Urban Research & Practice

ISSN: 1753-5069 (Print) 1753-5077 (Online) Journal homepage: www.tandfonline.com/journals/rurp20

From climate policy pioneers to climate policy leaders? The examples of the eastern German cities of Potsdam and Rostock

Wolfgang Haupt, Kristine Kern & Janne Lis Irmisch

To cite this article: Wolfgang Haupt, Kristine Kern & Janne Lis Irmisch (2024) From climate policy pioneers to climate policy leaders? The examples of the eastern German cities of Potsdam and Rostock, Urban Research & Practice, 17:1, 29-50, DOI: 10.1080/17535069.2022.2104655

To link to this article: https://doi.org/10.1080/17535069.2022.2104655

Published online: 02 Aug 2022.

URBAN RESEARCH & PRACTICE
2024, VOL. 17, NO. 1, 29–50
https://doi.org/10.1080/17535069.2022.2104655

Routledge
Taylor & Francis Group

From climate policy pioneers to climate policy leaders? The examples of the eastern German cities of Potsdam and Rostock

Wolfgang Haupt [a], Kristine Kern [a,b] and Janne Lis Irmisch [a]

[a]Research Group: Urban Sustainability Transformations, Leibniz-Institute for Research on Society and Space,Erkner,Germany; [b]Faculty of Social Sciences, Business and Economics, Department Public Administration, Åbo Akademi University, Turku, Finland

ABSTRACT

We illustrate how the two mid-sized post-socialist eastern German cities Potsdam and Rostock have managed to become climate pioneers, despite being located in regions that have been reluctant with regard to climate action. Drawing on municipal documentation and fieldwork interviews, we show how favorable and interrelated conditions concerning a city's socio-demographic, socio-economic, and particularly political situation were more important for progressive climate action than both cities' embeddedness in their respective regions. We also show how the absence of external ambitions and mayoral support hindered Potsdam and Rostock from making the leap from a pioneer to a leader.

KEYWORDS

Climate governance; local governments; leaders; pioneers; post-socialist cities

1. Introduction

Today, more than ever, cities are at the forefront in addressing the challenges posed by global climate change. Urban areas are responsible for the vast majority of greenhouse gas emissions, and their built environment makes them particularly vulnerable to the impacts of climate change (e.g. heatwaves or heavy rainfall). Thus, cities also need to engage in climate adaptation alongside mitigation. In this context, the degree of local climate action ranges from total passivity to introducing a range of ambitious and proactive initiatives. Cities that fall into the latter group are also referred to as climate policy forerunners (Otto et al. 2021).

Forerunners can be further differentiated into pioneers and leaders. In a nutshell, leaders distinguish themselves from pioneers with their outspoken external ambitions that are usually reflected in distinctive communication strategies that aim at attracting followers (Liefferink and Wurzel 2017; Torney 2019; Wurzel, Liefferink, and Torney 2019b). Previous research on leaders has mainly focused on larger leading cities (Bulkeley, Castán Broto, and Edwards 2015; Kern 2019; Wurzel, Liefferink, and Torney 2019b) with a strong international orientation. Examples in Germany include Berlin (Monstadt 2007; Shefer 2019), Hamburg (Mees, Driessen, and Runhaar 2014; Huang-Lachmann and Lovett 2016), Munich (Benz et al. 2015; Heinelt and Lamping

CONTACT Wolfgang Haupt wolfgang.haupt@leibniz-irs.de

2015; Zimmermann, Boghrat, and Weber 2015; Rave and Albrecht-Saavedra 2016), Stuttgart (Benz et al. 2015; Zimmermann, Boghrat, and Weber 2015) and Frankfurt (Benz et al. 2015; Heinelt and Lamping 2015; Zimmermann, Boghrat, and Weber 2015; Nochta 2021). In contrast, mid-sized and small cities have been widely neglected by scholarly research (Eckersley 2018b; van der Heijden 2019; Häußler and Haupt 2021; Haupt, Eckersley, and Kern 2022). The only exceptions are the two international leaders Heidelberg (West, Marquardt, and Gerhard 2017; Growe and Freytag 2020) and Freiburg (Kronsell 2013; Rohracher and Späth 2014; Bottero et al. 2019). This research gap derives also from the fact that only few mid-sized cities are pioneers or leaders, as many of them lack resources to develop and implement climate policies (Kern 2019; Otto et al. 2021). Moreover, there is not only a lack of research on the climate governance of mid-sized cities but also on post-socialist cities (Ferenčuhová 2020). Existing studies on post-socialist cities have rather focused on somewhat related topics such as green spaces (Badiu et al. 2019; Csomós et al. 2021), sustainability (Svirčić Gotovac and Kerbler 2019), or smart cities (Sikora-Fernandez 2018; Varró and Szalai 2021). Moreover, there is also a lack of studies on the regions (*Länder)* of the former German Democratic Republic (GDR). This may be because Germany's traditional leading regions in terms of environmental and climate governance are mostly to be found in Western Germany, particularly Baden-Württemberg, and Schleswig-Holstein (Jänicke and Wurzel 2019; Schill, Diekmann, and Püttner 2019; Eckersley et al. 2021).

Our article focusses on the question, if and how mid-sized cities can manage to become climate leaders even if they are located in rather disadvantaged regions that have been reluctant with regard to climate action. We chose Potsdam and Rostock as case studies because they are the only mid-sized cities in eastern Germany that can be clearly characterized as pioneers (Otto et al. 2021). Drawing on the results of 25 expert interviews and the analysis of several key policy documents we explore the climate policy pathways of both cities. In more detail, we explore the conditions that may determine if such cities can become leaders (or not). To do so, we orient on a typology of four different types of leaders developed by Wurzel et al. (2019a). Beyond the respective *Länder* the two cities are located in, this also requires an inclusion of further relevant institutional levels within a multilevel governance system, particularly the national level (Jänicke and Wurzel 2019; Hickmann 2021).

Our paper is structured as follows: First, we present and discuss the literature on climate pioneer and leadership (section 2). This is followed by a section on research design and methods (section 3). Thereafter, we present and discuss the empirical findings (section 4), followed by the final conclusions (section 5).

2. Climate pioneers and leaders

Initially, the literature on environmental and climate pioneer and leadership has focussed on countries and the dynamics between them (Jordan and Liefferink 2004; Jänicke 2005; Knill, Heichel, and Arndt 2012; Tobin 2017). Moreover, the European Union (EU) was the subject of several studies focussing on its leading role in environmental and climate policy (Gupta and Ringius 2001; Oberthür and Roche Kelly 2008). Increasingly, research also regards cities as pioneers or leaders in environmental and climate governance (Kern 2019; Wurzel et al. 2019a; Haupt 2021).

A pioneer or leader is most commonly understood as country or city that 'at a given point or period of time effectuates and pursues the most stringent approach in environmental policy and thereby intentionally or unintentionally sets an example that can be emulated or where others even feel pressured to emulate it' (Knill, Heichel, and Arndt 2012, 37). The key difference between a pioneer and leader is the nature of their policy ambitions. The literature distinguishes between internal ambitions (e.g. inducing policy change within their city) and external ambitions (e.g. attracting followers) (Liefferink and Wurzel 2017; Torney 2019; Wurzel, Liefferink, and Torney 2019b). While pioneers are lacking external ambitions – either because they are not interested in attracting followers or because they just do not have the capacities to do so – leaders usually have both, internal and external ambitions (Liefferink and Wurzel 2017; Tobin 2017; Wurzel, Liefferink, and Torney 2019b). Those leaders that are lacking internal ambitions or simply do not succeed in putting its external leadership promises into effect internally are referred to as symbolic leaders while those leaders that have both types of ambitions are known as substantial leaders (Wurzel, Liefferink, and Torney 2019b).

Wurzel et al. (2019a) further distinguish four types of leaders: *structural, entrepreneurial, cognitive, and exemplary leaders*. Similar distinctions of pioneers do not exist. *Structural leadership* refers to economic power and capacities. All *structural leaders* in Germany are large cities such as Berlin, Hamburg, or Frankfurt (Heinelt and Lamping 2015; Otto et al. 2021). This implies that becoming a *structural leader* is only realistic for a limited number of cities that possess these necessary pre-conditions. *Entrepreneurial leadership* centers on diplomacy, negotiation, and the networking skills of city staff. This includes networking with different (sets of) actors on different levels within a multilevel-governance system. Examples of German cities showing *entrepreneurial leadership* are Heidelberg and Freiburg that both – also with mayoral support – have managed to position themselves as visible and very active members of several international networks. As an example, Heidelberg is one of the few non-megacities that was admitted to the *C40 Cities Climate Leadership Group* and Freiburg hosts the European Secretariat of the network *Local Governments for Sustainability (ICLEI)*. *Cognitive leadership* describes a type of leadership that focusses on 'defining and redefining interests and developing innovative ideas' (Wurzel et al. 2019a, 151). Examples would be the development of a 'green economy' or the creation of 'green jobs'. Here Freiburg can also be listed as the most prominent example from Germany. With its showcase project in the district of Vauban, Freiburg aimed and succeeded at setting new standards for the integration of social and ecological planning (Growe and Freytag 2020). Lastly, *exemplary leadership* is characterized by the setting of good examples and inspiration or by being regarded as a model by other cities. It needs to be highlighted that this can be both, intentionally or even unintentionally (Wurzel et al. 2019a). German examples are Kiel for mitigation or Karlsruhe for adaptation (Otto et al. 2021).

Tobin (2017) highlighted that potentially every country could become a climate pioneer or leader, provided there is the (political) will to do so. With regard to cities, the literature suggests that the likelihood to become a pioneer or leader is strongly related to certain favorable socio-demographic, socio-economic, and political

conditions. Accordingly, pioneers or leaders are usually structurally advantaged cities characterized by certain characteristics, particularly:

(i) a young and growing population (Zahran et al. 2008; Bedsworth and Hanak 2013; Kern 2019),
(ii) low unemployment and a positive economic situation with a high number of service sector jobs that require workers with above-average levels of education and skills (Zahran et al. 2008; Bedsworth and Hanak 2013),
(iii) support for climate action by leading politicians, ideally the mayor (Fitzgerald and Lenhart 2016; Homsy 2018), but also environmentally concerned parties or electoral groups (Bedsworth and Hanak 2013; Homsy 2018),
(iv) a supportive and broadly diversified research environment (Eckersley 2018a; Keeler et al. 2019)

Additional to these four key characteristics some pioneers and leaders often also have the opportunity to steer municipal companies, particularly in the energy and housing sectors (Kern et al. 2021). Moreover, they are often characterized by a strong civil society, particularly environmental groups (Zahran et al. 2008; Homsy 2018).

Alongside these characteristics a city's climate policy is influenced by external factors such as the dependency on different institutions within the EU's multilevel governance system (Jänicke and Wurzel 2019; Hickmann 2021). For smaller and mid-sized cities, the dependency on the national level and its available funding sources is particularly high (Häußler and Haupt 2021). Cities located in leading *Länder* can additionally benefit from funding opportunities on the regional level (Eckersley et al. 2021). Due to the availability of these funding opportunities, EU-funding is less important for German cities, particularly compared to cities from most other European countries (Kern et al. 2021).

While the characteristics listed above significantly increase the likelihood that a city becomes a pioneer or leader, the city itself also has to become active in order to benefit from these advantages. These activities often center around setting ambitious greenhouse-gas reduction goals (Heinelt and Lamping 2015; Kern 2019; Otto et al. 2021; Salvia et al. 2021), pioneering place-based local experiments (Fitzgerald and Lenhart 2016; Kern 2019; Gailing et al. 2020; Haupt 2021), and exchanging practices and lessons with other cities, e.g. by joining international networks (Kern and Bulkeley 2009; Fenton and Busch 2016; Haupt et al. 2020;). Visible examples for place-based local experiments are eco-districts; neighborhood development or redevelopment projects that contribute to climate change mitigation and/or adaptation goals (Fitzgerald and Lenhart 2016). Among others, highly studied cases include projects from Stockholm (Pandis Iverot and Brandt 2011), Malmö (Fitzgerald and Lenhart 2016; Jönsson and Holgersen 2017), Copenhagen (Bottero et al. 2019; Haupt 2021), Hamburg (Huang-Lachmann and Lovett 2016; Kagan and Hahn 2011), or Freiburg (Bottero et al. 2019; Growe and Freytag 2020; Rohracher and Späth 2014). Particularly the example of the eco-district *Western Harbour* in Malmö highlights how a city uses various outreach strategies to popularize a neighborhood – and thus the city of Malmö as a whole – as 'a symbol for sustainability' (Jönsson and Holgersen 2017, 60). Indeed, actively seeking to attract followers by setting examples and providing models for them – e.g. through

developing such demonstration projects – is a common strategy of leaders (Kern 2019; Torney 2019). Another common practice is the upscaling of local experiments that have acquired a certain reputation to other cities. This may involve horizontal upscaling (from one leader to another), vertical upscaling (from a leader to a follower) and hierarchical upscaling (from a leader to a laggard) (Kern 2019). In this context, leaders often use placed-based experiments for the purpose of green city branding (Jönsson and Holgersen 2017; Growe and Freytag 2020; Haupt 2021). Furthermore, active participation in international climate networks can help popularize local experiments, raise the city's profile and attract followers (Fenton and Busch 2016; Haupt et al. 2020; Kern and Bulkeley 2009). Building upon the literature discussed in this section, we analyze how mid-sized post-socialist eastern German cities can manage to pioneer ambitious climate policies. In a similar vein, we explore which of the four types of leaders introduced by Wurzel et al. (2019a) apply to or might be realistic options for post-socialist eastern German mid-sized cities such as Potsdam or Rostock (if any). Previous findings suggest that several city characteristics such as favorable socio-demographic, socio-economic, and political conditions significantly increase the likelihood of a city to become a pioneer or leader (Zahran et al. 2008; Bedsworth and Hanak 2013; Homsy 2018; Kern 2019). However, we currently lack an understanding of the respective importance of these city characteristics. Are they equally important or are some of them more important than others and which of them define if a city becomes a pioneer or a leader? Lastly, we know rather little about how the dependency on different governance levels within the EU's multilevel governance system influence a city's climate policy pathway. Thus, we also analyze how favorable internal city characteristics relate to less favorable external conditions.

3. Research design and methods

3.1 *Case selection*

For our empirical work, we have selected pioneers from eastern Germany. We chose two very similar cities in order to reduce the risk that our findings relate to just one case. Potsdam and Rostock are both growing mid-sized cities of almost the same size (Potsdam around 180,000 inhabitants, Rostock around 209,000 inhabitants). Both stand out within their *Länder* of Brandenburg and Mecklenburg-Western Pomerania. They started to tackle climate change in the early 1990s, significantly earlier than many cities in western Germany and almost all of their counterparts in the East. Both succeeded in a competitive tender process to participate in the *Masterplan* funding program (*Masterplan 100% Klimaschutz*, funded by the *German Ministry of the Environment*) that supports the development of mitigation strategies in order to achieve climate neutrality by the year 2050. In 2013 (Rostock) and even in 2017 (Potsdam) such ambitions could be regarded as progressive in the German context. Furthermore, these climate goals that might appear as unambitious from today's perspective should also be seen in the light of the German energy mix in which coal and gas are still of major importance. Moreover, by formulating climate neutrality goals Potsdam and Rostock are significantly more ambitious than the average European city that aims at a total emissions reduction of 47% (Salvia et al. 2021). Besides formulating ambitious

climate goals, both cities have also managed to significantly reduce their CO_2-emssions since the 1990s (Potsdam: −43% between 1995 and 2014; Rostock: −60% between 1990 and 2011; compared to the Germany-wide number of −35% between 1990 and 2019). In this context, it needs to be noted that most cities that are considered as climate leaders have not made reductions anywhere near such numbers (Wei, Wu, and Chen 2021). Table 1 gives an overview of each city's most important climate policy milestones highlighting several chronological and content-related similarities between their climate policy pathways. A recent study that analyzed mitigation and adaptation efforts of 104 German cities ranks Potsdam in position 15 and Rostock in position 8 (Otto et al. 2021). This study highlights that both cities have managed to maintain abalanced climate policy approach receiving high scores for both mitigation and adaptation activities. The only other municipality from eastern Germany that features in the top 20 is the significantly larger city of Dresden (13). Among mid-sized cities Rostock

Table 1. Climate policy milestones of Potsdam and Rostock since the 1990s. Source: own table.

Climate Activity	Potsdam	Rostock
entry into the Climate Alliance *(Klima-Bündnis)*	1995	1993
Local Agenda 21 resolution	1997	1995
Publication of local climate reports	1999, 2003, 2009, 2014, 2017	1990, 2005, 2010, 2012, 2017, 2018, 2019
establishment of a climate coordination office	2008	2008
establishment of climate and energy-related advisory boards	2008: Climate Advisory Committee (*Potsdamer Klimarat*)	1999: Agenda 21 Council (*Agenda 21-Rat der Hanse- und Universitätsstadt Rostock*) 2008: energy transition work group within the Agenda 21 Council
foundation of climate and energy-related associations or alliances	2012: climate partnership *(Klimapartner Potsdam – Potsdamer Bündnis für Klimaschutz und Klimaanpassung)* 2018: city-science climate partnership *(KlimapartnerStadt und Wissenschaft)*	2011: energy alliance (*Energiebündnis Rostock e.V.*)
certification programs	since 2010: several municipal companies certified through the *Eco-Management and Audit-Scheme (EMAS)*	2006: climate activities certified through the *European Energy Award*
mitigation strategies	2010, 2017 (*Masterplan*)	2005, 2009, 2013 (*Masterplan*)
adaptation strategies	2015	2013
adhesion to the competitive *Masterplan 100% Klimaschutz* funding program	2016	2012
declaration of climate emergency	14th August 2019	25th September 2019
current climate targets	climate neutrality by 2050 (city council resolution of 2017)	climate neutrality by 2035 (city council resolution of 2020)
further notable activities and milestones	1992: foundation of the *Potsdam Institute for Climate Impact Research (PIK)* 2014: winner of a national climate action award for municipalities (awarding agency: *German Ministry of the Environment)* 2016: foundation of a climate agency (*Klimaagentur Potsdam*) managed by the Climate coordination office and local utility company (EWB)	1995: signing of the *European Sustainable Cities & Towns Campaign* 2000: guidelines for sustainable urban development (city council resolution) 2009: entry into the *Covenant of Mayors* 2014: entry into *Mayors Adapt*

ranks second after Münster (western Germany) and Potsdam ranks fifth after Karlsruhe and Aachen (both western Germany).

In addition, neither Potsdam nor Rostock is located in *Länder* viewed as pioneers or even leaders (Schill, Diekmann, and Püttner 2019; Jänicke and Wurzel 2019; Eckersley et al. 2021;). This applies particularly to the traditional coal state of Brandenburg that shows the highest greenhouse gas per capita emissions of all German *Länder* (Eckersley et al. 2021). Although both have little industry and a comparably high share of wind power in their electricity-mix, this is primarily due to some rural areas functioning as mere '"installation sites", developed on the basis of investment and planning decisions made outside of the respective regions' (Gailing and Röhring 2015, 32). Further, studies focusing on distinct efforts to address climate change systematically (e.g. developing strategies, passing climate change acts or providing support programs) describe both *Länder* as laggards (Eckersley et al. 2021). This applies to all eastern German *Länder* except for Thuringia (Kern, Koll, and Schophaus 2007; Eckersley et al. 2021).

3.2 *Methods*

The empirical work in Potsdam and Rostock was based on the analysis of policy documents, participant observation during climate-related events, and expert interviews with local actors. The policy documents mainly included key climate-related publications such as climate adaptation and mitigation strategies, climate or energy reports, but also supplementary sources, such as additional municipal reports and strategies on various topics (e.g. urban development strategies), agendas of city council meetings, or reports from local service providers. Between June 2019 and June 2021 we attended several formal events in Potsdam and Rostock during which the city's climate activities were presented and discussed. Examples are two workshops to discuss Potsdam's climate map, the annual conference of the Climate Alliance 2019 hosted in Rostock, and a regular meeting of Rostock's Agenda 21 Council.

Moreover, we conducted 25 semi-structured and guided expert interviews with local actors such as city staff (16), local politicians (4), and representatives of civil society (5). The city practitioners we spoke to work in sectors such as climate change, energy and water supply, urban development, traffic, public green-spaces, urban land-use or urban regeneration and included employees holding management positions as well as regular employees. The interviewed politicians included two members of the local city councils, one political leader of the city administration and one managing director of a party represented in the city council. Interviewed actors from civil society were local climate activists and members of local advisory bodies.

To explore how Potsdam and Rostock managed to become climate pioneers within eastern Germany it was important to find interview partners that were on board since the early days of the cities' climate activities. We managed to interview several actors that have been active co-designers and observers of the cities' climate activities for the past decades. This allowed us to identify key events and key actors that substantially influenced Potsdam and Rostock's climate policy pathways. The interviews were conducted between July 2017 and April 2021. Due to contact restrictions in the course of

the Covid-19 pandemic, we had to carry out several interviews via online video conference tools, telephone, or email. In total, 10 interviews took place on site, 9 online, 5 on the phone and one via email.

3.3 *Case presentation*

It is no coincidence that both cities took a pioneering role in climate governance. Indeed, several of the typical characteristics of climate pioneers and leaders that were presented in section 2 also apply to Potsdam and Rostock. We briefly introduce both cities in the following paragraphs. Additionally, Table 2 contains more detailed information on Potsdam and Rostock and highlights the manifold favorable conditions that allowed both cities to become climate pioneers.

Rostock is a coastal city at the Baltic Sea in the northeast of Germany (see Figure 1) with a predominantly maritime climate. While Schwerin is the capital of the *Land* of Mecklenburg-Western Pomerania, Rostock is by far the largest and economically and culturally most important city of the region. Rostock's city territory extends about 16 kilometers along the river Warnow up to its estuary in the Baltic Sea. The historical city centre and the port are remnants of Rostock's cultural and economic significance within the Hanseatic League and the Baltic Sea Region. In the 20th century, the more than 800-year-old city of Rostock gained importance through its function as a technological and maritime logistics hub within the Nazi era and the German Democratic Republic. Nowadays, Rostock is the economic powerhouse of the Northeast. The harbour, a strong research environment, and a diversified manufacturing and steadily growing service sector dominate the city's economy.

Potsdam is located southwest of Berlin and shares a border with Germany's capital and largest city. The city stretches out along the middle reaches of the river Havel and is characterized by a moderate climate with maritime and continental influences. Potsdam is the capital and by far the largest city of the *Land* of Brandenburg. The settling of Huguenots in the late 17th century strongly influenced the rise to the status of a Prussian garrison and residence town. The erection of the Berlin Wall in 1961 cut off Potsdam from its long-standing neighbouring city Berlin for almost 30 years. After reunification, the over 1000 year old city managed to establish itself as a dynamic regional economic hub characterised by a disproportionally dominant service sector driven by a strong and diverse research environment.

Both cities were heavily destroyed during World War II and rebuilt and reshaped during GDR-times. Especially in the 1970s and 1980 several large prefabricated housing estates were constructed in both cities. After German reunification, Potsdam and Rostock managed to establish themselves as highly sought after cities attractive for both residents and businesses. A German-wide study analysing the quality of life of all 401 independent municipalities and counties *(Kreise)* ranked Potsdam on position 4 (1st in eastern Germany and Brandenburg) and 1st in the sub-category 'leisure and nature'. Rostock was ranked on position 28 (4th in eastern Germany and 1st in Mecklenburg-Western Pomerania) and 4th in the sub-category 'leisure and nature' (Prognos 2015).[1]Potsdam hosts more than 20 water bodies, thereof five large lakes in and around the city center. Overall, around 75% of Potsdam's city are covered with water and green and agricultural areas. Rostock's city beach stretches for around 5

Table 2. City characteristics of Potsdam and Rostock. Source: own table.

Typical characteristics of climate forerunners	Potsdam	Rostock
Young and growing population	steady increase in population between 1945 and 1990 (1945: around 111,000, 1990: around 140,000) loss of around 10,000 inhabitants in the 1990s very substantial increase in population since the turn of the millennium youngest population in Brandenburg with an average age of 42,4 years (average in Brandenburg: 47,2 years)	substantial increase in population between 1945 and 1990 (1945: around 93,000, 1990: around 248,000) loss of around 55,000 inhabitants after 1990 (mainly due to emigration and a shrinking birth rate) continuous increase in population since 2007 youngest population in Mecklenburg-Western Pomerania with an average age of 44,9 years (average in Mecklenburg-Western Pomerania: 47,2 years)
Positive economic situation	high importance of the services sector, particularly in the area of media and IT; life science and health economics, tourism and congresses, and science and research gross domestic product per capita of 44.596 € in 2019 (average in Brandenburg: 29.716 €) manufacturing and raw materials are only of minor importance share of gross value added in the service sector: 93.4% German-wide study on economic opportunities of all 401 independent municipalities and counties *(Kreise*) ranked Potsdam on positon 92 (3rd in eastern Germany and 1st in Brandenburg)	focus on maritime economy, trade, and shipping companies other significant sectors are life sciences, aerospace, and wind power gross domestic product per capita 38.106 € in 2019 (average in Mecklenburg-Western Pomerania: 28.992 €) service sector is growing particularly in the area of IT, creative, touristic, online businesses, tourism (cruises, seaside tourism), science and research share of gross value added in the service sector: 86.2% German-wide study on economic opportunities of all 401 independent municipalities and counties *(Kreise)* ranked Rostock on positon 224 (9th in eastern Germany, 1st in Mecklenburg-Western Pomerania)
Political support from environmentally concerned parties or electoral groups	city council dominated by left-green parties social democrats have been the strongest party within the city council since 1990 social democratic mayors since 1990	city council dominated by left-green parties the post-communist party *The Left* has been the strongest party within the city council since 1990 mostly independent mayors since 1990
Strong and broadly diversified research environment	Five higher education institutions and more than 40 non-university research institutions Three distinct climate and energy-related research institutions (*PIK: Potsdam Institute for Climate Impact Research, IASS: Institute For Advanced Sustainability Studies, GFZ: German Research Centre for Geosciences)* around 10,000 employees in the science sector (highest percentage of researchers per capita in Germany) and around 25,000 students	Four institutions of higher education and ten non-university research institutions One of the oldest universities in Germany (founded 1419), oldest university in Northern Germany and the entire Baltic Sea region around 7,500 employees in the science sector and around 15,000 students

kilometers and is the widest beach on the German Baltic Sea coast. Moreover, with

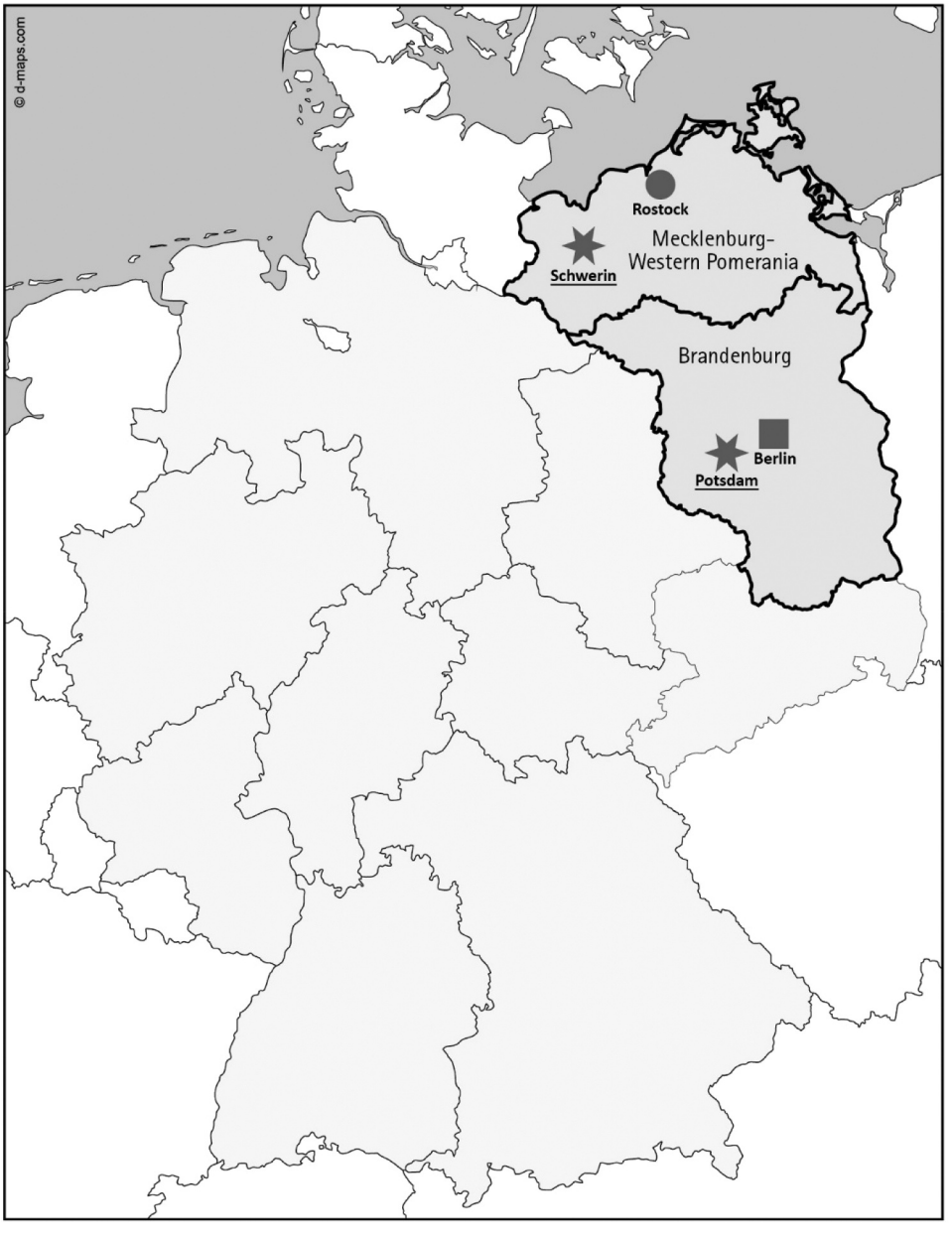

Figure 1. Location of Rostock and Potsdam.
Source: own figure.

around 6.000 hectares Rostock hosts Germany's largest contiguous coastal forest. Consequently, the urban development mission statements of both cities strongly oriented on these natural prerequisites: Potsdam's describes itself as 'green city by the water' (*Grüne Stadt am Wasse*r) while Rostock chose the slogan 'green city by the sea' (*Grüne Stadt am Meer*).

Potsdam and Rostock are independent cities (*kreisfreie Städte*), which can carry out their duties following the principle of local self-government (*kommunale Selbstverwaltung*). This basic political principle ensures all German municipalities have the constitutional right to manage their local affairs independently, climate action included. Although climate change mitigation and adaptation, as well as potentially related fields such as public transport, are voluntary functions for German municipalities, they have various opportunities to frame and exercise local climate policies, provided the political will exists (Benz et al. 2015; Link et al. 2018). Moreover, municipalities are free to carry out their mandatory tasks taking into account mitigation or adaptation concerns (e.g. low-emission energy and waste management or climate-adaptive urban planning). In contrast to many other, particularly smaller municipalities, Potsdam and Rostock are examples of eastern German cities that do significantly more than they are legally required in the area of climate policy. Indeed, municipalities in eastern Germany have tended to lag behind their western counterparts since the 1990s, when significantly fewer developed Local Agenda 21 processes (Kern, Koll, and Schophaus 2007). However, in this context, it also needs to be stressed that conditions were generally much more difficult in the eastern part of the country: following four decades of centralist planning within in the GDR, these municipalities needed to focus initially on establishing and practicing democratic local self-government (Wollmann 2003). Moreover, probably even more important than practicing local-self-government was the management of the economic transition from a centrally planned economy to a market economy. Especially the early 1990s were characterized by a general economic downturn, deindustrialization, mass unemployment and large-scale emigration from east to west.

4. Findings

4.1 *Forerunners in eastern Germany*

Previous literature on climate pioneer and leadership in Germany highlighted that Potsdam and Rostock are located in *Länder* that do not belong to the group of progressive actors (Jänicke and Wurzel 2019; Eckersley et al. 2021;). Our interviews confirm these previous findings. Indeed, several interviewees from Potsdam (Interviews 1, 11, 12) and Rostock (Interviews 16, 18, 21, 24) emphasized that neither of their respective state governments showed considerable efforts to support local climate action. Consequently, both cities had to develop their own strategies to tackle climate change locally.

Interviewees from both cities highlighted that they consider their *Länder* as very inactive with regard to climate policy and particularly with regard to guidance or support for local climate action (Interviews 11, 12, 15, 16, 18). Asked about the biggest disadvantages of Rostock one interviewee stated: 'our disadvantage is that we are located in Mecklenburg-Western Pomerania, where everything happens with a delay of 50 years' (Interview 18). Not only are both cities located in laggard regions but they are also the largest and one of the very few – if not the only – progressive cities within their respective *Länder*. While there are no 'suitable' partners for exchanging experiences for Potsdam – Brandenburg's other larger cities Cottbus, Frankfurt/Oder and

Brandenburg/Havel are all latecomers or laggards (Otto et al. 2021) – Rostock frequently collaborates with Greifswald that is also located in Mecklenburg-Western Pomerania (Interview 16, 17). Like Rostock, Greifswald is a growing, Hanseatic university city that successfully participates in the *Masterplan* funding program. However, apart from the cooperation with Greifswald, Rostock does not collaborate with any other municipality in Mecklenburg-Western Pomerania in the area of climate policy. Due to the lack of like-minded partners within their own region, Rostock decided to exchange experiences and ideas with further Masterplan municipalities from the neighboring *Land* Schleswig-Holstein. Some interviewees emphasized that Rostock's collaboration with these municipalities is not restricted to larger cities such as Kiel and Flensburg but also includes several small municipalities (Interview 16, 24). This was also explained by the fact that Schleswig-Holstein is far more progressive with regard to energy and climate issues and offers several funding opportunities for its municipalities. Those findings confirm previous research on climate policy in the German *Länder* that highlight the leading position of Schleswig-Holstein (Schill, Diekmann, and Püttner 2019; Eckersley et al. 2021). Like Rostock, also Potsdam is looking for like-minded partners outside of its region. Previously, Potsdam has realized this collaboration by participating in transdisciplinary research programs. One example is a project focusing on climate change adaptation and extreme weather events lead by the University of Potsdam. Moreover, as part of the *Masterplan*, cities like Potsdam that were selected in the second round were mentored by first round cities. Thus, during the development of the *Masterplan* strategy, Potsdam has collaborated closely with the climate leader city of Hanover (Interview 1). Finally, it is not surprising that Potsdam and Rostock have also been collaborating extensively with each other for many years. As an example, Potsdam decided to apply for the *Masterplan* program based on the recommendation and encouragement from city staff from Rostock (Interviews 11, 24). Rostock was part of the first wave of *Masterplan* cities (2012), while Potsdam joined in the second wave (2016). The key role of the *Masterplan* in both cities also underlines the high importance of national funding programs to support local climate action.

In addition to their exchanges with other climate-active municipalities in Germany, Potsdam and Rostock have joined city networks. Both cities are long-time members of the Climate Alliance (*Klima-Bündnis*), a European-wide network dominated by German-speaking municipalities. Over the years, both have organized and hosted *Klima-Bündnis* events such as annual conferences (Interviews 11, 17). In this context, some interviewees described networks that bring together a large number of municipalities from the same country as useful platforms for the exchange of strategic and tacit knowledge (Interviews 11, 24). While Potsdam has not joined further networks apart from *Klima-Bündnis*, Rostock is also active in the more internationally oriented climate network *Covenant of Mayors (CoM)*. Additionally, the city is a founding-member of the *Union of the Baltic Cities (UBC)*, a network of cities in the Baltic Sea region that focusses on exchanges in the areas of economic, social, cultural and environmental affairs. Nevertheless, our interviews revealed that – at least with regards climate policy – Rostock uses none of these memberships to explicitly develop an international leadership profile (Interviews 17, 23). Rather to the contrary, one interviewee highlighted that Rostock takes a back seat within the UBC and allows other cities to set the tone (Interview 23).

4.2 *Exploiting local potentials*

As outlined in section 3, it is no coincidence that cities like Potsdam and Rostock have been more active than most other cities. Both have a strong and diversified research environment and an active civil society that demands a greater say in decision-making processes that concern city development; two typical characteristics of pioneers and leaders (Zahran etal. 2008; Eckersley 2018a; Homsy 2018; Keeler et al. 2021; Kern 2019). Furthermore, both managed to formalize and institutionalize citizen participation and city-science collaborations, albeit with differing levels of success in the latter case.

Potsdam established a citywide network of public, private and civil stakeholders (*Klimapartner*) in 2012. Since 2018 it has been known as the city-science climate partnership (*Klimapartnerschaft Stadt und Wissenschaft*) (interview 18), and this aims to facilitate collaboration between actors from the city administration and local research institutes. This framework has already overseen various projects: examples include the collaboration of the utility company (*EWB*) with the German Research Centre for Geosciences (*GFZ*) to explore the potential of geothermal energy, ii) the municipal housing association (*ProPotsdam)* with the University of Applied Sciences, and iii) the city administration with the University of Potsdam and further scientific and non-academic partners in a transdisciplinary research project on urban climate resilience. Climate coordination office staff stressed that Potsdam's biggest climate policy strength is its well-established cooperation with local research institutions (interview 11). Indeed, the city works closely with the prestigious Potsdam Institute for Climate Impact Research (PIK): PIK-researchers have significantly contributed to the development of Potsdam's mitigation (2010, 2017) and adaptation strategies (2015). We also observed attempts to benefit from the broad local research environment in Rostock, although these were less successful. By establishing an energy alliance (*Energiebündnis Rostock*) in 2011, the city aimed to build a broad coalition of actors (encompassing science, municipal utility and housing companies and environmental groups). However, it was extremely difficult to build a consensus amongst such a diverse set of actors, and therefore the energy alliance does not play a major role in Rostock's energy and climate policy (Interview 18).

Citizen participation is quite strong in Rostock, in general but also with regard to climate change-related topics. Currently, local environmental activists – inter alia Fridays for Future (FFF) – are working on a petition aiming at the shutdown of a large coal-fired power plant located in the east of the city (Interviews 20, 25). Moreover, in 2019 a successful local referendum on expanding and improving Rostock's cycling infrastructure lead to institutional changes and innovations within the city administration. In 2020, the newly elected independent city mayor established a mobility department whose main task is to coordinate this initiative (Interviews 18, 20). During his election campaign, the mayor promised to transform Rostock into a bike-city, following the model of his hometown Copenhagen. Therefore, he hired new staff for the new mobility department as well as specialized planners from Scandinavian countries (Interviews 18, 24). Additionally, the FFF movement decisively influenced the city's emission reduction goal setting. In 2020, a group of FFF activists convinced a majority of Rostock's city council to pass a resolution that calls for climate neutrality by the year 2035 – although its current mitigation strategy sets out a plan for climate

neutrality by 2050, and it is unclear whether this will be updated as a result (Interview 23). Alongside these recent activities, citizen participation has a long tradition in Rostock and has been formalized and institutionalized. Since the early 1990s the Agenda 21 council (*Agenda 21-Rat*), composed of several active citizens, has been a visible player in Rostock's city development, including on climate and energy policy (Interviews 15, 16, 17, 18, 24). The council is an advisory panel managed by the department of city planning. It meets regularly to discuss topics related to sustainable urban development and informs and advises the city council. In 2008, a working group focusing on the local energy transition emerged within the council.

The city of Potsdam has also set up and institutionalized participation formats. Since its foundation in 2008, the significance of the Climate Advisory Committee (*Klimarat*) has steadily increased. Initially, this rather passive advisory committee assembled up to 45 stakeholders from politics, administration, business, research and civil society (Thieken et al. 2018). After a realignment in 2020 due to blockades by political members, it now consists of eight non-political 'experts', each responsible for one field of action from the Masterplan like sustainable planning, energy supply and infrastructure, economy or private households and consumption. Two local FFF-activists also participate, but remain without voting rights. Today, the committee is an actively involved body, which contributes to local climate activities and the implementation of the Masterplan. The success of Potsdam's Climate Advisory Committee has drawn the attention of Rostock's city staff responsible for mitigation. Rostock is currently discussing whether it should also set up a climate advisory committee following the model of Potsdam (Interview 23).

4.3 *Tackling eco-district pilot projects*

Over the years, both cities were able to kick-off, develop, and successfully implement ambitious eco-district projects. Potsdam stands out for the (still-ongoing) transformation of the low-income neighborhood *Drewitz* into a zero emission garden city. Worth mentioning in Rostock are the low-carbon, energy-efficient neighborhoods *Petriviertel* and *Werftdreieck* that were developed on former brownfields.

With its 3,000 apartments, *Drewitz* was built in the late 1980s as one of the last new development neighborhoods of the former GDR. After being awarded funding in a national competition for energy-efficient refurbishment of large housing estates in 2009, the city of Potsdam enforced the idea for the redevelopment of the garden city *Drewitz* in a Masterplan in 2011. The integrated energy and climate strategy (2013) connects the former approaches with energy refurbishment and climate protection. Since then, the municipal housing companies have refurbished many buildings energetically and renovated the facades in order to facilitate rainwater infiltration into the newly greened courtyards. In 2014, the project won a national climate action award for municipalities for its socially responsible energy refurbishment. Indeed, *Drewitz* provides attractive public spaces like the 'Green Cross' by converting traffic areas and parking spaces. As a central axis, this park with playgrounds and water areas was built on a former four-lane street. Also, newly created tenant gardens and public gardening spaces are popular among the citizens. As a unique project in Brandenburg, *Drewitz* is a pilot project of the Land Brandenburg on the topic of energy efficient urban renewal.

For its socially acceptable energetic redevelopment the project has received a climate award by the German ministry of the environment. City staff from Rostock have been impressed by the transformation of *Drewitz* and keep a close watch on how the project is developing (e.g. through discussions with their counterparts in Potsdam or by participation in thematic events focusing on the area) (Interview 24). The *Drewitz* project is of major interest for Rostock since the city itself has several comparable large housing estates that were built during GDR times. Moreover, in both cities the municipal housing companies manage most of these housing estates. However, as several interviews in Rostock revealed, the collaboration between city administration and municipal housing company proved to be difficult and not without conflicts in this city (Interviews 15, 16, 18). Nevertheless, compared to many other German cities, Potsdam and Rostock both have a large housing stock that the municipal companies own and manage. As highlighted by Kern et al. (2021), the opportunity to steer municipal companies is a favorable condition that can significantly contribute to a city's climate policy.

After German reunification, Rostock underwent a difficult process of structural change, particularly the decline of the shipyard industry. From a climate change perspective, this had a noticeable impact on Rostock's impressive emission reduction achievement. To cope with these changing conditions, Rostock repurposed former shipyard areas and other brownfields for urban development projects, particularly *Petriviertel* and *Werftdreieck*. Located in a landscape conservation area and a flood plain since the early 1990s, the aim was to develop the *Petriviertel* applying ecologically compatible construction practices. The various developers set and applied energy standards significantly higher than the legal minimum. Moreover, significant parts of the area have a recreational function. Today, *Petriviertel* has become a reference point for Rostock's sustainable urban development that various stakeholders frequently referred to during discussions about future city development. Another example is the city's central brownfield area *Werftdreieck* that is currently being redeveloped as a sustainable residential neighborhood. Rostock's largest municipal housing company bought the property and manages the transformation process in collaboration with several involved city departments. The architects managing the project set ambitious climate and environment-related development goals. These include realizing traffic-calmed zones, the re-cultivation of a canalized creek, creation of green inner areas, and the installation of an adequate cycling infrastructure.

These presented housing projects are more likely to be carried out in growing cities such as Potsdam and Rostock, due to the increasing demand for homes in such areas. Indeed, as outlined in previous publications, pioneers and leaders are most commonly also cities with a growing population (Zahran et al. 2008; Kern 2019). The examples demonstrate that both cities have the necessary self-confidence to tackle large and ambitious development projects. Nevertheless, our interviews revealed that key stakeholders in both cities do not regard their cities as leaders that have developed models that inevitably must inspire actors from other cities in Germany or even Europe (Interviews 11, 15, 16, 24). Rather than trying to showcase their success to other cities, Potsdam and Rostock incorporated the experiences gained into further neighborhood projects within their own cities. In the course of the 2025 national garden show (*Bundesgartenschau*), that will take place in Rostock, the city decided to develop the

Warnowquartier in the eastern Port area. Rostock plans to accompany the low-emission project by a process of extensive citizen participation. Besides, lessons learned from the previous projects *Petriviertel* and *Werftdreieck* (e.g. a stronger consideration and integration of climate change adaptation aspects) should be included in the on-going planning process (Interviews 15, 16). In Potsdam, the transformation of the low-income neighborhood *Schlaatz* into a more livable and sustainable area by 2030 is planned. It is exactly because of the similar starting conditions to *Drewitz* that the urban planners will incorporate several lessons from this successful project into the further development of *Schlaatz*. As an example, *Schlaatz* will receive a separate energy and climate strategy, like *Drewitz* (Interview 11).

4.4 *Climate policy pioneers or climate policy leaders?*

Taken together, our findings reveal that Potsdam and Rostock are pioneering but not leading cities since they only exhibit strong internal ambitions (Liefferink and Wurzel 2017; Wurzel, Liefferink, and Torney 2019b). The strongly suggested pioneering role of both cities (see Otto et al. 2021) could be confirmed: Starting from the 1990s, both have adopted ambitious climate goals, implemented institutional innovations to support climate action, and developed eco-district projects. That both cities have not become leaders can be largely attributed to a lack of durable and substantial political will and mayoral support. The necessary external ambitions were not formulated by (key actors) within the city governments.

First of all, becoming a *structural leader* appears very unrealistic for mid-sized cities such as Potsdam and Rostock since it is closely linked to economic power and capacities and thus may only be an option for larger cities. It does therefore not surprise that both cities have not become *structural leaders*. However, substantial efforts to show *entrepreneurial or cognitive leadership* could not be observed in both cities as well. First of all, the natures of Potsdam's and Rostock's network memberships suggest that neither has positioned itself as *entrepreneurial leader*. Leading cities often show strong external and international ambitions and are thus active in international networks, which they use to attract followers (Kern and Bulkeley 2009; Fenton and Busch 2016; Haupt et al. 2020). Potsdam is only active in the *Klima-Bündnis* that mostly focusses on municipalities from German-speaking countries. In contrast, Rostock has also joined international networks such as the *CoM* or the *UBC*. However, none of these memberships were explicitly used to develop an international leadership profile in climate policy. With *Drewitz* in Potsdam and *Petriviertel* in Rostock both cities have certainly set innovative examples for the development of eco-districts. This would be a solid starting point for the development of a *cognitive leadership* profile (Wurzel et al. 2019a). Moreover, the lessons learned through these projects were also applied to further projects within the cities. Indeed, applying knowledge gained from previous projects to new projects in other neighborhoods of the city is a common practice of leading cities (Fitzgerald and Lenhart 2016). However, confident leaders with outspoken ambitions would have exploited eco-district projects such as *Petriviertel* or *Drewitz* to attract followers (Jänicke and Wurzel 2019; Wurzel, Liefferink, and Torney 2019b) and to gain (international) visibility (Jönsson and Holgersen 2017; Haupt 2021), rather than learn from experiences and projects within their own city.

Lastly, it remains unclear if both cities have already shown *exemplary leadership*, meaning that they have provided suitable models for other cities without being aware of it (see Wurzel, Liefferink, and Torney 2019b). However, we find that Potsdam and Rostock have (unintentionally) developed and provided models that might be suitable for other cities. On the national level, their approaches to institutionalize citizen participation formats do have the potential to help and inspire other cities (e.g. Climate Advisory Committee in Potsdam or Agenda 21 Council in Rostock). Moreover, with its experience in making low-income neighbourhoods more climate-friendly and adaptive Potsdam could be an inspiring model for other cities with large prefabricated housing estates (*cognitive leadership*). These followers could be found in eastern Germany or in other post-socialist central eastern European cities with similar types of buildings and neighbourhoods. Indeed, there is not only a lack of research on climate governance in post-socialist cities (Ferenčuhová 2020) but also of models to follow for these types of cities. However, to become a model for post-socialist cities beyond eastern Germany Potsdam would first need to establish stronger international networks. Given the recent ambitions to become a bike-city that were underpinned by substantial institutional changes within the city administration, Rostock could become a model for other cities as well. Despite following the model of the bike-city Copenhagen, Rostock will probably not become a second Copenhagen. More likely, it will become a suitable model for other cities that are more like Rostock. Through its existing and intensively cultivated network with cities in the Baltic Sea region and active membership in national and international networks Rostock already has a platform to attract potential followers (*entrepreneurial leadership*).

5. Conclusions

Climate pioneers and leaders are much more likely to be found among large cities than mid-sized cities (Kern 2019; Otto et al. 2021; Haupt 2021). Mid-sized pioneers and in particular mid-sized leaders still remain an exception. Nevertheless, our findings demonstrate that mid-sized cities can become pioneers even if they are located in regions that (have) put little emphasis on supporting local governments' climate governance efforts. More important than the embeddedness in a multilevel governance system are internal factors such as a city's socio-demographic (e.g. a young and growing population), socio-economic (e.g. low unemployment rates) and most importantly political situation (e.g. political support for climate action). Nevertheless, the availability of funding for climate action is of key importance for the local level. This applies also to those cities that work under favorable socio-demographic, economic, and political conditions. However, our findings suggest that it is rather unimportant for German cities from which government level the funding derives from. Indeed, the examples of Potsdam and Rostock show that German cities willing to act on climate change can 'skip' the regional level and benefit from funding sources on the national level instead. Nevertheless, studies into climate ambitions and actions of cities from other post-socialist countries might bring new important insights in this respect. Other than German cities, most if not all, post-socialist cities have to develop climate policies under difficult conditions. Particularly with regard to support from their national

governments. Nevertheless, climate pioneers and even leaders do exist in those countries as well. A striking example is the mid-sized city of Ljubljana that was awarded with the title of European Green Capital in 2016.

Potsdam and Rostock are climate pioneers but do not qualify as climate leaders. While our findings have confirmed the key importance of several characteristics for becoming a climate pioneer or leader (Zahran et al. 2008; Bedsworth and Hanak 2013; Eckersley 2018a; Homsy 2018), we find that not all of them are equally decisive. It appears that mayoral support is of utmost importance for local climate action and policy ambitions. This applies in particular to the question if a city will become a pioneer or a leader. Becoming a leader is strongly related to strong external policy ambitions (Liefferink and Wurzel 2017; Torney 2019; Wurzel, Liefferink, and Torney 2019b). Indeed, unlike most other favourable characteristics for climate action, (persistent) mayoral support was lacking in both cities. To deepen our understanding of climate leadership, case studies in cities that lack most favourable city characteristics except for mayoral support appear to be of major interest. In other words, is mayoral support alone sufficient to become a leader? Lastly, we find that Potsdam and Rostock have the potential to become national or even international leaders. Potsdam has proven expertise and experience in redeveloping low-income neighbourhoods into eco-districts. Thus, the city could position itself as a *cognitive leader* and become a model for post socialist-cities with large prefabricated housing estates. Rostock's newly elected mayor has outspoken ambitions to transform the city into a bike-city. In case these ambitions will be put into practice Rostock could become an *entrepreneurial leader* in the mid-term future. Rostock could make itself a name as a bike-city by using its existing international networks, particularly with cities in the Baltic Sea region.

Notes

1. Prognos Zukunftsatlas Deutschland (2019).

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Germany's Federal Ministry of Education and Research (BMBF) under Grant FKZ 01LR1709B1; and the Turku Urban Research Programme; Bundesministerium für Bildung und Forschung [

ORCID

Wolfgang Haupt http://orcid.org/0000-0002-1042-2106
Kristine Kern http://orcid.org/0000-0001-9923-4621

References

Badiu, D. L., D. A. Onose, M. R. Niță, and R. Lafortezza. 2019. "From "Red" to Green? A Look into the Evolution of Green Spaces in A post-socialist City." *Landscape and Urban Planning* 187: 156–164. doi:10.1016/j.landurbplan.2018.07.015.

Bedsworth, L. W., and E. Hanak. 2013. "Climate Policy at the Local Level: Insights from California." *Global Environmental Change* 23 (3): 664–677. doi:10.1016/j.gloenvcha.2013.02.004Benz.

Benz, A., J. Kemmerzell, M. Knodt, and A. Tews. 2015. "The trans-local Dimension of Local Climate Policy. Sustaining and Transforming Local Knowledge Orders through trans-local Action in Three German Cities." *Urban Research and Practice* 8 (3): 319–335. doi:10.1080/17535069.2015.1051380.

Bottero, M., C. Caprioli, G. Cotella, and M. Santangelo. 2019. "Sustainable Cities: A Reflection on Potentialities and Limits Based on Existing Eco-Districts in Europe." *Sustainability* 11 (20): 5794. doi:10.3390/su11205794.

Bulkeley, H., V. Castán Broto, and G. A. S. Edwards. 2015. *An Urban Politics of Climate Change: Experimentation and the Governing of socio-technical Transitions*. London: Routledge.

Csomós, G., Z. J. Farkas, R. A. Kolcsár, P. Szilassi, and Z. Kovács. 2021. "Measuring socio-economic Disparities in Green Space Availability in post-socialist Cities." *Habitat International* 117: 102434. doi:10.1016/j.habitatint.2021.102434.

Eckersley, P. M. 2018a. *Power and Capacity in Urban Climate Governance: Germany and England Compared*. Oxford: Peter Lang.

Eckersley, P. 2018b. "Who Shapes Local Climate Policy? Unpicking Governance Arrangements in English and German Cities." *Environmental Politics* 27 (1): 139–160. doi:10.1080/09644016.2017.1380963.

Eckersley, P., K. Kern, W. Haupt, and H. Müller. 2021. *The Multi-level Context for Local Climate Governance in Germany: The Role of the Federal States*. Erkner: Leibniz Institute for Research on Society and Space. (IRS Dialog; 2021, 3). http://hdl.handle.net/10419/237056

Fenton, P., and H. Busch. 2016. "Identifying the "Usual Suspects"—Assessing Patterns of Representation in Local Environmental Initiatives." *Challenges in Sustainability* 4 (2). doi:10.12924/cis2016.04020001.

Ferenčuhová, S. 2020. "Not so Global Climate Change? Representations of post-socialist Cities in the Academic Writings on Climate Change and Urban Areas." *Eurasian Geography and Economics* 61 (6): 686–710. doi:10.1080/15387216.2020.1768134.

Fitzgerald, J., and J. Lenhart. 2016. "Eco-districts: Can They Accelerate Urban Climate Planning?" *Environment and Planning C: Government and Policy* 34 (2): 364–380. doi:10.1177/0263774X15614666.

Gailing, L., and A. Röhring. 2015. "Was ist dezentral an der Energiewende?" *Infrastrukturen erneuerbarer Energien als Herausforderungen und Chancen für ländliche Räume. Raumforschung und Raumordnung* 73 (1): 31–43. doi:10.1007/s13147-014-0322-7.

Gailing, L., A. Bues, K. Kern, and A. Röhring. 2020. "Socio-Spatial Dimensions in Energy Transitions: Applying the TPSN Framework to Case Studies in Germany." *Environment and Planning A* 52 (6): 1112–1130. doi:10.1177/0308518X19845142.

Growe, A., and T. Freytag. 2020. "Image and Implementation of Sustainable Urban Development: Showcase Projects and Other Projects in Freiburg, Heidelberg and Tübingen, Germany." *Raumforschung Und Raumordnung | Spatial Research and Planning* 77 (5): 457–474. doi:10.2478/rara-2019-0035.

Gupta, J., and L. Ringius. 2001. "The EU's Climate Leadership: Reconciling Ambition and Reality." *International Environmental Agreements* 1 (2): 281–299. doi:10.1023/A:1010185407521.

Haupt, W., L. Chelleri, S. Van Herk, and C. Zevenbergen. 2020. "City-to-City Learning within Climate City Networks: Definition, Significance, and Challenges from a Global Perspective." *International Journal of Urban Sustainable Development* 12 (2): 143–159. doi:10.1080/19463138.2019.1691007.

Haupt, W. 2021. "How Do Local Policy Makers Learn about Climate Change Adaptation Policies? Examining Study Visits as an Instrument of Policy Learning in the European Union." *Urban Affairs Review* 57 (6): 1697–1729. doi:10.1177/1078087420938443.

Haupt, W., P. Eckersley, and K. Kern. 2022. "How Can 'Ordinary' Cities Become Climate Pioneers?" In *Addressing the Climate Crisis: Local Action in Theory and Practice*, edited by C. Howarth, M. Lane, and S. Amanda, 83–92. Cham: Palgrave Macmillan. doi:10.1007/978-3-030-79739-3_8.

Häußler, S., and W. Haupt. 2021. "Climate Change Adaptation Networks for Small and Medium-sized Cities." *SN Social Sciences* 11 (1): [262]. doi:10.1007/s43545-021-00267-7.

Heinelt, H., and W. Lamping. 2015. "Interdisziplinäre Stadtforschung." In *Wissen und Entscheiden: Lokale Strategien gegen den Klimawandel in Frankfurt am Main, München und Stuttgart*. Vol. 20. Frankfurt am Main: Campus, p.327.

Hickmann, T. 2021. "Locating Cities and Their Governments in Multi-Level Sustainability Governance." *Politics and Governance* 9 (1): 211–220. doi:10.17645/pag.v9i1.3616.

Homsy, G. C. 2018. "Unlikely Pioneers: Creative Climate Change Policymaking in Smaller U.S. Cities." *Journal of Environmental Studies and Sciences* 8 (2): 121–131. doi:10.1007/s13412-018-0483-8.

Huang-Lachmann, J.-T., and J. C. Lovett. 2016. "How Cities Prepare for Climate Change: Comparing Hamburg and Rotterdam." *Cities* 54: 36–44. doi:10.1016/j.cities.2015.11.001.

Jänicke, M. 2005. "Trend-setters in Environmental Policy: The Character and Role of Pioneer Countries." *European Environment* 15 (2): 129–142. doi:10.1002/eet.375.

Jänicke, M., and R. K. Wurzel. 2019. "Leadership and lesson-drawing in the European Union's Multilevel Climate Governance System." *Environmental Politics* 28 (1): 22–42. doi:10.1080/09644016.2019.1522019.

Jönsson, E., and S. Holgersen. 2017. "Spectacular, Realisable and 'Everyday'." *City* 21 (3–4): 253–270. doi:10.1080/13604813.2017.1325186.

Jordan, A. J., and D. Liefferink. 2004. *Environmental Policy in Europe*. London: Routledge. doi:10.4324/9780203449004.

Kagan, S., and J. Hahn. 2011. "Creative Cities and (Un)sustainability: From Creative Class to Sustainable Creative Cities." *Culture and Local Governance* 11–27. doi:10.18192/clg-cgl.v3i1.182.

Keeler, L. W., F. Beaudoin, A. Wiek, B. John, A. M. Lerner, R. Beecroft, and N. Forrest. 2019. "Building actor-centric Transformative Capacity through city-university Partnerships." *Ambio* 48 (5): 529–538. doi:10.1007/s13280-018-1117-9.

Kern, K., C. Koll, and M. Schophaus. 2007. "The Diffusion of Local Agenda 21 in Germany: Comparing the German Federal States." *Environmental Politics* 16 (4): 604–624. doi:10.1080/09644010701419139.

Kern, K., and H. Bulkeley. 2009. "Cities, Europeanization and Multi-level Governance: Governing Climate Change through Transnational Municipal Networks." *JCMS: Journal of Common Market Studies* 47 (2): 309–332. doi:10.1111/j.1468-5965.2009.00806.x.

Kern, K. 2019. "Cities as Leaders in EU Multilevel Climate Governance: Embedded Upscaling of Local Experiments in Europe." *Environmental Politics* 28 (1): 125–145. doi:10.1080/09644016.2019.1521979.

Kern, K., S. Grönholm, W. Haupt, L. Hopman, N. Tynkkynen, and P. Kettunen. 2021 . *Matching Forerunner Cities: Assessing Turku's Climate Policy in Comparison with Malmö, Groningen and Rostock*. Turku: City of Turku.

Knill, C., S. Heichel, and D. Arndt. 2012. "Really A front-runner, Really A Straggler? Of Environmental Leaders and Laggards in the European Union and beyond — A Quantitative Policy Perspective." *Energy Policy* 48: 36–45. doi:10.1016/j.enpol.2012.04.043.

Kronsell, A. 2013. "Legitimacy for Climate Policies: Politics and Participation in the Green City of Freiburg." *Local Environment* 18 (8): 965–982. doi:10.1080/13549839.2012.748732.

Liefferink, D., and R. K. Wurzel. 2017. "Environmental Leaders and Pioneers: Agents of Change?" *Journal of European Public Policy* 24 (7): 951–968. doi:10.1080/13501763.2016.1161657.

Link, G., C. Krüger, C. Rösler, A. Bunzel, A. Nagel, and B. Sommer. 2018. *Klimaschutz in Kommunen*. 3rd. Berlin: Deutsches Institut für Urbanistik -Difu. Praxisleitfaden. https://repository.difu.de/jspui/handle/difu/248422

Mees, H. L. P., P. P. J. Driessen, and H. A. C. Runhaar. 2014. "Legitimate Adaptive Flood Risk Governance beyond the Dikes: The Cases of Hamburg, Helsinki and Rotterdam." *Regional Environmental Change* 14 (2): 671–682. doi:10.1007/s10113-013-0527-2.

Monstadt, J. 2007. "Urban Governance and the Transition of Energy Systems: Institutional Change and Shifting Energy and Climate Policies in Berlin." *International Journal of Urban and Regional Research* 31 (2): 326–343. doi:10.1111/j.1468-2427.2007.00725.x.

Nochta, T. 2021. *Routledge Focus on Energy Studies. Network Governance and Energy Transitions in European Cities*. Abingdon, Oxon, New York, NY: Routledge.

Oberthür, S., and C. Roche Kelly. 2008. "EU Leadership in International Climate Policy: Achievements and Challenges." *The International Spectator* 43 (3): 35–50. doi:10.1080/03932720802280594.

Otto, A., K. Kern, W. Haupt, P. Eckersley, and A. H. Thieken. 2021. "Ranking Local Climate Policy: Assessing the Mitigation and Adaptation Activities of 104 German Cities." *Climatic Change* 167 (1–2). doi:10.1007/s10584-021-03142-9.

Pandis Iverot, S., and N. Brandt. 2011. "The Development of a Sustainable Urban District in Hammarby Sjöstad, Stockholm, Sweden?" *Environment, Development and Sustainability* 13 (6): 1043–1064. doi:10.1007/s10668-011-9304-x.

Prognos. 2015. "Das Ranking Für Deutschlands Regionen: Prognos Zukunftsatlas Deutschland." https://www.prognos.com/de/projekt/zukunftsatlas-2019.

Rave, T., and J. Albrecht-Saavedra. 2016. "Die Diffusion von Politikinnovationen: Fallstudie München (ENERGIO – Working Paper No. 6)." Munich: ifo Institut – Leibniz-Institut für Wirtschaftsforschung.

Rohracher, H., and P. Späth. 2014. "The Interplay of Urban Energy Policy and Socio-technical Transitions: The Eco-cities of Graz and Freiburg in Retrospect." *Urban Studies* 51 (7): 1415–1431. doi:10.1177/0042098013500360.

Salvia, M., D. Reckien, F. Pietrapertosa, P. Eckersley, N.-A. Spyridaki, A. Krook-Riekkola, and M. Olazabal. 2021. "Will Climate Mitigation Ambitions Lead to Carbon Neutrality? An Analysis of the local-level Plans of 327 Cities in the EU." *Renewable and Sustainable Energy Reviews* 135: 110253. doi:10.1016/j.rser.2020.110253.

Schill, W.-P., J. Diekmann, and A. Püttner. 2019. *Sechster Bundesländervergleich erneuerbare Energien: Schleswig-Holstein und Baden-Württemberg an der Spitze (DIW Wochenbericht No. 48)*. Berlin: DIW Berlin - Deutsches Institut für Wirtschaftsforschung e. V. https://www.diw.de/documents/publikationen/73/diw_01.c.698968.de/19-48-3.pdf

Shefer, I. 2019. "Policy Transfer in city-to-city Cooperation: Implications for Urban Climate Governance Learning." *Journal of Environmental Policy & Planning* 21 (1): 61–75. doi:10.1080/1523908X.2018.1562668.

Sikora-Fernandez, D. 2018. "Smarter Cities in post-socialist Country: Example of Poland." *Cities* 78: 52–59. doi:10.1016/j.cities.2018.03.011.

Sviršić Gotovac, A., and B. Kerbler. 2019."From Post-Socialist to Sustainable: The City of Ljubljana" *Sustainability* 11(24): 7126. doi:10.3390/su11247126.

Thieken, A., J. Dierck, L. Dunst, C. Göpfert, A. Heidenreich, K. Hetz, and A. Walz. 2018. *Urbane Resilienz gegenüber extremen Wetterereignissen – Typologien und Transfer von Anpassungsstrategien in kleinen Großstädten und Mittelstädten (ExTrass)*. Potsdam: University of Potsdam.

Tobin, P. 2017. "Leaders and Laggards: Climate Policy Ambition in Developed States." *Global Environmental Politics* 17 (4): 28–47. doi:10.1162/GLEP_a_00433.

Torney, D. 2019. "Follow the Leader? Conceptualising the Relationship between Leaders and Followers in Polycentric Climate Governance." *Environmental Politics* 28 (1): 167–186. doi:10.1080/09644016.2019.1522029.

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. doi:10.1016/j.esg.2019.100005.

Varró, K., and Á. Szalai. 2021. "Discourses and Practices of the Smart City in Central Eastern Europe: Insights from Hungary's 'Big' Cities." *Urban Research & Practice* 1–25. doi:10.1080/17535069.2021.1904276.

Wei, T., J. Wu, and S. Chen. 2021. "Keeping Track of Greenhouse Gas Emission Reduction Progress and Targets in 167 Cities Worldwide." *Frontiers in Sustainable Cities* 3. doi:10.3389/frsc.2021.696381.

West, C., E. Marquardt, and U. Gerhard. 2017. "Co-design und co-production von Wissen für die nachhaltige Stadt: Das Reallabor Urban Office in Heidelberg." *GAIA - Ecological Perspectives for Science and Society* 26 (1): 58–59. doi:10.14512/gaia.26.1.13.

Wollmann, H. 2003. "Rebuilding Local Democracy and Administration in East Germany — A "Special Case" of post-communist Transformation?" In *Local Democracy in Post-Communist Europe*, edited by H. Baldersheim, M. Illner, and H. Wollmann, 29–59. Wiesbaden: VS Verlag für Sozialwissenschaften. doi:10.1007/978-3-663-10677-7_2.

Wurzel, R. K., J. F. Moulton, W. Osthorst, L. Mederake, P. Deutz, and A. E. Jonas. 2019a. "Climate Pioneership and Leadership in Structurally Disadvantaged Maritime Port Cities." *Environmental Politics* 28 (1): 146–166. doi:10.1080/09644016.2019.1522039.

Wurzel, R. K. W., D. Liefferink, and D. Torney. 2019b. "Pioneers, Leaders and Followers in Multilevel and Polycentric Climate Governance." *Environmental Politics* 28 (1): 1–21. doi:10.1080/09644016.2019.1522033.

Zahran, S., S. D. Brody, A. Vedlitz, H. Grover, and C. Miller. 2008. "Vulnerability and Capacity: Explaining Local Commitment to Climate-Change Policy." *Environment and Planning C: Government and Policy* 26 (3): 544–562. doi:10.1068/c2g.

Zimmermann, K., J. Boghrat, and M. Weber. 2015. "Urban Strategies and Measures to Deal with Climate Change." *Urban Research & Practice* 8 (3): 303–318. doi:10.1080/17535069.2015.1051379.