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Mainstreaming ‘adaptigation’ in city administrations: a taxonomy of different roles of the climate department



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How can a joint institutionalization and mainstreaming of climate change adaptation and mitigation —“adaptigation”—be strengthened within city administrations, and what different roles can a dedicated climate department play in this process? Drawing on an exploratory study based on participant observation and document analysis conducted in Würzburg, Germany, this perspective develops a taxonomy of three distinct roles climate departments can take in advancing adaptigation within medium-sized city administrations. The findings highlight institutional dynamics and governance mechanisms as key drivers for progressing toward climate-neutral municipal governance.

Climate change is the most pressing challenge facing modern societies. Addressing the climate crisis necessitates effective, integrated policy responses across all levels of governance—with particular emphasis on municipalities, which are pivotal actors operating ‘on the ground’. In recent years, the concept of climate policy mainstreaming has gained increasing prominence as a key strategy for municipalities to enhance climate resilience, curb emissions, and align with often ambitious climate targets to pursue a “sustainable and just transition”¹.

It stems from the growing recognition that municipal climate departments alone cannot achieve the ambitious goals outlined in climate strategies and plans²—instead, for the sake of climate neutrality and to adapt to climate change an administration needs all hands on deck: the involvement of various departments and municipal enterprises whose areas of responsibility intersect with climate mitigation and adaptation is essential. The political level must also contribute by setting appropriate goals and framework conditions. Furthermore, mitigation and adaptation are inherently cross-cutting issues, requiring broader engagement across almost all policy sectors to have an impact^{3–5}. Historically, however, local authorities of the Global North have predominantly prioritized climate mitigation as their primary approach to addressing the climate crisis, often sidelining or neglecting climate adaptation^{6–8}. Yet, the rising frequency of climate-induced extreme weather events, such as heatwaves and flash floods in Germany, has prompted a transition towards more integrated approaches. This shift has brought the concept of “adaptigation” into greater focus—the balanced and interconnected pursuit of climate mitigation and adaptation to avoid conflicts and foster synergies between the two^{9–11}.

How can adaptigation be mainstreamed within a municipal administration in such a way that, ideally, all departments contribute to the successful achievement of climate neutrality and climate adaptation? This perspective concentrates on the interplay between dedicated climate

departments and further departments of local administrations that possess a certain degree of discretionary authority. To assess how adaptigation mainstreaming can be successfully achieved in such contexts, a taxonomy is developed along the axis of the different forms and intensities of support a climate department may provide towards other departments, specifying the role of the local climate department and differentiating its various functions within the local administration.

Taking a closer look at the city administration is worthwhile in several respects. It implements the various resolutions of the city council and thus the mitigation and adaptation concepts adopted¹². In addition, municipal administrations have a broad thematic focus, which is why mainstreaming into other sectors such as social affairs, culture, or finance can be reconstructed. Municipal administrations often position themselves as role models for society and the economy by pursuing ambitious climate goals and reducing their GHG emissions. As frontrunners¹³, they experiment with various methods, which is why examples of adaptigation mainstreaming within these administrations could be transferable to other sectors in subsequent steps.

We conduct an exploratory investigation¹⁴ of three case studies of climate initiatives embedded within city administrative frameworks using the method of participant observation^{15,16}, complemented by document analysis. The participant observation was carried out by two researchers who, as “full participants”, were partially deeply involved in the adaptigation processes, gaining an insider perspective on daily administrative interactions¹⁷. This method emerged from exploring how adaptigation mainstreaming can succeed and what role the climate department must play. It enables a nuanced, context-sensitive understanding of administrative processes, emphasizing formal procedures and informal practices. To ensure conclusions reflect shared understanding rather than individual perception, regular reflection and discussion among authors and municipal staff foster intersubjective reliability and credibility of findings.

In the process of participating while observing, a taxonomy of—at least—three different climate department roles in adaptation mainstreaming within the city administration can be developed. The case studies are taking place within the municipality of Würzburg (Germany), a Bavarian city with more than 130,000 inhabitants, whose adaptation efforts have been increasingly institutionalized. In the past, research has often focused on mitigation and adaptation activities of large cities¹⁸. Consequently, there is growing scholarly interest in the contribution of intermediate cities¹⁰, not least because they make up a substantial part of the world's population.

Through a critical analysis informed by the taxonomy of three different types of roles a climate department can take in adaptation mainstreaming in city administrations, this perspective offers valuable insights into the opportunities and challenges of embedding adaptation policies in municipal governance. Identifying the Autonomous, Coordination and Standard Operating Procedure Type, the findings contribute actionable lessons that may inform comparable urban contexts striving for integrated climate strategies to shape the municipal administration in a more sustainable way.

Adaptation mainstreaming as key to implement climate action in city administrations

The implementation of climate mitigation and adaptation concepts at the local level inevitably involves a lot of different actors, particularly different departments of the city administration. If a specialized climate department exists, it is often responsible for ensuring that the concepts are implemented. One potential approach is to consider adaptation mainstreaming as a key strategy, which involves integrating adaptation into the actions of other departments.

Adaptation mainstreaming is hereby helpful for several reasons: firstly, climate departments within municipalities are often relatively new, small in scale, and are not able (and/or designed) to politically push and finance all needed mitigation and adaptation measures^{19,20}; secondly, achieving climate neutrality and adaptation requires the active involvement of all sectors and departments contributing to the climate crisis via their GHG emissions and adaptation action, such as the departments of housing, mobility, finance, culture, and many more. In fact, nearly all activities of a city administration are likely to have an impact on the climate, which is why they all must become more climate friendly in their daily administrative activities and actions addressing the city through adaptation mainstreaming.

A taxonomy of different roles of the climate department

Two general types of institutions can be differentiated within city administrations when it comes to adaptation: the sector specifically tasked with adaptation and the sectors or departments into which adaptation is to be integrated¹⁰. From a top-down perspective of municipal governance and administrations, one might assume that adaptation is implemented in non-adaptation-focused departments through directives issued from the executive leadership or through legislative procedures. Indeed, most municipalities have adopted climate mitigation plans and, increasingly, climate adaptation strategies¹². Hence, the politically binding foundation has already been laid for adaptation mainstreaming within a bulk of German cities and their administrations. Nevertheless, such political commitments do not automatically ensure their translation into concrete administrative practices. In contrast, municipal administrations are significantly more complex in structure, requiring us to consider a hybrid form of governance

containing both bottom-up and top-down approaches as well as the power of the administration and its structures.

Besides, it is essential to consider the political positions of the different stakeholders and political actors involved²¹. Efforts to mainstream adaptation are unlikely to be fully represented across the various political forces within the respective city administration—particularly in times of fragmented party systems and fragile coalitions²². Moreover, while adaptation may be of interest to the non-climate sectors or departments, it might entail additional responsibilities, considerations, or procedural adjustments that may challenge or alter established workflows and can also have an additional financial impact²³. But, of course, the reverse version is also possible and the integration of adaptation can enable traditional structures to be broken up, financial resources to be saved in the short or medium term or other co-benefits can arise²⁴.

How can adaptation be systematically mainstreamed into almost all other policy fields of a city administration and which roles can a climate department play? Using an abductive approach via participant observation, we propose distinguishing three roles a climate department plays trying to mainstream adaptation within municipal administrations as a starting point. An abductive approach allows for the development of theoretical insights by iteratively moving between empirical observations and existing concepts, while embracing “surprises, tensions and doubts”²⁵. When examining adaptation mainstreaming within a city administration, it is first necessary to analyze the organizational structure itself.

Given potential concerns and the subsequent likely lack of political will within the other departments, the climate department of a city administration plays a pivotal role. This could be that of the facilitator, the coordinator, or the encourager; in presumably rare cases also that of the observer, if adaptation has already been mainstreamed within another sector. Insofar as the climate department's activity is needed, we identified the following taxonomy of three different types of mainstreaming adaptation in non-climate-departments of a city administration. To this end, we reviewed literature on local climate mitigation and adaptation with a focus on implementation modes, including those in non-climate-related departments (see Table 1). These insights were compared with findings from our participant observation, forming the basis for a taxonomy of adaptation mainstreaming. We employed the iterative research process of the chosen abductive approach²⁵, moving back and forth between empirical observations and theoretical concepts to make sense of adaptation mainstreaming within the municipal administration of an intermediate city. The types are classified according to the axis of intensity or differentiation of support by the climate department. In many German municipalities, the climate department serves as initiator, architect, or supporter, especially where the various climate mitigation and climate adaptation concepts adopt or insinuate these roles. Although we distinguish the three roles based on the support provided, no hierarchy is implied.

Several studies were analyzed in the literature review preceding the participant observation, with a rather incidental focus on adaptation, as this seems to be a primary emphasis in the mainstreaming literature, compared to climate policy integration. However, only the study by Baack et al. reconstructs, in a similar form, the roles we identified within the process of mainstreaming—exclusively in relation to adaptation mainstreaming. Although the body of mainstreaming literature on which this work is based reveals a predominant focus on adaptation, the forms of mainstreaming identified therein can also be attested, in our reconstructed cases, to

Table 1 | Taxonomy of adaptation mainstreaming in municipalities

Role of Climate Department	Type of Adaptation Mainstreaming	Corresponding Literature
(Limited) Supporter	Autonomous	Baack et al. ²⁴ , Knieling, Reitzig, Zimmermann ³¹ , Wamsler ³²
Institutionalized Supporter	Standard Operating Procedure	Baack et al. ²⁴ , Climate Change Advisory Council Ireland ³³ , Göpfert et al. ¹⁰ , Runhaar et al. ³⁴ , Jordan, Schout ³⁵
Coordinator and Facilitator	Coordination	Baack et al. ²⁴ , Wamsler, Pauleit ⁸

processes of adaptation. Hence, the literature reviewed corresponds to a theoretical mosaic that enables feedback to our exploratively observed findings—albeit through different pathways.

The types identified in our research do not correspond exactly to those in the literature—particularly as the mentioned literature examined different political systems such as those of Ireland or the Netherlands. As shown in Table 1, we used these elements as a foundation and supplement to our empirical considerations, integrating them as a theoretical basis. In most of the studies underlying the iterative development of the taxonomy, the focus is placed on governance structures and institutional practices.

The three case studies of the city administration of Würzburg will be analyzed, focusing on the role the climate department plays in adaptation mainstreaming within the city administration. Following our explorative approach, we have selected these three cases from a range of potential cases as the most representative examples. These are all cases of integrated adaptation, involving elements of both practices, although in some instances adaptation or mitigation is emphasized more strongly. In particular, the (side) effects of adaptation mainstreaming will be reconstructed to provide insights into why adaptation mainstreaming constitutes a central task of the climate department, especially regarding the various roles the department can play and offer to other departments.

Three case studies of adaptation mainstreaming

The three case studies on the different types of adaptation mainstreaming within the Würzburg city administration address different sectors. The first case focuses on the Würzburg alliance ‘Climate Culture’. This initiative brings together the cultural sector within the city administration and various external cultural institutions to collaboratively advance diverse climate initiatives. The second case examines the integration of climate expertise into urban planning, showcasing how adaptation mainstreaming is embedded within administrative structures. Lastly, the third case addresses the city administration’s short-term energy-saving measures. This internal fund, managed by the climate department, enables all departments to apply for full financing of cost-effective, short-term energy-saving projects.

Adaptation mainstreaming in the cultural sector: Würzburg Alliance ‘Climate Culture’

The Würzburg Climate Culture Alliance (Bündnis KlimaKultur) was founded in 2021 as a collaborative network linking Würzburg’s municipal cultural sector with private cultural institutions. Its goal is to advance adaptation through joint efforts. The alliance was initiated by the head of the municipal cultural department, who also provided shared financial resources. These included funding for sustainability coaching and greenhouse gas (GHG) accounting for cultural institutions. In this case, the role of the head of the cultural department as an “individual champion”²⁶—driving momentum and building support—becomes evident. Nevertheless, the legislative foundation for the alliance was established in Measure 8.3.2: “Making cultural events climate-neutral” of Würzburg’s integrated climate mitigation concept²⁷.

Today, the cultural department acts as the central coordinating body, although subgroups within the alliance have formed to address specific challenges. GHG evaluations revealed that attendee mobility is the largest source of emissions, leading the alliance to prioritize solutions like promoting public transport to reduce carbon footprints. Measures to support public transport should be regarded as an integrated approach to adaptation, as they help reduce urban overheating while also cutting a significant share of the greenhouse gas emissions generated within the city. By reducing reliance on private vehicles, such measures decrease the demand for extensive parking infrastructure, thereby freeing up valuable urban land. This space could instead be repurposed for green areas, which play a critical role in the generation of fresh air and the mitigation of heat island effects. Moreover, the multifunctional use—or multicoding—of these newly available spaces (e.g., combining green infrastructure with recreational or social uses) enhances the city’s capacity to adapt to changing climatic conditions. In addition, reducing the intensity of road use can lead to improved air quality, offering further benefits for public health.

In line with the integrated approach, several members of the alliance have now embarked on the path of common good balance sheet reporting. This method allows for a holistic assessment of individual organizations and encompasses many aspects of sustainability, including adaptation.

The Climate Culture Alliance operates largely independently of Würzburg’s climate department, receiving only occasional support. Collaboration has occurred during key processes such as GHG accounting or a themed action day, but the alliance’s activities are self-managed. This independence makes it a strong example of the *autonomous type of adaptation mainstreaming* needing and receiving limited support of the climate department if deemed required. The alliance’s focus on GHG neutrality is deeply embedded in its operations and those of its member institutions.

Participation in the alliance is voluntary. External stakeholders involved might be primarily those theaters, festivals or other actors already committed to sustainability, while within municipal institutions, support comes from employees and groups willing to champion the alliance’s goals. Hence, the benefits of the alliance extend beyond emissions reductions. It built new climate advocates, has raised awareness of the climate department’s support capabilities, expanded networks, and fostered openness that could inspire similar initiatives. The Climate Culture Alliance demonstrates how autonomous, cross-sector collaboration can effectively integrate adaptation and climate goals into diverse areas of governance.

Integrating climate expertise in urban planning

Urban planning plays a central role in addressing urban development challenges within municipal administrations. Established practices, such as land-use planning, are guided by legal mandates, including requirements in Germany to take climate mitigation and adaptation into account (§1 Sect. 5 and §1a Sect. 5 of the German Building Code 2023)²⁸. In Würzburg, a comprehensive workflow has evolved over time to integrate these elements into planning processes, via regular consultations and expert assessments²⁹.

The mainstreaming of adaptation in land-use planning relies on interdisciplinary collaboration. Würzburg facilitates this by conducting expert assessments informed by its updated 2018 urban climate map. This map provides critical mesoclimatic data, including information on thermal stress, ventilation, and airflow patterns, making it an essential tool for land-use planning²⁹. The city’s climate adaptation manager oversees the use of the map and commissions more detailed studies when necessary. The early establishment of this role has enabled a well-structured workflow, placing the city ahead of many other German municipalities in institutionalizing climate adaptation efforts. Moreover, the expert assessments also incorporate the expertise of the municipal coordinator for climate-neutral energy supply. Hence, the assessments entail the integrated approach of adaptation, also taking mitigation into account—for example, in matters related to the allocation of land for the expansion of open-space photovoltaic systems or key aspects of heat planning relevant to urban development.

When considering the mainstreaming of adaptation, Würzburg’s cooperation between the climate department and the urban planning department exemplifies a Standard Operating Procedure (SOP) approach. Although the legal requirements for climate considerations in planning are relatively unspecific, they provide a framework for formalized processes. This framework institutionalizes collaboration between the climate department and the urban planning department, ensuring consistent workflows and effective integration of climate expertise. Accordingly, the second type, the *Standard Operating Procedure*, could be clearly reconstructed here, as well as the role of the climate department, which provides institutional support here and thus carries out adaptation mainstreaming.

Broad adaptation mainstreaming via short-term energy-saving measures

Following a suggestion of the Climate Advisory Council of the City of Würzburg, which consists of members of the city council, climate experts, and activists, the idea of a small budget allocation for short-term energy-saving measures within municipal buildings was developed. This budget was introduced for the first time in 2023, accompanied by a letter distributed to

all departments via their respective heads. The departments were encouraged to initiate immediately effective measures such as replacing old-fashioned lightning with more efficient LED lights, insulating top-floor ceilings, or upgrading air pressure compressors.

In Würzburg, the management of over 200 municipal buildings is largely decentralized. For instance, the department of youth is responsible for the facility management of daycare centers, while the municipal library is managed centrally, and implementation of measures falls under the department of building construction. Therefore, widespread dissemination of information about the available funds is essential. Experiences in 2023 revealed that responses were highly concentrated within just a few departments. Consequently, in 2024, the instrument of the well institutionalised circular letter was chosen to ensure broader outreach. This approach led to more diverse feedback, likely because the information reached a wider audience and encouraged greater focus on smaller projects.

Data from 2023 shows that an investment of approximately €113,000 resulted in annual CO₂ savings of more than 28 tons. The climate department's role extends beyond designing and promoting the program. It also collaborates with the Energy Management team to evaluate submitted proposals, handles financial settlements, and fosters networking among various stakeholders. For example, this approach sparked discussions about larger energy retrofitting projects for specific buildings. The evaluation process ensures that sub-projects are not taken out of the city's overall retrofitting plans at the wrong time. Moreover, the measures requested in 2024 exceeded the initial budget by more than €500,000, prompted extensive debate about the municipal budget and ultimately resulted in its expansion for the short-term energy-saving measures in 2025.

Even when the program was initially announced as a mitigation initiative, proposals for adaptation measures were also submitted—for example, UV films for windows heavily exposed to sunlight. Therefore, and especially in the course of developing the climate adaptation strategy, the program was expanded in line with the integrated adaptation approach. In 2025, it explicitly called for the submission of proposals for climate adaptation measures in municipal buildings.

All in all, the program mainstreams adaptation and uses the circular letter as an opportunity to more closely examine building infrastructure and reiterate the goal of achieving a climate-neutral municipal administration by 2028. It also emphasizes the significant contribution of municipal buildings to the administration's greenhouse gas emissions and furthermore stimulates discussions about greater funds for the building sector and better resources to implement them. Overall, this program is a reminder that while decentralized property management poses challenges, it can also contribute to the mainstreaming of adaptation through the coordinative work of the climate department. Thus, the *Coordination Type* of our adaptation mainstreaming taxonomy is to be attested here, as the climate department serves as coordinator and facilitator. Moreover, we were able to demonstrate that additional side effects were achieved within the framework of the coordination type that go beyond the mere implementation of the program.

Conclusion

The abductively developed framework demonstrates that adaptation mainstreaming can take various forms within municipal administrations, with differing levels of involvement of climate departments. The three identified types are not definitive and can be expanded in other contexts. Future research should not only explore additional cities to identify further types but also examine the impacts and side effects of the different approaches in greater depth. This initial study only covers the context of an intermediary city with a population of 130,000. Large cities or metropolitan areas with populations exceeding 500,000³⁰ typically have larger administrative structures, which may entail different conditions for collaboration in general and for adaptation mainstreaming in particular. Conversely, smaller administrations perhaps face contrasting organizational dynamics probably characterized by more direct and streamlined pathways for implementing adaptation mainstreaming. Therefore, follow-up studies should not only aim to verify and further develop the proposed taxonomy

but also consider potential differentiations along the axis of city and administrative size.

Such insights would enable more specific recommendations for climate departments regarding which measures to support and how, as well as identifying key strategies for achieving climate-neutral administration. While our analysis cannot provide definitive answers due to its limited sample size, it does show that adaptation mainstreaming is feasible even with limited resources. However, this requires targeted and effective actions by the relevant departments. It is of great importance to better understand how the climate department is able to support, encourage, or coordinate with other departments to mainstream adaptation across the board.

However, a persistent challenge of clarifying and defining the roles of the climate department within municipal administrations still exists. As climate governance increasingly relies on multi-level, networked, and collaborative forms of coordination, Climate Departments are required to act as effective meta-governors orchestrating and aligning diverse actors, interests, and policy instruments. Mastering meta-governance is therefore essential for Climate Departments to enable coherent and adaptive climate action across sectors and governance levels, a challenge for which our taxonomy can offer a first analytical lens.

Although the question of optimal measures remains open, our taxonomy highlights the significant potential of adaptation mainstreaming but also the action needed by the climate department to achieve climate-neutral municipal administrations. This, in turn, represents a vital step toward a sustainable and just transition for society as a whole.

Data availability

No datasets were generated or analysed during the current study.

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The authors declare no competing interests.

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