration would also increase the possibilities for comparing different survey results, improve knowledge accumulation to reach more generalizable conclusions, and perhaps also conduct longitudinal studies. Such efforts are widely lacking today (at least in the German research community) and would greatly contribute to a more comprehensive understanding of local adaptation to climate change. Furthermore, more substantial involvement of local authorities in project design could enhance the practical relevance of future survey research and align the surveys more closely with the local administrative context and approaches to climate adaptation.

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ChatGPT-4 was used exclusively to convert comprehensive German bullet points into structured English sentences for Chapter 4.2. These were used as the basis for Sections 4.2.2 and 4.2.5, but were fully revised and rewritten so that the final manuscript no longer contains any verbatim overlap with the AI-generated text. The tool did not perform any conceptual, analytical, or interpretive work at any point during the writing process.

References

Amundsen, H., Berglund, F., & Westskogh, H. (2010). Overcoming barriers to climate change adaptation – a question of multilevel governance? *Environment and Planning C: Government and Policy*, *28*(2), 276–289. https://doi.org/10.1068/c0941

Araos, M., Berrang-Ford, L., Ford, J. D., Austin, S. E., Biesbroek, R., & Lesnikowski, A. (2016). Climate change adaptation planning in large cities: A systematic global assessment. *Environmental Science and Policy*, *66* (July), 375–382. https://doi.org/10.1016/j.envsci.2016.06.009

Aylett, A. (2015). Institutionalizing the urban governance of climate change adaptation: Results of an international survey. *Urban Climate*, *14*, 4–16. https://doi.org/10.1016/j.uclim.2015.06.005

Bausch, T., & Koziol, K. (2020). New policy approaches for

increasing response to climate change in small rural municipalities. *Sustainability*, *12*(6), 1894. https://doi.org/10.3390/su12051894

Bickel, M. W., Caniglia, G., Weiser, A., Lang, D. J., & Schomerus, T. (2020). Multilevel knowledge management for municipal climate action: Lessons from evaluating the operational situation of climate action managers in the German Federal State of Lower Saxony. *Journal of Cleaner Production*, *277*, 123628. https://doi.org/10.1016/j.jclepro.2020.123628

Biesbroek, G. R., Berrang-Ford, L., Ford, J. D., Tanabe, A., Austin, S. E., & Lesnikowski, A. (2018). Data, concepts and methods for large-n comparative climate change adaptation policy research: A systematic literature review. *Wires Climate Change*, *9*, e548. https://doi.org/10.1002/wcc.548

Burch, S. (2010). Transforming barriers into enablers of action on climate change: Insights from three municipal case studies in British Columbia, Canada. *Global Environmental Change*, *20*(2), 287–297. https://doi.org/10.1016/j.gloenvcha.2009.11.009

Buschmann, D., Koziol, K., Bausch, T., & Reinhard, S. (2022). Adaptation to climate change in small German municipalities: Sparse knowledge and weak adaptive capacities. *Natural Resources Forum*, *46*(4), 377–392. https://doi.org/10.1111/1477-8947.12262

Cannon, C., Chu, E., Natekal, A., & Waaland, G. (2023). Translating and embedding equity - thinking into climate adaptation: an analysis of US cities. *Regional Environmental Change*, *23*(30). https://doi.org/10.1007/s10113-023-02025-2

Cheng, Y. (Daniel), Farmer, J. R., Dickinson, S. L., Robeson, S. M., Fischer, B. C., & Reynolds, H. L. (2021). Climate change impacts and urban green space adaptation efforts: Evidence from U.S. municipal parks and recreation departments. *Urban Climate*, 100962. https://doi.org/10.1016/j.uclim.2021.100962

Desthieux, G., & Joerin, F. (2022). Urban planning in Swiss cities has been slow to think about climate change: Why and what to do? *Journal of Environmental Studies and Sciences*, *12*(4), 692–713. https://doi.org/10.1007/s13412-022-00767-9

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys. The tailored design method* (4th ed.). Wiley.

Dupuis, J., & Biesbroek, R. (2013). Comparing apples and oranges: The dependent variable problem in comparing and evaluating climate change adaptation policies. *Global Environmental Change*, *23*(6), 1476–1487. https://doi.org/10.1016/j.gloenvcha.2013.07.022

Eckersley, P., Kern, K., Haupt, W., & Müller, H. (2023). Climate governance and federalism in Germany. In A. Fenna, S. Jodoin, & J. Setzer (Eds.), *Climate Governance and Federalism in Germany: A Forum of Federations Comparative Policy Analysis* (pp. 150–176). Cambridge University Press.

Ford, J. D., & Berrang-Ford, L. (2016). The 4Cs of adaptation tracking: Consistency, comparability, comprehensiveness, coherency. *Mitigation and Adaptation Strategies for Global Change*, *21*(6), 839–859. https://doi.org/10.1007/s11027-014-9627-7

Friedrich, T., & Rossow, V. (2023). Wissenstransfer für Klimaanpassung - Ergebnisse einer Kommunalbefragung in Hessen [Knowledge transfer for climate adaptation – results of a municipal survey in Hessen]. *Transforming Cities*, *2*.

Friedrich, T., Otto, A., & Stieß, I. (2024). Kommunale Klimaanpassung. Bestandsaufnahme, Einflussfaktoren und Hebelpunkte. [Municipal climate adaptation: Assessment, influencing factors and leverage points]. Umweltbundesamt. https://www.umweltbundesamt.de/system/files/medien/11850/publikationen/48_2024_cc_kommunale_klimaanpassung.pdf

Friedrich, T., Stieß, I., Sunderer, G., Böhmer, C., Murawski, W., Knirsch, F., Otto, A., Wutzler, B., & Thieken, A. (2024). *Kommunalbefragung Klimaanpassung 2023* [Municipal survey on climate adaptation 2023]. Umweltbundesamt. https://www.umweltbundesamt.de/publikationen/kommunalbefragung-klimaanpassung-2023

German Federal Government (Die Bundesregierung). (2023). *Federal Climate Adaptation Act (Bundes-Klimaanpassungsgesetz – KAnG) of 20 December 2023*. https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Gesetze/kang_en_bf.pdf

Hasse, J., & Willen, L. (2019). *Umfrage. Wirkung der Deutschen Anpassungsstrategie (DAS) für die Kommunen* [Survey. Impact of the German Adaptation Strategy (DAS) on local authorities]. Umweltbundesamt. Dessau. https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2019-01-21_cc_01-2019_umfrage-das.pdf

Haupt, W., Eckersley, P., & Kern, K. (2022). *How can 'ordinary' cities become climate pioneers? In addressing the climate crisis* (pp. 83–92). Springer International Publishing. https://doi.org/10.1007/978-3-030-79739-3_8

Henn, S., Miggelbrink, J., & Hörschelmann, K. (2022). *Research ethics in human geography*. Routledge studies in human geography. Routledge.

Huber, B., Miechielsen, M., Otto, A., Schmidt, K., Ullrich, S., Deppermann, L., Eckersley, P., Haupt, W., Heidenreich, A., Kern, K., Lipp, T., Neumann, N., Schneider, P., Sterzel, T., & Thieken, A. H. (2022). *Instrumente und Maßnahmen der kommunalen Klimaanpassung* [Instruments and measures for municipal climate adaptation]. https://publishup.uni-potsdam.de/frontdoor/index/index/docId/56345%0A

Intergovernmental Panel on Climate Change. (2022). *Impacts, adaptation, and vulnerability. Contribution of working group II to the sixth assessment report of the Intergovernmental Panel on Climate Change* (H.-O. Pörtner, D. C. Roberts, M. Tignor, E. S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, & B. Rama [Eds.]). Cambridge University Press. https://doi.org/10.1017/9781009325844

Kalafatis, S. E. (2018). Comparing climate change policy adoption and its extension across areas of city policymaking. *Policy Studies Journal*, *46*(3), 700–719. https://doi.org/10.1111/psj.12206

Kenkmann, T. (2024). Evaluierung geförderter Klimaschutzmanager*innen: Ergebnisse einer Vergleichsgruppen- und einer Vorher-Nachher-Analyse [Evaluation of funded climate protection managers: Results of a comparative group analysis and a before-and-after analysis]. *Zeitschrift für Evaluation*, *23*(1), 97–110. https://doi.org/10.31244/zfe.2024.01.06

Kenkmann, T., Eisenmann, L., & Muckenfuß, L. (2021). Municipal climate action managers: Evaluating the impact. In *Eceee Summer Study Proceedings*. https://www.oeko.de/publikation/municipal-climate-action-managers-evaluating-the-impact/

Kern, K., Eckersley, P., & Haupt, W. (2023). Diffusion and upscaling of municipal climate mitigation and adaptation strategies in Germany. *Regional Environmental Change*, *23*(1). https://doi.org/10.1007/s10113-022-02020-z

King, J. P. (2022). Sixteen ways to adapt: A comparison of state-level climate change adaptation strategies in the federal states of Germany. *Regional Environmental Change*, *22*(2). https://doi.org/10.1007/s10113-021-01870-3

Krause, R. M., Fatemi, S. M., Nguyen Long, L. A., Arnold, G., & Hofmeyer, S. L. (2024). What is the future of survey-based data collection for local government research? Trends, strategies, and recommendations. *Urban Affairs Review*, *60*(3), 1094–1115. https://doi.org/10.1177/10780874231175837

Krosnick, J. A., & Presser, S. (2010). Question and questionnaire design. In J. D. Wright & P. V. Marsden (Eds.), *Handbook of survey research* (2nd e., pp. 263–314). Elsevier.

Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: A literature review. *Quality & Quantity*, *47*(4), 2025–2047. https://doi.org/https://doi.org/10.1007/s11135-011-9640-9

Kuhlmann, S., & Seyfried, M. (2020). Comparative methods B: Comparative methods in public administration - the value of looking around. In E. Vigoda-Gadot & D. R. Vashdi (Eds.), *Handbook of research methods in public administration, management and policy* (pp. 181–196). Edward Elgar.

Lee, J. S., & Kim, J. W. (2018). Assessing strategies for urban climate change adaptation: The case of six metropolitan cities in South Korea. *Sustainability*, *10*(6), 1–31. https://doi.org/10.3390/su10062065

Leiner, D. J. (2019). Too fast, too straight, too weird: Non-reactive indicators for meaningless data in internet surveys. *Survey Research Methods*, *3*, 229–248. https://doi.org/DOI: 10.18148/srm/2019.v13i3.7403

Lenzner, T., Neuert, C., & Otto, W. (2016). *Cognitive pretesting. GESIS survey guidelines.* https://doi.org/10.15465/gesis-sg_en_010

Lesnikowski, A., Ford, J. D., Biesbroek, R., & Berrang-Ford, L. (2019). A policy mixes approach to conceptualizing and measuring climate change adaptation policy. *Climatic Change*, *156*(4), 447–469. https://doi.org/10.1007/s10584-019-02533-3

Massey, E., Biesbroek, R., Huitema, D., & Jordan, A. (2014). Climate policy innovation: The adoption and diffusion of adaptation policies across Europe. *Global Environmental Change*, *29*, 434–443. https://doi.org/10.1016/j.gloenvcha.2014.09.002

Morwitz, V. G., & Fitzsimons, G. J. (2004). The mere-measurement effect: Why does measuring intentions change actual behavior? *Journal of Consumer Psychology*, *14*(1–2), 64–74. https://doi.org/https://doi.org/10.1207/s15327663jcp1401&2_8

Nohrstedt, D., & Nyberg, L. (2015). Do floods drive hazard mitigation policy? Evidence from Swedish municipalities. *Geografiska Annaler Series A-Physical Geography*, *97*(1), 109–122. https://doi.org/https://doi.org/10.1111/geoa.12081

Olazabal, M., Ruiz De Gopegui, M., Tompkins, E. L., Venner, K., & Smith, R. (2019). A cross-scale worldwide analysis of coastal adaptation planning. *Environmental Research Letters*, *14*(12). https://doi.org/10.1088/1748-9326/ab5532

Otto, A., Schoenefeld, J. J., Schubert, A., Schulze, K., & von Streit, A. (2026). Examples for cover letters for surveys with local authorities. [Beispiele für Anschreiben für kommunale Befragungen aus drei Studien]. https://doi.org/10.17605/OSF.IO/VZEYG

Otto, A., Miechielsen, M., Schmidt, K., & Thieken, A.H. (2025). Drivers and barriers to municipal climate change adaptation: A comparative analysis of selected measures and different implementation stages. *Journal of Environmental Studies and Sciences*. https://doi.org/10.1007/s13412-025-01049-w" \t "_top

Otto, A. (2022). Bundesweite Bestandsaufnahme der kommunalen Klimaanpassung [Nationwide inventory of municipal climate adaptation]. In A. Otto & A. H. Thieken (Eds.), *Urbane Resilienz gegenüber extremen Wetterereignissen. Gemeinsamer Verbundabschlussbericht des Forschungsprojektes ExTrass* (pp. 5–17). Universitätsver-

lag Potsdam. https://publishup.uni-potsdam.de/opus4-ubp/frontdoor/deliver/index/docId/55542/file/extrass_report.pdf

Otto, A., Göpfert, C., & Thieken, A. H. (2021). Are cities prepared for climate change? An analysis of adaptation readiness in 104 German cities. *Mitigation and Adaptation Strategies for Global Change*, *26*(8). https://doi.org/10.1007/s11027-021-09971-4

Otto, A., Kern, K., Haupt, W., Eckersley, P., & Thieken, A. H. (2021). Ranking local climate policy: Assessing the mitigation and adaptation activities of 104 German cities. *Climatic Change*, *167*(1–2). https://doi.org/10.1007/s10584-021-03142-9

Patterson, J. J. (2021). More than planning: Diversity and drivers of institutional adaptation under climate change in 96 major cities. *Global Environmental Change*, *68*(March), 102279. https://doi.org/10.1016/j.gloenvcha.2021.102279

Pietrapertosa, F., Salvia, M., Gregorio, S. De, Alonzo, V. D., Marco, J., Geneletti, D., Musco, F., Reckien, D., Analysis, E., Loja, C. S., & Scalo, T. (2019). Urban climate change mitigation and adaptation planning: Are Italian cities ready? *Cities*, *91*, 93–105. https://doi.org/10.1016/j.cities.2018.11.009

Reckien, D., Buzasi, A., Olazabal, M., Spyridaki, N., Eckersley, P., & Simoes, G. (2023). Quality of urban climate adaptation plans over time. *Urban Sustainability*, *3*(13), 1–14. https://doi.org/10.1038/s42949-023-00085-1

Reckien, D., Salvia, M., Heidrich, O., Church, J. M., Pietrapertosa, F., De Gregorio-Hurtado, S., D'Alonzo, V., Orru, H., Orru, K., Foley, A., Simoes, S. G., Flacke, J., Olazabal, M., Geneletti, D., Vasilie, S., Nador, C., Krook-Riekkola, A., Matosovi, M., Fokaides, P. A., … Dawson, R. (2018). How are cities planning to respond to climate change ? Assessment of local climate plans from 885 cities in the EU-28. *Journal of Cleaner Production*, *191*(2018), 207–219. https://doi.org/10.1016/j.jclepro.2018.03.220

Riach, N., & Glaser, R. (2024). Local climate services. Can municipal climate profiles help improve climate literacy? *Climate Services*, *34*, 100449. https://doi.org/10.1016/j.cliser.2024.100449

Rogers, N. J. L., Adams, V. M., & Byrne, J. A. (2023). Factors affecting the mainstreaming of climate change adaptation in municipal policy and practice: A systematic review. *Climate Policy*, *May*, 1–18. https://doi.org/10.1080/14693062.2023.2208098

Rossow, V., Friedrich, T., Schuldt-Baumgart, N., Stieß, I., & Böhmer, C. (2025). *Wissenstransfer in Kommunen. Wissensbedarfe in der Klimaanpassung in Hessen. Abschlussbericht „WissTransKlima"* [Knowledge transfer in municipalities. Knowledge requirements for climate adaptation in Hessen. Final report "WissTransKlima"]. Frankfurt am Main. https://www.isoe.de/publikation/wissenstransfer-in-kommunen-wissensbedarfe-in-der-klimaanpassung-in-hessen

Ruge, K., & Ritgen, K. (2021). Local self-government and administration. In S. Kuhlmann, I. Proeller, D. Schimanke, & J. Ziekow (Eds.), *Public administration in Germany* (pp. 123–141). Springer Nature.

Schäfer, S. (2015). *Climate change adaptation in South Korea*. transcript.

Schmidt, N. M., & Wagner, M. (2023). Obstacles to the diffusion of adaptation in the Rhein-Neckar region in Germany. *Regional Environmental Change*, *23*(72). https://doi.org/10.1007/s10113-023-02062-x

Schoenefeld, J. J., Hildén, M., Schulze, K., & Sorvali, J. (2023). What motivates and hinders municipal adaptation policy ? Exploring vertical and horizontal diffusion in Hessen and Finland. *Regional Environmental Change*, *23*(53). https://doi.org/10.1007/s10113-023-02048-9

Schoenefeld, J. J., Schulze, K., & Bruch, N. (2022). The diffusion of climate change adaptation policy. *Wiley Interdisciplinary Reviews: Climate Change*, *13*(3), 1–18. https://doi.org/10.1002/wcc.775

Schulze, K. (2024). The soft channels of policy diffusion: Insights from local climate change adaptation policy. *Policy Studies Journal*, 52(4), 881–906. https://doi.org/10.1111/psj.12555

Schulze, K., Bruch, N., Meyer, M., & Schoenefeld, J. J. (2022). *Die Verbreitung kommunaler Klimaanpassungspolitik in Hessen: Bestandsaufnahme und Perspektiven* [The spread of municipal climate adaptation policy in Hessen: Current status and prospects]. https://doi.org/10.26083/tuprints-00022826

Schulze, K., & Schoenefeld, J. J. (2023). Measuring climate change adaptation policy output: Toward a two-dimensional approach. *Review of Policy Research*, *40*, 1058–1092. https://doi.org/https://doi.org/10.1111/ropr.12553

Shi, L., Chu, E., & Debats, J. (2015). Explaining progress in climate adaptation planning across 156 U.S. Municipalities. *Journal of the American Planning Association*, *81*(3), 191–202. https://doi.org/10.1080/01944363.2015.1074526

Simonet, G., & Leseur, A. (2019). Barriers and drivers to adaptation to climate change—a field study of ten French local authorities. *Climatic Change*, *155*(4), 621–637. https://doi.org/10.1007/s10584-019-02484-9

Stadtherr, L., Teichert, V., & Foltin, O. (2020). Abschlussbericht des Projekts Maßnahmen zur Klimafolgenanpassung am Beispiel der Metropolregion Rhein-Neckar [Final report on the project Measures for climate impact adaptation using the example of the Rhine-Neckar metropolitan region]. Forschungsstätte der Evangelischen Studiengemeinschaft e.V. (FEST).

Stults, M., & Woodruff, S. C. (2017). Looking under the hood of local adaptation plans: Shedding light on the actions prioritized to build local resilience to climate change. *Mitigation and Adaptation Strategies for Global Change*, *22*(8), 1249–1279. https://doi.org/10.1007/s11027-016-9725-9

Tafel, J., Zorn, A., & Schäfer, S. (2024). Klimapolitisches Engagement auf kommunaler Ebene in Deutschland – Entwicklung eines Index zu Bewusstsein, Konzeption und Durchführung von Klimaschutz und Klimawandelanpassung [Climate policy engagement at the municipal level in Germany – Development of an index on awareness, conception, and implementation of climate protection and climate change adaptation]. *Raumforschung und Raumordnung*, *82*(3), 231–247. https://doi.org/https://doi.org/10.14512/rur.2225

Vanette, D. L., & Krosnick, J. A. (2018). *The Palgrave handbook of survey research*. Palgrave.

von der Forst, E., Höpker, K.-A., & Schliebe, R. (2020). *Wie kommt der Klimawandel bei Kommunen an? Ergebnisse einer Umfrage* [How do local authorities view climate change? Results of a survey]. https://pudi.lubw.de/detailseite/-/publication/10025

van der Heijden, J. (2019). Studying urban climate governance: Where to begin, what to look for, and how to make a meaningful contribution to scholarship and practice. *Earth System Governance*, *1*, 100005. https://doi.org/10.1016/j.esg.2019.100005

van Thiel, S. (2014). *Research methods in public administration and public management*. Routledge.

von Streit, A., Schubert, A., & Marth, H. (2023). *Starkregenrisikomanagement im Oberland und im Landkreis Landsberg am Lech. KARE-Arbeitsbericht 2* [Heavy rain risk management in the Oberland and Landsberg am Lech district. KARE working report 2]. https://doi.org/https://doi.org/10.17605/osf.io/qtej2

von Streit, A., Schubert, A., & Garschagen, M. (2024a). *Kommunenbefragung „Anpassung an Extremwetterereignisse und den Klimawandel" – Fragebogen. KARE Methodenbericht 2* [Municipal survey "Adaptation to extreme weather events and climate change" – questionnaire. KARE Methods Report 2]. https://doi.org/10.17605/osf.io/8d2yz

von Streit, A., Schubert, A., & Garschagen, M. (2024b). Starkregenrisikomanagement zur Klimawandelanpassung als neues Handlungsfeld [Heavy rain risk management for climate change adaptation as a new field of action]. *RaumPlannung*, *227*(3/4), 60–68. https://doi.org/10.17605/OSF.IO/5EYVR

von Streit, A., Schubert, A., & Marth, H. (2022). *Stand der Klimawandelanpassung im Oberland und im Landkreis Landsberg am Lech* [Status of climate change adaptation in the Oberland region and the district of Landsberg am Lech]. *KARE-Arbeitsbericht 1.* https://doi.org/10.17605/osf.io/94grf

Ward, M. K. , & Meade, A. W. (2023). Dealing with careless responding in survey data: Prevention, identification, and recommended best practices. *Annual Review of Psychology*, *74*, 577–596. https://doi.org/10.1146/annurev-psych-040422-045007

Wood, R. S., Hultquist, A., & Romsdahl, R. J. (2014). An examination of local climate change policies in the great plains. *Review of Policy Research*, *31*(6), 529–554. https://doi.org/10.5822/978-1-61091-510-6_1

Wooldridge, J. M. (2013). *Introductory econometrics. A modern approach* (5th ed.). South-Western Cengage Learning.

Zorn, A., & Schäfer, S. (2025). Climate change perception and adaptation in small and medium-sized municipalities in Central Germany. *DIE ERDE, 156*(4).

Appendix

Set of key questions for assessing the experiences from eight survey projects [translated from German; shortened]

Aim: Structured information collection on the approaches and experiences of each of the eight survey projects.

1. Short profile of survey study

- Name of survey/project/study
- Main topics included in the survey
- Time period of the survey
- Study area
- Size of contacted local authority
- Administrative level of contacted local authority (e.g., independent cities, municipalities belonging to a county, associations of municipalities or counties)
- Contacted positions/persons (e.g., mayor, climate managers/department heads, municipal employees in general)
- Number of contacted local authorities/persons
- Completed cases used for analysis
- Response rate
- Number of questions (with/without filter)
- Completion time stated in the cover letter or at the beginning of the survey
- Average completion time in the pre-test
- Average completion time
- Combination with further methods
- Publications
- Development of the concept and realization by, e.g., research institute, government agency, survey institute
- Funding organization
- Study contact person

2. Approaches, experiences (on potentials and challenges), and recommendations

2.1 Selection of local authorities

- What is the potential of local authority surveys on climate adaptation that result from the selection of local authorities (in general and/or in relation to the study you conducted)?
- How and why did you select the municipalities to be surveyed? Sampling method?
- What methodological challenges did you face and why?
- What would you do differently in the future?
- What recommendations can you make (based on your experience)?

2.2 Selection of contact persons/administrative positions

- What is the potential of local authority surveys on climate adaptation that result from selecting persons/administrative positions (in general and/or in relation to the study you conducted)?
- How and for what reasons did you select the people/administrative positions to be surveyed, or through what networks did you reach them?
- What methodological challenges did you face and why?
- What would you do differently in the future?
- What recommendations can you make (based on your experience)?

2.3 Contacting local authorities/people

- What are the potentials of municipal surveys on climate adaptation that result from the contacting of local authorities/people (in general and/or in relation to the study you conducted)?
- How were local authorities/individuals approached, and why? How did you try to motivate them to participate?
- What methodological challenges did you face and why?
- Could you provide your cover letter?
- What would you do differently in the future?
- What recommendations can you make (based on your experience)?

2.4 Designing the questionnaire

- What are the potentials of municipal surveys on climate adaptation that result from the design of the questionnaire (in general and/or in relation to the study you conducted)?
- How was the questionnaire designed? What was paid particular attention to?
- Was the questionnaire tested in advance? If so, how/with whom?

- What methodological challenges did you face and why?
- Could you provide your questionnaire?
- Which questionnaires could potentially be included in the appendix?
- What would you do differently in the future?
- What recommendations can you make (based on your experience)?

2.5 Ensuring data protection

- What are the potentials of municipal surveys on climate adaptation that result from ensuring data protection (in general and/or in relation to the study you conducted)?
- To what extent have aspects of data protection been integrated and considered?
- What methodological challenges did you face and why?
- What would you do differently in the future?
- What recommendations can you make (based on your experience)

2.6 Response rate/non-response

- What are the potentials of municipal surveys on climate adaptation that result from the response rate (in general and/or in relation to the study you conducted)?
- What could have had a positive/negative effect on the response rate? What did you do to increase the response rate?
- What methodological challenges did you face and why?
- What would you do differently in the future?
- What recommendations can you make (based on your experience)?

2.7 Analysis and validation of survey data

- What are the potentials of municipal surveys on climate adaptation that result from the analysis and validation of survey data (in general and/or in relation to the study you conducted)?
- How were the data processed and analyzed? (Which statistical methods and approaches were used for the analyses?)
- What methodological challenges did you face and why?
- For mixed methods: How did you use survey data to inform further steps, and what challenges did you face?
- What did you publish, and what challenges did you face?
- What would you do differently in the future?
- What recommendations can you make (based on your experience)?