

Global Communications

EDITED BY MICHAEL BRÜGGEMANN AND SIMONE RÖDDER

# Global Warming in Local Discourses

How Communities around the World  
Make Sense of Climate Change





<https://www.openbookpublishers.com>

© 2020 Michael Brüggemann and Simone Rödder. Copyright of individual chapters is maintained by the chapters' authors.



This work is licensed under a Creative Commons Attribution 4.0 International license (CC BY 4.0). This license allows you to share, copy, distribute and transmit the text; to adapt the text and to make commercial use of the text providing attribution is made to the authors (but not in any way that suggests that they endorse you or your use of the work). Attribution should include the following information:

Michael Brüggemann and Simone Rödder (eds), *Global Warming in Local Discourses: How Communities around the World Make Sense of Climate Change*. Cambridge, UK: Open Book Publishers, 2020, <https://doi.org/10.11647/OBP.0212>

In order to access detailed and updated information on the license, please visit, <https://doi.org/10.11647/OBP.0212#copyright>

Further details about CC BY licenses are available at, <https://creativecommons.org/licenses/by/4.0/>

All external links were active at the time of publication unless otherwise stated and have been archived via the Internet Archive Wayback Machine at <https://archive.org/web>

Updated digital material and resources associated with this volume are available at <https://doi.org/10.11647/OBP.0212##resources>

Every effort has been made to identify and contact copyright holders and any omission or error will be corrected if notification is made to the publisher.

Global Communications vol. 1 | ISSN 2634-7245 (Print) | ISSN 2634-7253 (Online)

ISBN Paperback: 9781783749591

ISBN Hardback: 9781783749607

ISBN Digital (PDF): 9781800641259

ISBN Digital ebook (epub): 9781783749386

ISBN Digital ebook (mobi): 9781783749393

ISBN XML: 9781783749409

DOI: 10.11647/OBP.0212

Cover design by Anna Gatti based on a photo by Duangphorn Wiriya on Unsplash at <https://unsplash.com/photos/KiMpFTuuAk>

# 4. Sense-Making of COP 21 among Rural and City Residents

## The Role of Space in Media Reception

*Imke Hoppe, Fenja De Silva-Schmidt,  
Michael Brüggemann, and Dorothee Arlt<sup>1</sup>*

---

This chapter explores the role of space in making sense of climate change. The study compares how the United Nations' summit resulting in the Paris Agreement in 2015 was received in an urban (Hamburg) and a rural setting (Otterndorf), both located in Northern Germany. In each setting, two focus group interviews were held (n = 15), one with long-term inhabitants and one with newly relocated citizens. Media coverage was criticized as depicting climate change as overly complex and distant. Use of the local newspaper was more frequent in the rural setting, but its reporting was seen as failing to provide a local angle to the climate summit. Space plays an important role: people in the rural setting—with the rising tides of the North Sea behind the dikes—felt more personally concerned by climate change. Furthermore, long-term inhabitants drew much stronger links between climate change and their region. The duration of stay in a certain setting thus turns out to moderate the influence of space on interpretations of climate change.

---

1 The research project “Down2Earth” was funded by the German Research Foundation’s “Integrated Climate System Analysis and Prediction” (CliSAP) Cluster of Excellence, Universität Hamburg. Further information on the project can be found at URL: <https://climatematters.blogs.uni-hamburg.de/down-to-earth/>. We would like to thank Aaron McKinnon for his assistance in preparing this manuscript, and Josephine B. Schmitt, Irene Neverla and Katharina Kleinen-von Königslöw for supporting the study and the publication.

## Introduction

According to Hulme (2015), there are *many* climate changes around the world: it has different meanings for people in different contexts. How can the emergence of these different meanings of climate change be explained? From a human geography perspective, “space” and “place” are important reference points for explaining these different perceptions and interpretations (Amunden 2015; Ratter and Gee 2012). However, since the “spatial turn” in human geography (Warf and Arias 2009), there has been a consensus that physical characteristics and political boundaries do not dictate certain meanings (Glasze and Matissek 2012; Ratter and Gee 2012). People living in a vulnerable area are not necessarily more aware of climate change (Lee et al. 2015).

In human geography, communication is understood as a central process in constructing “place”. People negotiate the meanings and boundaries of a “place” (Glasze and Matissek 2012; Agnew 2005). Yet, this is rarely reflected in communication studies (stated as desideratum by, e.g., Autischer and Maier Rabler 2017; Brüggemann et al. 2017; Rodríguez Amat and Brantner 2016; Couldry and McCarthc 2004; Kleinsteuber and Rossmann 1994; Maier Rabler 1992).

Media play a central role in bringing climate change to people’s homes—via TV, newspaper, radio, or social networks. This role should be explored in order to better understand climate-related attitudes (Newman, Nisbet, and Nisbet 2018; Taddicken 2013; Brulle, Carmichael, and Jenkins 2012; Arlt, Hoppe, and Wolling 2011).

Content analyses have demonstrated that United Nations (UN) climate summits (known as Conference of the Parties/COP) are a main driver of media attention to climate change (Schäfer, Ivanova, and Schmidt, 2014). These COPs take place as annual meetings of the 194 UN member states that signed the UNFCCC (United Nations Framework Convention on Climate Change). They serve as a focal point and gathering spot for international policy makers and journalists, but little is known about how audiences relate to these events.

The qualitative study presented in this chapter explores how COP coverage is experienced in two different places in order to better understand the extent to which audiences draw a link between media

coverage and their living environment. We compare two regions within the same country, so that spatial factors are not overshadowed by substantial differences in culture, language, or socio-economic conditions.

We focus our research on (a) how the *flow of mediated information* about a COP varies in different places and (b) how *media reception and interpretation* of coverage of COPs differs.

The following section will analyze the state of research on how climate change coverage is received, and to what extent spatial aspects play a role. Then, we proceed to describe the research questions and design of the empirical study before discussing the results.

## State of Research

A huge body of literature explores how climate change coverage is used, perceived, interpreted, and negotiated (Nisbet 2018). Empirical studies have been conducted in different countries—with a clear bias towards European and US audiences—but the relevance of spatial factors for mediated communication about climate change has not been systematically addressed by communication scholars. Thus, it remains an open question whether (and which) spatial factors influence the process of media reception, and how they may affect climate-change awareness and related constructs.

Past studies have focused on three aspects that will structure our discussion of the literature: (a) (attributed) spatial distance and/or proximity to climate change, (b) personal experiences with nature and weather, and (c) social spaces and group identities.

### The Role of (Attributed) Spatial Distance of Climate Change

Does the media's use of proximity (or distance) in depictions of climate change influence the audience's understanding of the issue? Human geography scholars stress that the act of describing an area as a "place of climate change" is a product of social construction (Agnew 2005). Similarly, communication scholars agree that media reporting that classifies a place as being impacted by climate change is a product of mediated social construction (see Neverla et al. 2019). Nonetheless,

places “objectively differ in terms of their environmental, social and economic characteristics and these will open up or close down the possibilities open to individuals and groups to interpret proposed place changes” (Manzo and Devine-Wright 2014: 56). The following three studies explore how people perceive and interpret places of climate change through representations in the news media and the effect of (attributed) spatial distance from these places.

O’Neill and Nicholson-Cole (2009) examine fear appeals in media coverage, also with respect to spatial aspects. In their research, focus group discussions in the United Kingdom showed that pictures from a person’s direct living environment (like energy-saving lamps or public transport) have positive effects on their intention to act in a climate-friendly manner. Although climate-change awareness and attention to the issue were augmented by ‘dramatic visions or human or animal suffering at both local and global scales’ (O’Neill and Nicholson-Cole: 371–72), aversive imagery (e.g. starving children, famine) was found to hinder personal engagement because it provokes helpless and overwhelmed sentiments due to the immense dimension of the problem. However, spatial proximity portrayed in pictures that depict negative impacts on “local or regional places that individuals care about and empathize with” (375–76) encouraged people to think about the vulnerability of their living environment to climate change.

Hart and Nisbet (2012) explore whether it matters for a US audience if “climate victims” are depicted as inhabitants of the participants’ own country or as living in distant places. The authors use an experimental design to examine the extent to which people’s support for climate mitigation policy (dependent variable) increases after reading news articles on the negative health effects of climate change (independent variable). Their mediating variables included spatial distance (climate victims in France versus the US) and group affiliation (Democrats versus Republicans) (Hart and Nisbet 2012: 710). The authors assume that “social identity cues may activate the unintended construct that an issue or problem is not applicable to the group to which a message receiver belongs, and thus the message may be ineffective or result in a negative impact” (705). Their results demonstrate that both mediators indeed influence the media effect—a mechanism the authors call the “boomerang

effect". Respondents who strongly identified with a specific US political party interpreted the news article on climate victims in line with their party's official position on climate change: Democrats' support for climate mitigation policy was increased by media exposure of negative climate-change impacts, and Republicans' support decreased even below their baseline values. Hart and Nisbet found that spatial distance also influences perceptions: geographic proximity to climate victims enhances support for climate mitigation policy among individuals who believe climate change is an important problem and decreases support among individuals who deny it. Hart and Nisbet (2012) empirically prove the importance, as well as the complexity, of the role of spatial factors in climate communication. They demonstrate that spatial proximity not only elicits positive responses to mitigation policies; it can also lead to stronger cognitive and emotional defense reactions. This "boomerang effect" did not apply to test subjects who evaluated climate change as an important problem beforehand; for these respondents, geographical proximity reinforced their awareness of the issue.

Jensen (2017) uses "space" as one of four pillars of his theoretical model to analyze how people in Denmark make sense of climate change. A central finding on the space-related dimension is that "world geography enters into both narratives about the origins of climate change and arguments on potential solutions" (449). Audience perceptions of climate change develop in conjunction with definitions of their "space"—e.g. Denmark is perceived as "our little corner of the world" (441), a small country in contrast to a superpower like the United States. In consequence, the Danish participants feel a need to situate themselves in relation to actors in the news of the day, whereas American viewers in a comparable study rarely referred to their own place in world geography because they perceived their nation as the center of the world. Jensen also observed a "North/South" theme in group discussions, related to economic growth and the responsibility of developing countries to also fulfil CO<sub>2</sub> reduction targets.

## The Role of Personal Experiences of Weather and Nature

Ryghaug, Sorensen and Naess (2011) use focus group discussions to analyze how Norwegian audiences use weather to contextualize their knowledge about climate change. As one of five “sense-making devices” (784), “nature drama” is a typical interpretive schema that is inspired by and learned through media coverage: “Nature drama events were followed by deliberations with regard to the actual risks. In these exchanges, we noted frequent efforts to soften dramatic media accounts by participants who invoked their own experiences, often to weather” (785). Yet, also the personal experience of “nature drama” is highly interconnected with how media coverage frames the weather.

For Chinese audiences, who have on average a very high climate-change awareness, Wang (2017) found that media usage had no impact on risk perceptions. Instead, a positive correlation between self-reported unusual weather experiences and higher risk perceptions of climate change was found. Brulle, Carmichael, and Jenkins (2012) studied whether extreme weather phenomena in the US (NOAA Climate Extremes Index) shifted public opinion on climate change over a nine-year period (climate change threat index (CCTI)). They concluded that “weather extremes have no effect on aggregate public opinion” (169), but that “the extent of these changes has not reached a level where these shifts can be measured in nationwide polls at the aggregate level. This result may change over time if weather disruptions attributable to climate change increase” (Brulle, Carmichael, and Jenkins 2012: 178; see also Chapter 7, Attribution Science). Indeed, Zanocco et al. (2018) show in a real-life experimental setting that the greater the individual damage experienced in an extreme weather event, and the more this event is discussed in the respective community as attributable to climate change, the more it influences climate-change awareness.



## The Social Space: The Role of Group Identification and Othering

To determine how places are related to interpretations of climate change coverage, perceptions of physical appearances, as well as perceptions and interpretations of the social space (e.g. interpersonal networks like neighborhoods or sports clubs, and hyper-local public spheres like marketplaces or playgrounds) must be considered. Moreover, these social spaces have individual meanings for people, for example in processes both of othering (defining “in-groups” and “out-groups”) and identification.

Smith and Joffe (2013: 23) conducted semi-structured interviews with people from the UK, and demonstrate the functions of othering processes: “An ‘othering’ of the most serious impacts distances the threat by locating it ‘out there’”. The authors track this view of their UK audiences back to the iconography of mass media coverage, e.g., droughts in Africa, melting glaciers in the Himalaya, polar bears in the Arctic. These processes of othering are thus fostered by media coverage, which is focused on geographically distant places affected by climate change. By attributing climate change to other places of the world, the own “social space” is protected as “a safe place”. This outsourcing of the problem is consistent with an assumed vulnerability of others, while being unaffected personally. A similar function of othering is related to the attribution of responsibility: “The antinomy of self versus other plays a core role in everyday conceptualizations of global warming. At one level, the self is regarded as the solution, whereas the other is seen as the perpetrator” (Smith and Joffe 2013: 24).

In these studies, space and proximity are social rather than geographical concepts. Non-physical social spaces influence opinions about climate change and affect the way media coverage is received.

In addition to political affiliation as an instance of group belonging and social space, many other facets could be considered important to understanding the role of social spaces. For example, locality might influence communication flows among meso-structures like sports clubs, schools, choirs, church groups, weekly markets, etc., so these local communities might have an impact on the flow of interpersonal

communication, which is crucial to understanding climate communication: “Practices of actively searching for supplementary information, and of engaging in many-to-many communication online about the climate, appear negligible. Instead, one-to-one communication in everyday settings of face-to-face interaction about concrete choices with environmental implications is described as the predominant form of communicative engagement with climate change” (Jensen 2017: 451). How individuals are embedded in geographic and social spaces (e.g. family, sports clubs, colleagues, church groups, political parties, and affiliations like NGOs), and how this affects climate change communication, is a virtually unexplored topic. Othering has been proven to be important, but it remains unclear when (and how) people feel inspired by media coverage to think about their everyday environment as being affected by climate change—i.e. the opposite of othering (in the sense of “Climate change is a topic for us, not only a threat to others”). Table 4.1 summarizes the state of research on space as a dimension to explain the reception of climate change communication.

Table 4.1 Spatial aspects of media reception and effects studies on climate change

Authors	Analyzed Aspects/ Sub-Dimensions	Theoretical Background	Method
<i>(Attributed) spatial distance and/or proximity to climate change, experienced via media</i>			
Hart and Nisbet (2012)	<ul style="list-style-type: none"> <li>Spatial distance/proximity towards “climate victims”</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge deficit model</li> <li>Motivated reasoning</li> </ul>	Experimental design
O’Neill and Nicholson-Cole (2009)	<ul style="list-style-type: none"> <li>Spatial distance/proximity combined with “fear appeals”</li> </ul>	<ul style="list-style-type: none"> <li>Internal control mechanisms of fear (e.g. issue denial)</li> </ul>	Focus groups, Q-sorting, semi-structured interviews
Jensen (2017)	<ul style="list-style-type: none"> <li>Defining and comparing “here” versus “there”</li> </ul>	<ul style="list-style-type: none"> <li>Reception analysis</li> </ul>	Secondary data analysis with survey data, focus groups
<i>Personal nature and weather experiences as mediated frames</i>			

Ryghaug, Sorensen, and Naess (2011)	<ul style="list-style-type: none"> <li>Nature and weather as sense-making devices formed by media experiences</li> </ul>	<ul style="list-style-type: none"> <li>Domestication of knowledge</li> </ul>	Focus groups
Wang (2017)	<ul style="list-style-type: none"> <li>Self-attributed unusual weather experiences as consequence of media frames</li> </ul>	<ul style="list-style-type: none"> <li>Risk perception</li> </ul>	Online survey
Brulle, Carmichael, and Jenkins (2012)	<ul style="list-style-type: none"> <li>Extreme weather phenomena and their coverage</li> </ul>	<ul style="list-style-type: none"> <li>Information deficit model, agenda setting, elite cues, etc.</li> </ul>	Longitudinal study with a time-series analysis
<i>Social space—othering versus identification</i>			
Smith and Joffe (2013)	<ul style="list-style-type: none"> <li>“Othering” as mechanism to distance threats and responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>Social representation theory</li> </ul>	Semi-structured interviews
Hart and Nisbet (2012)	<ul style="list-style-type: none"> <li>Group affiliation (political partisanship)</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge deficit model</li> <li>Motivated reasoning</li> </ul>	Experimental design
Jensen (2017)	<ul style="list-style-type: none"> <li>Interpersonal communication as key to understanding climate communication</li> </ul>	<ul style="list-style-type: none"> <li>Reception analysis</li> </ul>	Secondary data analysis with survey data, focus groups

## Desiderata and Research Question

Even though the studies discussed above did not focus explicitly on the role of spatial aspects in mediated communication about climate change, such aspects appear as important cross-cutting or implicit themes in all cited publications. Current research on climate change communication thus demonstrates that spatial factors do have manifold impacts on how people interpret media coverage of the issue, how they make sense of it, and how media coverage affects their attitudes, knowledge, and behavioral intentions. However, these aspects are analyzed in an isolated, fragmented way or the results were primarily side effects of other research interests.

We seek a better understanding of the role of spatial aspects and how they come into play before, during or after the reception of climate change-related coverage. Our research question is: *What role do spatial factors play in the media reception of COP 21?*

Although this question also calls for comparative international approaches, we start by systematically varying spatial factors and compare an urban versus a rural social setting in the same country. Oriented towards a most similar systems design (MSSD) (Przeworski and Teune 1970), we expect to see how this difference shapes spatial aspects, namely (a) (attributed) spatial distance and/or proximity to climate change, (b) personal nature and weather experiences, and (c) social spaces shape media reception.

Thus, we compare a rather small city (Otterndorf, 7,202 inhabitants) in a rural area with a huge city in a metropolitan region (Hamburg, 1.8 million inhabitants), both of which are located in Northern Germany on the river Elbe and vulnerable to climate change (see below). Hamburg is much further down the river. Otterndorf, while also technically being located on the river, instead evokes the feeling of living right by the North Sea, just behind the dike. Coastal protection is also much less impressive than in Hamburg, with its complex constructions protecting the city against high tides and flooding.

We decided to take a deeper look at COPs as transnational media events (Brüggemann et al. 2017), because they raise media attention across national borders and, potentially, enable audiences to feel connected to each other as global citizens. Content analysis has proven that climate summits are main drivers of media attention to climate change worldwide (Schäfer, Ivanova, and Schmidt 2014). UN climate summits are a main point of reference in climate communication research; most studies focus on communicators on site such as journalists, politicians or NGOs (Lück, Wozniak, and Wessler 2016; Roosvall and Tegelberg 2013; Russell 2013), or on the media coverage (Lück, Wozniak, and Wessler 2016; Zamith, Pinto, and Villar 2013). Yet few studies have explored the audience perspective during climate summits (Wonneberger, Meijers and Schuck 2020). Our research (see also Brüggemann et al. 2017) was conducted during the COP 21 in Paris (2015), which is now seen as a key political event due to its role in renewing and extending the Kyoto Protocol by agreeing on the 1.5°C target (Hulme 2016). Therefore, COP 21 and its corresponding media coverage are not representative of climate summits in general.

Due to the role of COPs as drivers of worldwide media attention, we can make sure that during COP 21 the issue was covered by the media in both regions analyzed. However, the salience of the issue in

the individual media repertoires of participants in both places is an open question. The first sub-question thus addresses the patterns of information and news usage in both places:

- **Sub-Question (a). Patterns of Information:** How do people's media use and interpersonal communication about COP 21 differ in both locations?

As patterns of information and communication inform the interpretation and appropriation processes, they are important to consider as they provide contextual information for the interpretation of sub-question (b), which is our main research interest:

- **Sub-Question (b). Patterns of Interpretation:** How do people interpret media coverage of climate change with regard to spatial distance, the natural environment they live in and their social space?

Because local discourses are nourished by physical, interpersonal presence, they foster face-to-face communication (Mettler-Meibom 1992). As a cross-cutting theme, we focus on the role of direct personal communication as a bridge between media and local discourses on climate change.

## Method: Comparing Rural and City Residents

This section compares the two cases with respect to their geographic proximity to projected climate threats and selected conditions that shape the social space and are relevant to media reception and effects (especially the presence of local media). Next, their differences are outlined. The last part of this section describes the method of focus groups and media diaries, and presents the data sources analyzed in this chapter.

### Similarities between the Two Study Locations

Hamburg and Otterndorf are both strongly influenced and shaped by the North Sea and the River Elbe (see Fig. 4.1). While Otterndorf is situated directly on the coast at the extreme end of the Elbe estuary, Hamburg lies further upstream on the Elbe. At the position of Hamburg,

the tides and tidal range are still very strong. Both regions are therefore perceived as being potentially vulnerable to climate change effects, especially a higher frequency and potentially more severe impacts of storm surges due to the expected sea level rise (Meinke et al. 2010). The whole region has experienced grave floods in the past such as the North Sea flood of 1962, which has become part of the collective memory in the region (Trümper and Neverla 2013; NLWKN 2017a). The region has also been recently affected by severe storm surges. In November 2007, windstorm Tilo hit the German bight (St. Pauli/Hamburg: NN + 5,42 m; Cuxhaven/Otterndorf: NN + 4,44 m); in December 2013 it was Xaver (St. Pauli/Hamburg: NN + 6,09 m Bremerhaven/Otterndorf: NN + 4,99m).



Fig. 4.1 Locations of Hamburg and Otterndorf. © OpenStreetMap contributors, CC BY-SA.

Storm Xaver in 2013 produced “one of the most severe storm surges of the past hundred years”, raising the water level by three meters in some areas (NLWKN 2017b: author’s translation). The dike system, which is built along the entire North Sea coast, prevented injuries and major property damage in both study areas.

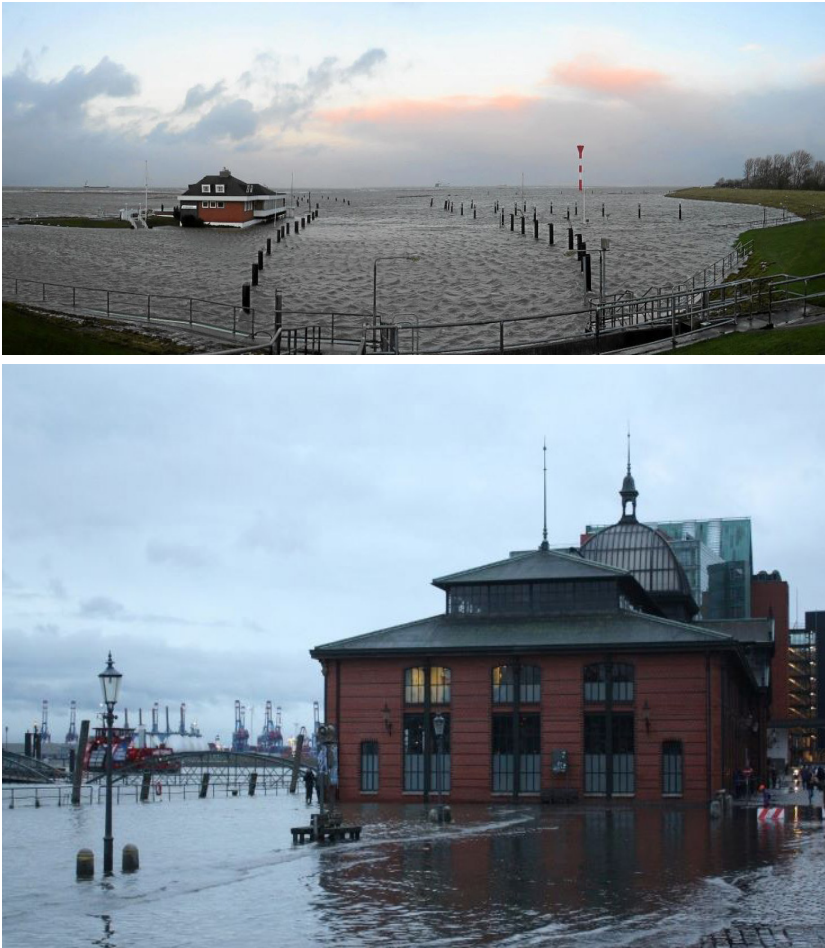


Fig. 4.2 Impact of storm surges. Above: Otterndorf at the beginning of the storm surge in 2013 (photo by Ekkehard Drath, CC-BY-NC). Below: Hamburg during a storm surge in 2016 (photo by Olle August, from Pixabay, <https://pixabay.com/photos/high-water-hamburg-port-motifs-3930235/>).

Otterndorf is directly exposed to the North Sea, and as part of the Wadden Sea Region (WSR) it is especially at risk from sea level rise (Gerkenmeier, Ratter, and Vollmer 2016). Coastal researchers have called for the development of an integrative risk management approach for the region.

Although Hamburg is less directly exposed to the North Sea, it would still be at risk during storm surges *without* its flood protection system; seventeen of its districts are officially categorized as risk areas. In the city's most dire risk scenario—an extreme storm surge combined with a collapse of the protection system—33,000 persons would be directly affected (Freie und Hansestadt Hamburg 2013).

In Germany, climate-change awareness of the public is quite high. Accordingly, we found in the quantitative survey data that both regions have a similarly high climate-change awareness, which does not differ from the average population in Germany (Brüggemann et al. 2017). While 55% of the country's population agrees that "global climate change is a very serious problem", fewer than 20% feel "very concerned it will personally harm them during their lifetime" (Stokes, Wike, and Carle 2015). A yearly telephone survey administered to approximately 500 Hamburg inhabitants from 2008 to 2018 has generated quantitative data about residents' risk perceptions and personal concerns about climate change (Ratter 2018). In contrast to the objective risk assessments discussed above, 40% of respondents do not believe they will be affected by any natural catastrophes such as storm flooding, heatwaves or heavy rainfall. The results even show a decline in risk perceptions for Hamburg from 2008 to 2011. However, no clear trend can be observed. Unfortunately, these data are not available for rural residents along the German North coast.

Ratter and Gee (2012) describe *Heimat* as a German concept of regional perception and identity. For the Wadden Sea Region, "Natural resources play a strong role in shaping people's perception of Heimat. Specific mentions included resources such as the Wadden Sea, beaches, the coastal landscape, nature on the coast, fresh air, as well as fish and seafood, all of which are used by the people living on the coast in many different ways" (131). As both locations are part of the Wadden Sea Region, one can assume that this description also applies to Hamburg and Otterndorf, although Hamburg is less exposed to the sea than Otterndorf.

In both locations, local print media play an important role. In Hamburg, the *Hamburger Abendblatt* has a large distribution; also, many hyperlocal (online) newspapers are published. In Otterndorf, the *Niederelbe Zeitung* has a lower circulation — due to the lower number of



residents — it is complemented by the weekly newspaper *Hadler Kurier*. Table 4.2 compares the two locations.

Table 4.2 Spatial aspects indicating similarities between Otterndorf and Hamburg

Indicator	Hamburg and Otterndorf	Source
<b>Exposure to climate change</b>	<ul style="list-style-type: none"> <li>• Strongly influenced and shaped by the North Sea and the River Elbe</li> <li>• Potentially vulnerable to climate change effects, especially a higher frequency and potentially more severe impact of storm surges due to the expected sea level rise</li> </ul>	(Meinke et al. 2010)
<b>Coastal protection</b>	<ul style="list-style-type: none"> <li>• Dike systems</li> </ul>	(Müller and Gönner 2016)
<b>Shared features of <i>Heimat</i> understandings</b>	<ul style="list-style-type: none"> <li>• Natural resources like water and fresh air are important, as well as food (fish) and the coastal landscape</li> </ul>	(Ratter and Gee 2012)
<b>Local media</b>	<ul style="list-style-type: none"> <li>• <i>Hamburger Abendblatt</i> (167,000 copies daily)</li> <li>• <i>Niederelbe Zeitung</i> (7,400 copies daily)</li> <li>• <i>Hadler Kurier</i> (25,800 copies per weekly issue)</li> </ul>	(Informationsgemeinschaft zur Feststellung der Verbreitung von Werbeträgern e.V. 2018)
<b>Public climate-change awareness (“climate of opinion”)</b>	<ul style="list-style-type: none"> <li>• Both regions are located in Germany—where climate awareness is quite high on average but people feel personally affected by climate change only to a lesser degree</li> </ul>	(Brüggemann et al. 2017; Stokes, Wike, and Carle 2015)

## Differences between the Two Locations

While Hamburg is Germany's second-largest city with a high population density and approximately 1,78 million residents (Statistisches Amt für Hamburg und Schleswig-Holstein 2019), Otterndorf is a small town in a rural area with 7,202 inhabitants (Landesamt für Statistik Niedersachsen 2017). Hamburg has a huge but less dense social network that makes it possible to stay isolated. Otterndorf is located in a rural area with a low population density (Stadt Otterndorf 2016).

In the literature it is assumed that in rural settings, "everyone knows everyone", and that social connections are closer than in the city: "[C]ompared to personal networks in urban settings, personal networks in rural settings contain ties of greater intensity and role multiplexity, are based more on kinship and neighborhood solidarities rather than on friendship, are smaller, are denser, and have greater educational, race-ethnic, and religious homogeneity, but less age and gender homogeneity" (Beggs, Haines, and Hurlbert 1996: 306).

Cities in general have a far more heterogeneous population than smaller communities, which can lead to the formation of sub-cultures and sub-networks in which traditional ties (e.g. relatives, neighbors) no longer play a role: "community, notably urbanism, also affects the social contexts from which people draw their relations, albeit far more weakly than social class, life cycle, and other personal traits" (Fischer 1982: 79-80).

Coastal protection plays an important role in climate change adaptation. Hamburg has a EUR 600 million flood protection system consisting of mechanical barriers and a central warning system (called KATWARN). Detailed risk maps define the dangers and protection measures for the neighborhoods close to the river (Müller and Gönner 2016). The system has been constructed with future upgrades in mind, required due to sea level rise (Freie und Hansestadt Hamburg 2012). Otterndorf, in contrast, has not recently renewed its protections, the most important of which is the dike. Some of its pumping stations and floodgates have been in use for decades (Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz) or even centuries (the Otterndorf floodgate was put into service in 1854 and last reworked in 1985, Kosch 2020).

Table 4.3: Spatial aspects indicating differences between Otterndorf and Hamburg

Indicator	Hamburg	Otterndorf	Source
<b>Social structure</b>	<ul style="list-style-type: none"> <li>• Approx. 1,78 million inhabitants</li> <li>• Mean age: 42.75 years</li> </ul>	<ul style="list-style-type: none"> <li>• Approx. 7,202 inhabitants</li> <li>• Mean age: 21–64 years (60 %)</li> </ul>	(Statistisches Amt für Hamburg und Schleswig-Holstein 2019; Stadt Otterndorf 2016)
<b>Assumptions regarding social networks</b>	<ul style="list-style-type: none"> <li>• High population density, “big city life”—huge, but less dense social network</li> </ul>	<ul style="list-style-type: none"> <li>• Low population density, rural area where “everyone knows everyone”—close(r) connections, dense networks</li> </ul>	(Beggs, Haines, and Hurlbert 1996; Fischer 1982)
<b>Status of coastal protection</b>	<ul style="list-style-type: none"> <li>• Mechanical flood protection system with capacities for further extensions</li> </ul>	<ul style="list-style-type: none"> <li>• Central mechanical barriers in need of renewal</li> </ul>	(Müller and Gönnert 2016)
<b>Financial situation of coastal protection measures</b>	<ul style="list-style-type: none"> <li>• High financial capacities for new protective measures</li> </ul>	<ul style="list-style-type: none"> <li>• No recent investments</li> </ul>	(Freie und Hansestadt Hamburg 2012)

## Method

This study is part of a larger research project at the Universität Hamburg called “Down to Earth”<sup>2</sup> (Brüggemann et al. 2017). It analyzes how the media coverage of COP 21 reached and affected citizens in Germany. The project combines three interconnected sub-studies with different methodological approaches: a quota-based online panel survey (n = 1,121) including three waves, digital communication diaries (n = 42), and four focus group interviews (n = 15). All sub-studies have a

2 The project was funded by the German Research Foundation’s “Integrated Climate System Analysis and Prediction” (CliSAP) Cluster of Excellence, Universität Hamburg. Further information can be found at <https://climatematters.blogs.uni-hamburg.de/down-to-earth/>

common interest in shedding light on media reception of climate politics. The qualitative parts of the project allow us a deeper understanding of how people make sense of COP 21, while the standardized survey allows to draw broader conclusions about public perceptions of climate policy in Germany. In this chapter, we concentrate on material from the focus groups and media diaries and contextualize the results with data obtained from the online survey.

**Focus group discussions:** We conducted four focus group discussions—two in Otterndorf ( $n = 9$ ) and two in Hamburg ( $n = 6$ )—during the final week of COP 21. The conference was on the media agenda, but the focus groups took place before the final press conference, so the outcome of the conference did not overshadow participants' memories of the entire coverage. Participants were aged 30 to 75. A “contrasting case selection” sampling strategy (Flick 2007) was used, which aims to vary the central aspect of theoretical interest so that alternative explanations can be found, and thereby helps to explore the research question as openly as possible. If spatial aspects play a central role in the reception of climate change communication, the results from both groups should vary, at least in parts.

On the basis of the literature analysis we assume that it is not only the physical space that effects how people interpret media coverage on climate change, but also the social aspects of space, for example a feeling of “*Heimat*” [belonging], the degree of connectedness to others, the set of experiences made at a certain place (e.g. floodings), etc. Thus, for the focus groups we varied the degree of connectedness people have to their living spaces. We were not able to realize pre-interviews to fully understand these aspects a priori. Instead, we focused on a more objective criterion, which is the length someone had lived at her/his current address. We grouped participants in each location in two homogenous groups, one with “long-term inhabitants” and one with “short-term inhabitants” (living less than six years in the current place). Additionally, a rough quota target for diversity regarding age (min: 30; max: 75), gender (5 w: 10 m) and professions (e.g., administration employee, electro technician, translator, pensioner, teacher) was implemented.

The collected data was analyzed via a qualitative content analysis (Schreier 2013), and categories were built inductively and deductively.

The initial classification mainly contains the two dimensions detailed in sub-research questions (a) patterns of information and communication and (b) patterns of interpretation.

**Communication diaries:** During the two weeks of COP 21, 42 participants from Hamburg and Otterndorf filled out digital communication diaries on a daily basis. In these online diaries, they noted their daily media use and face-to-face conversations about climate change. To encourage steady participation, the respondents received a financial incentive. The focus group participants were also part of the diary survey.

**Three-wave online panel survey (n = 1.121):** A three-wave online panel survey was administered throughout the event: the baseline measurement was conducted two weeks before COP 21, the main survey was carried out during the conference, and a final survey four weeks after.

## Results

This section interprets the findings of the focus groups and media diaries; the results of the online panel study are described to contextualize the statements of the participants. Quotes are translated, and participants' names are pseudonyms.

### Patterns of Information

During the conference, media diary participants reported each day whether they had noticed media coverage of the COP 21 or on climate change in general. Compared to the baseline study that covered the German population (results published in Brüggemann et al. 2017), the findings for the participants of the study in Hamburg and Otterndorf demonstrate that people received information about the climate conference through their usual media repertoires, and that the amount of information did not differ by location (see Table 4.4); participants from both places recalled an average of ten media contacts about COP 21. However, some of their regular sources did not seem to contribute news on the topic at all. For example, while private television news

is popular for rural participants, they hardly noticed climate change reporting there (on 0.3 days on average during COP 21).

Table 4.4 News reception in Hamburg and Otterndorf during COP 21

Medium	Hamburg M (SD)	Otterndorf M (SD)
<i>"Do you remember one or more news items on climate change today?"</i> (summative index from 0 to 13 days)		
News and information on public television (incl. online)	2.5 (2.7)	2.7 (1.8)
News and information on private television (incl. online)	0.1 (0.3)	0.3 (0.8)
News and information on radio (incl. online)	2.0 (2.6)	1.4 (2.0)
Printed national newspaper	0.4 (1.2)	0.1 (0.3)
Printed weekly magazine	0.2 (0.5)	0.0 (0.0)
<b>Printed local newspaper*</b>	<b>1.0 (1.6)</b>	<b>2.5 (2.1)</b>
<i>Bild-Zeitung</i> (tabloid press)	0.0 (0.0)	0.0 (0.0)
Online newspaper	2.7 (2.8)	2.5 (2.4)
Online portal (like google news)	0.6 (1.1)	0.1 (0.3)
Social networks	0.2 (0.5)	0.4 (1.4)
Blogs and online discussions	0.3 (1.0)	0.0 (0.0)
Video platforms	0.1 (0.3)	0.0 (0.0)
Total number of news contacts (on average)	10.10	10.00

Note: n = 13 for Otterndorf; n = 29 for Hamburg; summative index: added the answer (yes = 1; no = 0) for the entire enquiry period (30 November—12 December 2015). Significant differences between Hamburg and Otterndorf are printed in bold, \*p ≤ .05.

Respondents in both places received information from public television and online newspapers most often (on average on almost three out of thirteen days, see Table 4.4), followed by radio (De Silva-Schmidt and Brüggemann 2019). Individual variances between respondents were high in both locations. Some respondents only mentioned two or three different sources of media information during the entire enquiry period (mostly a print newspaper and public radio or TV). Others named a

variety of online sources such as TEDTalks on Youtube, science blogs, and media websites, while using traditional media at the same time.

This wide variance in our sample also explains the high standard deviation for most items and might be a reason why there is only one significant difference: the use of local print newspapers. About two-thirds of respondents (both younger and older) read local papers at least sometimes. While Hamburg residents read information on climate politics in their local news on only one day during the entire study period, Otterndorf participants noted an average of two-and-a-half days. Interestingly, none of the participants who recently moved to Otterndorf or Hamburg read a local newspaper, suggesting that exposure to local news is connected to how long a person has lived in their current area. As we show below, this is also likely to lead to a less localized perception of climate change.

During the climate summit, residents from Hamburg and Otterndorf also mentioned a lot of interpersonal communication in their media diaries.

Table 4.5 Interpersonal communication during COP 21

Medium	Hamburg M (SD)	Otterndorf M (SD)
<i>"Do you remember talking about climate change today?"</i>		
... with family and friends	1.2 (1.5)	2.2 (2.5)
... with colleagues and acquaintances	0.4 (0.6)	0.7 (1.1)

Note: n = 13 for Otterndorf; n = 29 for Hamburg; summative index: added the answer (yes = 1; no = 0) for the entire enquiry period (30 November—12 December 2015). Index scales ranges from min = 0 days to max = 13 days. There are no significant differences between groups.

In both places, there were many "non-talkers"—sixteen in total, which again explains the high standard deviation and is possibly a reason why there was no significance in the t-test. However, of those who did talk about climate change during the COP 21, regional differences are notable.

First, the *number of conversations* about climate change differs. Respondents from Otterndorf (n = 13) noted 47 individual conversations (3.6 per person) about climate change during the enquiry period, which

is over one-and-a-half times more conversations per person than the participants from Hamburg ( $n = 29$ , talks: 59). Otterndorf residents not only talked more often about climate change, but they also had more diverse interlocutors, conversing with family and friends as well as acquaintances and colleagues about the topic

Second, the *topic of the conversations* varied. Participants in Hamburg talked more about the climate conference, about technological measures to prevent climate change (“*carbon capture and storage*”, Niklas, twenty-eight years old), and about the endangering effects on nature in general, such as the extinction of vulnerable species. The group discussions revealed that Hamburg participants discussed climate change more often in the context of their professions (e.g. in the energy sector) or lifestyle choices (e.g. with their flat-sharing community). In contrast, respondents in Otterndorf talked more often about the negative effects of climate change on their living environment (i.e. high tides, floods and heavy rains, also having other consequences such as climate refugees) and local adaptation measures. Many of them discussed their personal responsibility. Helge, a sixty-two-year-old long-term resident of Otterndorf, declared: “We need to start with our own consumption behavior. If everyone does it, we are many”.

For the Otterndorf participants, interpersonal communication also served the purpose of sharing and trading knowledge, especially on local issues such as dike protection and storm surges. Max, 31 years old, recently moved to Otterndorf, said: “I heard our colleague [...] speak. And he said that [...] behind the dike not everything is as safe as we all believe. I don’t know what area he referred to”. Florian, thirty-three years old, recently moved to Otterndorf, replied: “Altenbruch? [a neighboring village]”. Max: “Yes, he said it’s just a matter of time before it [the dike] collapses”.

With reference to the section on differences between the two regions, Max’s assumption fits with the objective data about Otterndorf’s vulnerability and the quality of the dikes, some of which are obsolete and in need of renewal. This example demonstrates that in Otterndorf, interpersonal communication serves as an important medium to ask for, spread and negotiate information on local issues such as dike quality and climate change adaptation. It thus compensates for a perceived lack of reporting from local journalism. The participants asserted that this



is an urgent issue not covered in local newspapers or radio stations. Manuel, forty-one, who has lived in Otterndorf for six years, reported: "I have been asking myself in the last few days how the quality of the dike actually is, and the opinions differ very much on how good the dike here in Otterndorf is at all. [...] There are also voices that claim that the dikes here are not that good".

Elderly Otterndorf participants assumed that dike protection and storm surges were not of interest to younger people. According to Anton, a sixty-four-year-old long-term resident:

Yes, I think for the older generation in particular it is even more [a topic] than for the younger generation. Because [the older generation] saw that from childhood on, what the storm surges were like, or what it means to have floods. Or if the dikes start breaking, we'll have seen it all here. [...] One has enormous fears, yes. Young people haven't even experienced it: "Oh, the dike is safe". They don't care at all.

Indeed, in the second group with younger participants, Otterndorf respondents assessed that climate change was irrelevant. Florian, thirty-three years old, recently moved to Otterndorf, assumed: "Yes, maybe we will have a higher sea level. But we have great dikes, so to me this discussion is not relevant".

Hamburg participants also mentioned that climate change in general is not salient enough for private conversations. Participants from both locations reported that climate change is not an issue in their circle of friends and colleagues. Dirk, sixty-two years old, reported: "I notice that in my personal discussion, with friends or colleagues, it [the refugee crisis, high numbers of refugees coming to Germany due to the war in Syria in 2015] plays a greater role than climate".

The participants also assume that climate change does not bring enough news value for private conversations. Dirk explains: "In my circle of friends, a real debate about the topic is not possible because the problem is universally known", and Stefanie (thirty-eight, Hamburg) added "We have more serious problems at the moment here, for Hamburg the application for the Olympic Games". Anton (sixty-four, Otterndorf) stated similarly: "...because you just don't feel the immediate threat, right? That is, I think, how many people think. It's just hard to keep thinking about future generations".

## Patterns of Interpretation

The first part of this section discusses the common patterns of interpretation in both locations. When asked about their perception of news on COP 21, the following patterns are characteristic of the reception and interpretation: a perceived neglect of the issue in media coverage, complexity, abstractness, and single key moments of being overwhelmed and having obtained new insights.

### *Weak Saliency of the Issue in Broadcasting Media—Disappointment with Local News*

From a scholarly perspective, it is often assumed that climate change is a tough topic for journalism because it does not interest broad audiences (see, e.g., Jensen 2017). Yet, we find that the respondents complained about *too little* media coverage of climate change on TV and radio. Participants from both locations criticized journalistic coverage for providing too short and superficial news items—a complaint that is widely confirmed by the country-wide survey ( $n = 1,121$ ) (De Silva Schmidt and Brüggemann 2019; Brüggemann et al. 2017). For example, 84% stated that the media did not report enough on the COP 21 negotiations, 85% agreed that the media did not report appropriately on political parties' conflicts and strategies, and 82% accused the media of reporting insufficiently on climate change in general. Margret (sixty-two, Otterndorf) complained about “insufficient coverage in public service broadcasting”, and Sandra (forty-five, Hamburg) noted “far too few pieces of information”. The opposite was true for national daily newspapers. Fewer participants read them, but those who did reported that they provide much-appreciated detailed insights (e.g., Margret: “The article was really captivating and well-written”), although others mentioned not having enough time to read them properly: “Unfortunately, I only had time to skim through” (Luisa, twenty-six, Hamburg).

The local print media, however, were rated extremely poorly, especially by the long-term residents—e.g. by Anton, sixty-four, long-term resident in Otterndorf: “I think it is so important, that the local newspapers in particular, that they regularly supply their readers with what happens there [at the COP 21 conference]—but this just wasn't

the case!”). Both groups assessed their local newspaper as biased and negative, using the sparse coverage of COP 21 as an example. Participants worried about other people in their city or region who use the local newspaper as their single source of information, supposedly elderly people (“I worry about people who do not have the opportunity to read online news”, Anton, Otterndorf). Economic interests of the publisher were held responsible for the poor performance of the local Hamburg newspaper. Elisabeth, sixty-two, and a long-term resident of Hamburg, criticized: “In our obedient and submissive local newspaper there was nothing on COP 21. In comparison to e.g. *Süddeutsche Zeitung*, our local newspaper in Hamburg is a provincial newspaper”. Here, the spatial reference (“provincial”) was used to negatively connote the failure of local newspapers to convey the local angle of climate change. They do not connect what happened at COP 21 in Paris to Hamburg, but more importantly they do not connect the elite discourse on climate change to local discourses, and thereby fail to create a social space of communication.

In summary, our first result is that participants would have liked to receive more information on climate change and COP 21. This finding is confirmed by the survey data and is thus a general pattern of reception of COP 21 in Germany (Brüggemann et al. 2017), and not limited to the cases of Otterndorf and Hamburg. Especially regarding their local newspapers, many respondents were disappointed about the low salience of the issue in their own local media outlet and the perceived failure to connect the issue to local discourses.

#### *Complexity and Abstractness— Climate Change and the COP as Distant Issues*

One reason for the complaints about too little information on COP 21 in media coverage could be rooted in the perceived high level of complexity of the issue. Local audiences were unable to make sense of the multiple facets of climate change and of climate politics. Respondents referred to the complex terminology used in media coverage, and describe it as hard to understand and to translate into their everyday language (Anton: “Very, very complex issue, I had to learn a lot in order to be able to pursue the discussion. And the terminology, 2 °C target and the like”).

Moreover, they criticized cumbersome and long-winded printed news articles, which are not understandable and readable within a normal amount of time. “Abstractness” is a related concept, but it comes with the feeling of not being able to grasp the meaning of climate change for one’s own daily life.

Participants described the COP 21 as far away from their everyday life reality (Anton, sixty-four, Otterndorf; “These climate summits are relatively far away. We need a concrete example on the ground to make sense of climate change. So, for us, this would be the dike”). This statement demonstrates that the perceived distance from the event in Paris has a cognitive, emotional and social dimension. Instead of receiving “abstract” information, participants would have liked to learn about the consequences climate change has for their local environment. In addition, Hannah (forty-three, Hamburg) reported: “In my circle of friends, I feel there is a big distance from the topic”. Here, the spatial metaphor is also employed to describe the basic feelings and cognitions about climate change. Distance may refer less to geographic distance and more to the perceived disconnect between climate change and one’s personal life within its social and physical space.

*Being Overwhelmed and Affected by Media Coverage—  
Moments of Connection*

Although the participants described a fundamental sense of distance, touching moments of very personal connection were reported as well—when the media coverage opens up a social space of genuine encounter. A sense of “being overwhelmed” is very salient in our focus group data. Also, participants of the group discussions felt touched by the coverage on rare occasions—not as a persistent feeling, but in extraordinary moments.

Triggers can be media persona (fictional and non-fictional characters) who are perceived to be socially close and directly affected by climate change in the near future, e.g. Barbara (sixty-two, Otterndorf) said “What touches me the most is if people tell how they are affected by climate change, e.g. a farmer who said that he will be able to farm another two years but after that his land will be washed away”. These can also be people who act as a personification of powerful values, here

in the form of Native Americans: “When Indians appear in their outfits and demand (a change) from industrialized countries” (Barbara), who are perceived as ambassadors bridging various forms of cognitive and emotional distance.

The “happy ending” of the COP in Paris was much reported in the media diaries and perceived as a touching moment: “Everyone waited all day long for the result and talked about how it would be. Then when the news of the signing came, that was great” (Margret, sixty-two, Otterndorf). Others felt “joy and hope after the conference” (Birgit, fifty-three, Hamburg) as well as relief: “Which I did not dare to hope... after twenty-three years finally a working approach, unfortunately still (with) many compromises and perhaps also too late” (Susanne, forty-nine, Hamburg). Here, another reason for the described distance from the issue came to the surface: due to many failed previous conferences, and an inability at the policy level to reach progress, the topic was considered too frustrating. Distance thus also serves as a mechanism of “self-protection” from bad news, such that the “good news” encouraged people to re-connect.

The dimension “getting new insights” includes a positive experience as well: learning new facts during COP 21—even ones that question ones’ own beliefs—was evaluated as positive. Dirk (sixty-two, Hamburg) reported:

I have already learned a lot during the COP, especially about the interests of individual states. So, for example [...] this smog situation in Beijing, then you (thought before) “Oh God, thank God it’s not like that here”, but what I did not know is that China, for example, does a lot for climate protection, which does not yet have the addressed effects, but they are very active there.

Climate reporting was positively assessed if it facilitated insights into geographically and socially distant countries to which the respondents otherwise had no access.

### *“We are Vulnerable” versus “We are a Leading Industrial Nation”*

A main finding with respect to the relevance of spatial aspects for reception and interpretation is that long-term residents were more likely to link COP 21 coverage to their region or city.

Moderator: "Did you think about Otterndorf while you watched coverage of the climate summit?" Anton, sixty-four: "Yes, yes, yes. It is a huge topic for us". Klaus, sixty-eight, long-term resident in Otterndorf, immediately added "I have a dinghy in my garden!"

However, this connection is sometimes, again, followed by mechanisms of suppression.

Anton: "You have to care for yourself to not get depressed. Otherwise you cannot live with that fear", and Martin, forty-six, agreed: "There's always a certain fear, that's for sure. And we assume it [the dike] will hold. Otherwise we would not make any new developments in this area, we would not have built us a house".

For long-term Otterndorf residents, fear and serious concerns about their area seemed to be enormous, yet rather hidden, as an everyday life issue. Klaus, sixty-eight, long-term resident of Otterndorf:

Yes, climate change is a fast-moving issue, especially if you consider the connection to infrastructural projects like Elbe dredging [with consequences for the height of storm surges], that is also a huge topic for us here. It's all connected. And that's why we all should walk around here every day complaining [about our situation]. But at some point you get depressed. [Agreement from the entire group.] If you can't do anything and still have the danger on the back of your neck.

The Otterndorfers described themselves as affected by huge infrastructure projects such as dredging to deepen the Elbe, to support Hamburg's huge harbor industry. This economically motivated infrastructure project places an additional strain on the dike system, on top of climate change. The participants reported that the dredging has already made floods and storm tides more destructive.

For the long-term Hamburg residents, the harbor and its responsibility for climate change (e.g., emissions of cruise liners) were the main reference point in responding to the question if Hamburg would be directly affected by climate politics. Elisabeth, sixty-two, stated that "economy and jobs in Hamburg are reasons put forward, especially cruise liners as most dirty polluters like Queen Mary". Local media coverage is evaluated as extremely unsatisfying and disappointing by the long-term residents of Hamburg, due to a perceived lack of coverage of the manifold meanings of climate change for the city. They especially miss a particularly critical investigation: "There was once a report, that

is really long ago, and it was about the 'Hafencity' [the newly built harbor district], because of the air pollution the Hafencity performed so poorly!" (Elisabeth, sixty-two). Some new residents of Hamburg assume that the media's lack of localizing COP issues for the city indicates that climate change is not a risk for Hamburg and that there is no reason to worry. Karl (forty, Hamburg): "There is no relevance for Hamburg, otherwise the media would have had reported on that".

Many participants, both from Otterndorf and Hamburg, viewed the aim of COP 21 as engaging "other countries" in climate policy, assuming that Germany already had a pioneering role.

Max, thirty-one, newly moved to Otterndorf: "Germany already has a leading position in climate protection; COP 21 is more about engaging other countries".

They attribute responsibility for climate change to other nations' governments and declare that Germany is a leading industry and technology nation that cannot be affected by climate change. Othering was applied to qualify their country's responsibility against those of others; moreover, Germany is seen as completely untouched by the effects of climate change due to technical fixes. Max asserts:

Here in Germany, we are lucky. Because we have great dikes, the coverage on COP 21 and its effects on Otterndorf are irrelevant to me. Even if a dike breaks down, we'll build a new one. So, we are lucky in Germany. They can't do that on those small islands in the Pacific. So, there the sea level rises, and then they go down.

Similarly, Karl, forty, a new inhabitant of Hamburg, stated: "I do not see a link between COP 21 and Hamburg. Consequences of climate change happen elsewhere. Even if the River Elbe rises about a metre, so what? We can handle that. In other countries, the situation is much more severe. Droughts, lack of water. One storm more or less, we will survive". This statement shows how he creates a perceived distance between his home environment and "other countries", "elsewhere", which can be seen as a case of othering.

The study participants exhibit the same pattern of thinking as in the panel survey: There has to be more engagement on climate protection, but someone else, somewhere else (other countries, the politicians) should act (Brüggemann et al. 2017). However, it is striking that people who have lived in the same place for a long time—in both locations—think

and talk much more about their personal responsibility and that of their community than those who recently moved to their area. “There are a lot of grassroot initiatives in this region, and they organize, for example, local country markets to sell products from local farms”. Klaus, sixty-eight: “Yes, but that is not the majority. These initiatives are noticed by a minority only”. Margret, sixty-two, Otterndorf added: “Indeed, these initiatives are not our typical everyday life—that is our supermarket”.

### References to the Physical Environment— Similar but Different

The most prominent climate change concern for all respondents is flooding and dike protection. For Hamburg, the harbor is an equally important point of reference. Residents of Hamburg and Otterndorf differ in the extent to which they are personally concerned about potential climate-change impacts. Respondents from Hamburg seem to feel that climate change is unlikely to concern them personally, or only in an abstract way since it might affect humanity as a whole. One participant (Karl, forty, short-term resident) reported: ‘I didn’t see a direct connection to Hamburg [...] because the really painful effects will take place somewhere else. So, even if the Elbe rises a meter, that’s still all doable’. Although Hamburg is potentially vulnerable to flooding, participants from the city did not believe they were likely to be personally affected by storm surges or other climate change effects. Even though “land submerged in the North” (Annette, forty-five, short-term resident) is a tangible consequence of climate change for them—it will not affect them personally. According to sixty-two-year-old Elisabeth, a long-term resident: “That Wilhelmsburg [suburb of Hamburg heavily affected by the 1962 storm surge] is flooded again, that can’t happen to us today. So, I had the feeling, yes, we can sit back and relax now, and we are also warned in time [...] to drive away our car”.

Hamburg residents perceive the effects of climate change and sea level rise at an emotional distance (which some respondents refer to as “suppression” of the disturbing knowledge); problems only seem to exist elsewhere, e.g. “in Africa” (Birgit, fifty-three, long-term resident). Yet, for respondents from Otterndorf, high tides in the Elbe and floods are dangers that are easy to grasp and represent a direct



threat to their physical environment. Thus, a major difference is that Hamburg participants feel much less threatened by climate change than Otterndorf participants, who are located much closer to the North Sea and have several weak points in their dike systems.

Although the participants from Otterndorf also mention serious consequences for faraway regions such as the Fiji Islands, they paint a much clearer picture of how climate change might affect their hometown. They talk about past experiences of “high tides in the Elbe” (Margret, sixty-two, long-term resident), and future “storm flooding warnings for our coastal region”, and even think about the possibility of losing their home in the future: “in case of a sea level rise, there might be a wave of refugees coming from the North Sea region” (both quotes by Anton, sixty-four, long-term resident in Otterndorf). They also specifically refer to themselves: “We talked about how climate change is connected to our town, what we can do, what has already changed. We just became aware that this topic also concerns us” (Margret, sixty, long-term resident).

## Conclusion

The study compared media reception and sense-making of news on climate change in a big city versus a small rural town located directly on the coast. As Hamburg and Otterndorf are located close to each other in Northern Germany, it is not surprising that common patterns of both media use and interpretations of climate change emerge. Yet, we found that spatial factors play an important role in both (a) how news about climate change and policy making are received, and (b) how people engage and make sense of it.

**Sub-Question (a):** The findings demonstrate that people received information about the climate conference COP 21 through their usual media repertoires, as the quantitative survey data and media diaries show. However, many regular media sources provided little information about the event and the issue. By testing group differences statistically, it turns out that the amount of information received did not differ by location, so that differences in perception and interpretation of both groups (sub-question b) cannot have been influenced hereby. Many of the regular sources—such as private television news—did not seem to contribute news on the topic at all. Rural residents

(Otterndorf) significantly accessed more local sources of news (i.e., local newspapers), as demonstrated by the survey data and media diaries. They are engaged with the issue more closely by talking more about climate change, and they connect climate change more to their direct living environment. Interpersonal communication plays a more important role in the rural setting: personal conversations serve to pass on knowledge about vulnerable aspects of the area, especially between new and old residents. It is reasonable to assume that living right next to a dike in a rural setting with more first-hand experience of weather phenomena makes the issue of climate change more salient.

**Sub-Question (b):** We found common patterns related to sense-making of news on COP 21. Spatial references abound among both groups of participants. A perceived weak salience of the issue in mass media coverage is echoed by the perception of a weak salience in personal discussions. The study participants are disappointed by the perceived failure of local media to account for the importance of the negotiations in Paris for their region. Climate change and climate policy are perceived as complex and abstract and the media are blamed for not explaining them well. Thus, local publics experienced the issue of climate change and the COP 21 negotiations as distant events. Yet, media personas and some iconic personal stories, even if being from other parts of the world, are able to bridge the perceived social and geographical distance and establish an emotional connection with climate change and policy making.

These differences in information pathways go hand in hand with different interpretations of climate change. Residents from the rural setting and from the city experience the spatial distance to climate change slightly differently. Many of the spatial aspects identified in previous studies in the literature could also be found in our data. Although climate change is an abstract and “far-away” concept for all of our respondents, personal concerns were more prominent in the rural setting and connected to a feeling of potentially being personally affected. For participants from Otterndorf, climate change was more relevant to one’s personal life and fears. Respondents from Hamburg felt less personally concerned and saw themselves less as potential victims but (partly) as responsible for causing climate change. These different feelings are connected to different nature and weather experiences,

and the variation in the strength of dikes and protection systems in both places leads to different risk perceptions of the inhabitants. Some participants domesticated climate change in interpersonal discussions by referring to the current weather or the natural environment.

An important finding is that the differences presented were more salient for the long-term residents in our sample. People who are more rooted in the area they live in seem to perceive climate change as more severe. Local newspapers are mainly used by those who have lived in an area for longer, and connections between climate change and one's own living environment were mostly drawn by long-term residents. It seems that the longer a person lives in a place and the more connected he or she feels to it, the more relevant spatial factors become for his or her experience of climate change. The time spent living in one place, and the extent of being rooted in that space, seems to be an important variable that mediates the influence of space.

This mediating factor emerging from our study has important implications in a world that has become increasingly mobile and less rooted in physical space: the more people move around, the less they will access local media, and the less they will know about (or be interested in) their local area and how climate change might affect it. They might be more inclined to view climate change as a distant issue that has no implications for one's personal life. If the local media, for those long-term residents who use them, are also failing to draw the connection between global warming and local development, this might constitute a barrier to initiate and promote adaptation and mitigation processes on the local level—but this would have to be tested by future research.

Talks about climate change also reflect the economic inequality between the city, that is better shielded against floods and the (perceived) neglect of dikes in the rural area. Climate change may deepen the (perceived) inequality between wealthy and important cities and the far less privileged countryside. Local media fail in the perception of our interviewees to critically discuss these problems. The failure of local media is partly compensated through face-to-face discussions, particularly among long-term inhabitants who seem to be more inclined to draw the link between global policy-making at COP 21 and local politics.

## References

- Agnew, John. 2005. 'Space: Place', in *Spaces of Geographical Thought: Deconstructing Human Geography's Binaries*, Society and Space Series, ed. by Paul Cloke and Ron Johnston (London: SAGE Publications Ltd), pp. 81–96, <https://doi.org/10.4135/9781446216293.n5>
- Amundsen, Helene. 2015. "Place Attachment as a Driver of Adaptation in Coastal Communities in Northern Norway", *Local Environment*, 20.3: 257–76, <https://doi.org/10.1080/13549839.2013.838751>
- Arlt, Dorothee, Imke Hoppe, and Jens Wolling. 2011. "Climate Change and Media Usage: Effects on Problem Awareness and Behavioural Intentions", *International Communication Gazette*, 73.1-2: 45–63.
- Autischer, Alfred, and Ursula Maier-Rabler. 2017. "Kommunikationsatlanten als Konzept für eine raumbezogene Kommunikationsforschung", *MedienJournal*, 9.2: 27–32, <https://doi.org/10.24989/medienjournal.v9i2.1251>
- Beggs, John J., Valerie A. Haines, and Jeanne S. Hurlbert. 1996. "Revisiting the Rural-Urban Contrast: Personal Networks in Nonmetropolitan and Metropolitan Settings", *Rural Sociology*, 61.2: 306–25, <https://doi.org/10.1111/j.1549-0831.1996.tb00622.x>
- Brüggemann, Michael, Fenja De Silva-Schmidt, Imke Hoppe, and Josephine B. Schmitt. 2017. "The Appeasement Effect of a United Nations Climate Summit on the German Public", *Nature Climate Change*, 7.11: 783–87, <https://doi.org/10.1038/nclimate3409>
- Brulle, Robert J., Jason Carmichael, and J. Craig Jenkins. 2012. "Shifting Public Opinion on Climate Change: An Empirical Assessment of Factors Influencing Concern over Climate Change in the U.S., 2002–2010", *Climatic Change*, 114: 169–88, <https://doi.org/10.1007/s10584-012-0403-y>
- Couldry, Nick, and Anna McCarthy. 2004. *MediaSpace: Place, Scale and Culture in a Media Age* (London, New York: Routledge), <https://doi.org/10.4324/9780203010228>
- De Silva-Schmidt, Fenja, and Michael Brüggemann. 2019. 'Klimapolitik in den Medien—das Publikum erwartet mehr.: Befunde einer Befragung zu den UN-Klimagipfeln 2015 und 2018', *Media Perspektiven*, 50.3: 107–13.
- Fischer, Claude S. 1982. *To Dwell Among Friends: Personal Networks in Town and City*, 4th edn (Chicago: University of Chicago Press)
- Flick, Uwe (ed.). 2007. *Designing Qualitative Research* (London: Sage Publications, Ltd), <https://doi.org/10.4135/9781849208826>
- Freie und Hansestadt Hamburg. 2012. *Sturmflutschutz in Hamburg gestern – heute – morgen*, 10th edn (Hamburg: LSBG) <https://www.hamburg.de/pressearchiv-fhh/3286334/2012-02-09-bsu-sturmflutschutz/>

- . 2013. *Umsetzung der Hochwasserrisikomanagementrichtlinie in Hamburg: Information der Öffentlichkeit gemäß § 79 Wasserhaushaltsgesetz (WHG) über die Umsetzung der Hochwasserrisikomanagementrichtlinie (Richtlinie 2007/60/EG) in der Flussgebietsgemeinschaft Elbe (Hamburg)* <https://www.hamburg.de/contentblob/4146070/dd0201b68660a4025a0feed391020096/data/download-begleittext.pdf>
- Gerkenmeier, Birgit, Beate Ratter, and Manfred Vollmer. 2016. "Trilateral (Flood) Risk Management in the Wadden Sea Region", in *ENHANCE. Novel Multi-Sector Partnerships in Disaster Risk Management*, ed. by Jeroen Aerts and Jaroslav Mysiak (Brussels: European Commission), pp. 210–31, <https://www.technopolis-group.com/wp-content/uploads/2020/04/Enhance-Layout-WEB-low.pdf>
- Glasze, Georg, and Annika Mattissek. 2012. *Handbuch Diskurs und Raum: Theorien und Methoden für die Humangeographie sowie die sozial- und kulturwissenschaftliche Raumforschung*, 2nd edn (Bielefeld: Transcript).
- Hart, Philip S., and Eric C. Nisbet. 2012. "Boomerang Effects in Science Communication: How Motivated Reasoning and Identity Cues Amplify Opinion Polarization About Climate Mitigation Policies", *Communication Research*, 39.6: 701–23, <https://doi.org/10.1177/0093650211416646>
- Hulme, Mike, and Martin Mahony. 2010. "Climate Change: What Do We Know about the IPCC?", *Progress in Physical Geography: Earth and Environment*, 34.5: 705–18, <https://doi.org/10.1177/0309133310373719>
- Hulme, Mike. 2015. "Climate and its Changes: A Cultural Appraisal", *Geo: Geography and Environment*, 2.1: 1–11, <https://doi.org/10.1002/geo2.5>
- . 2016. "1.5 °C and Climate Research after the Paris Agreement", *Nature Climate Change*, 6: 222–24, <https://doi.org/10.1038/nclimate2939>
- Informationsgemeinschaft zur Feststellung der Verbreitung von Werbeträgern e.V. 2018. "Quartalsauflagen ab 2016", <https://www.ivw.de/aw/print/qa>
- Jensen, Klaus B. 2017. "Speaking of the Weather: Cross-Media Communication and Climate Change", *Convergence*, 23.4: 439–54.
- Kleinsteuber, Hans J., and Torsten Rossmann. 1994. *Europa als Kommunikationsraum: Akteure, Strukturen und Konfliktpotentiale in der europäischen Medienpolitik* (Opladen: Westdeutscher Verlag).
- Kosch, Andreas. 2020. "Hadelnder Kanalschleuse Otterndorf", [https://www.nlwkn.niedersachsen.de/hochwasser\\_kuestenschutz/landeseigene\\_anlagen/schleusen/schleuse\\_otterndorf/kanalschleuse-otterndorf-41074.html](https://www.nlwkn.niedersachsen.de/hochwasser_kuestenschutz/landeseigene_anlagen/schleusen/schleuse_otterndorf/kanalschleuse-otterndorf-41074.html)
- Landesamt für Statistik Niedersachsen. 2017. "Bevölkerung und Katasterfläche in Niedersachsen", <https://www.statistik.niedersachsen.de/themenbereiche/bevoelkerung/themenbereich-bevoelkerung---tabellen-87673.html>

- Lee, Tien M., Ezra M. Markowitz, Peter D. Howe, Chia-Ying Ko, and Anthony A. Leiserowitz. 2015. "Predictors of Public Climate-change awareness and Risk Perception around the World", *Nature Climate Change*, 5.11: 1014–20, <https://doi.org/10.1038/nclimate2728>
- Lück, Julia, Antal Wozniak, and Hartmut Wessler. 2016. "Networks of Coproduction: How Journalists and Environmental NGOs Create Common Interpretations of the UN Climate Change Conferences", *The International Journal of Press/Politics*, 21.1: 25–47, <https://doi.org/10.1177/1940161215612204>
- Maier-Rabler, Ursula. 1992. "In Sense of Space: Überlegungen zur Operationalisierung des Raumbegriffs für die Kommunikationswissenschaft", in *Zeit, Raum, Kommunikation*, ed. by W. Hömberg and M. Schmolke (Munich: Ölschläger), pp. 357–70.
- Manzo, Lynne C., and Patrick Devine-Wright (eds). 2014. *Place Attachment: Advances in Theory, Methods and Applications* (London: Routledge).
- Meinke, I., et al. 2010. "Klimawandel in Norddeutschland: Bisherige Änderungen und mögliche Entwicklungen in Zukunft", in *Kalte Zeiten-Warme Zeiten: Klimawandel(n) in Norddeutschland*, ed. by mamoun Fansa and Carsten Ritzau, pp. 56–59.
- Mettler-Meibom, Barbara. 1992. "Raum – Kommunikation – Infrastrukturentwicklung aus kommunikationsökologischer Perspektive", in *Zeit, Raum, Kommunikation*, ed. by W. Hömberg and M. Schmolke (Munich: Ölschläger), pp. 387–401.
- Müller, Jan-Moritz, and Gabriele Gönnert. 2016. *Entwicklung der Hochwasserschutzanlagen in Hamburg* (Hamburg: LSBG), [https://www.klimacampus-hamburg.de/fileadmin/user\\_upload/klimacampus-aktiv/160420\\_Sturmfluttagung/MuellerGoennert\\_Hochwasserschutzanlagen.pdf](https://www.klimacampus-hamburg.de/fileadmin/user_upload/klimacampus-aktiv/160420_Sturmfluttagung/MuellerGoennert_Hochwasserschutzanlagen.pdf)
- Neverla, Irene, Monika Taddicken, Ines Lörcher, and Imke Hoppe (eds). 2019. *Klimawandel Im Kopf: Studien Zur Wirkung, Aneignung und Online-Kommunikation* (Wiesbaden: Vieweg), <https://doi.org/10.1007/978-3-658-22145-4>
- Newman, Todd P., Erik C. Nisbet, and Matthew C. Nisbet. 2018. "Climate Change, Cultural Cognition, and Media Effects: Worldviews Drive News Selectivity, Biased Processing, and Polarized Attitudes", *Public Understanding of Science*, 27.8: 985–1002, <https://doi.org/10.1177/0963662518801170>
- Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz. "Unterhaltung von landeseigenen Anlagen—dafür steht der NLWKN", [https://www.nlwkn.niedersachsen.de/hochwasser\\_kuestenschutz/landeseigene\\_anlagen](https://www.nlwkn.niedersachsen.de/hochwasser_kuestenschutz/landeseigene_anlagen)

- Nisbet, Matthew (ed.). 2018. *The Oxford Encyclopedia of Climate Change Communication* (New York: Oxford University Press), <https://doi.org/10.1093/acref/9780190498986.001.0001>
- NLWKN. 2017a. "Auch die höchsten Deiche geben keine absolute Sicherheit: Rückblick auf die Sturmflut 1962", [https://www.nlwkn.niedersachsen.de/hochwasser\\_kuestenschutz/kuestenschutz/rueckblick\\_auf\\_sturmfluten/rueckblick\\_auf\\_sturmflut\\_1962/auch-die-hoechsten-deiche-geben-keine-absolute-sicherheit-rueckblick-auf-die-sturmflut-1962-102700.html](https://www.nlwkn.niedersachsen.de/hochwasser_kuestenschutz/kuestenschutz/rueckblick_auf_sturmfluten/rueckblick_auf_sturmflut_1962/auch-die-hoechsten-deiche-geben-keine-absolute-sicherheit-rueckblick-auf-die-sturmflut-1962-102700.html)
- . 2017b. "Nikolausflut vom 6. Dezember 2013", [https://www.nlwkn.niedersachsen.de/hochwasser\\_kuestenschutz/kuestenschutz/rueckblick\\_auf\\_sturmfluten/sturmflutbilder\\_2013/nikolausflut-vom-6-dezember-2013-120645.html](https://www.nlwkn.niedersachsen.de/hochwasser_kuestenschutz/kuestenschutz/rueckblick_auf_sturmfluten/sturmflutbilder_2013/nikolausflut-vom-6-dezember-2013-120645.html)
- O'Neill, Saffron, and Sophie Nicholson-Cole. 2009. "Fear won't do it: Promoting positive engagement with climate change through visual and iconic representations", *Science Communication*, 30.3: 355–79, <https://doi.org/10.1177/1075547008329201>
- Przeworski, Adam, and Henry Teune. 1970. *The Logic of Comparative Social Inquiry* (New York: John Wiley & Sons, Inc.).
- Ratter, Beate M. W. 2018. "Wahrnehmung des Klimawandels: Veränderung der Wahrnehmung", *Klimanavigato*, <https://www.klimanavigator.eu/dossier/artikel/037475/index.php>
- Ratter, Beate M. W., and Kira Gee. 2012. "Heimat—a German Concept of Regional Perception and Identity as a Basis for Coastal Management in the Wadden Sea", *Ocean and Coastal Management*, 68: 127–37, <https://doi.org/10.1016/j.ocecoaman.2012.04.013>
- Rodríguez-Amat, Joan R., and Cornelia Brantner. 2016. "Space and Place Matters: A Tool for the Analysis of Geolocated and Mapped Protests", *New Media & Society*, 18.6: 1027–46, <https://doi.org/10.1177/1461444814552098>
- Roosvall, Anna, and Matthew Tegelberg. 2013. "Framing Climate Change and Indigenous Peoples: Intermediaries of Urgency, Spirituality and De-Nationalization", *International Communication Gazette*, 75.4: 392–409, <https://doi.org/10.1177/1748048513482265>
- Russell, Adrienne. 2013. "Innovation in Hybrid Spaces: 2011 UN Climate Summit and the Expanding Journalism Landscape", *Journalism*, 14.7: 904–20, <https://doi.org/10.1177/1464884913477311>
- Ryghaug, Marianne, Knut Holtan Sorensen, and Robert Naess. 2011. "Making Sense of Global Warming: Norwegians Appropriating Knowledge of Anthropogenic Climate Change", *Public Understanding of Science*, 20.6: 778–95, <https://doi.org/10.1177/0963662510362657>
- Schäfer, Mike S., Ana Ivanova, and Andreas Schmidt. 2014. "What Drives Media Attention for Climate Change? Explaining Issue Attention in Australian,

- German and Indian Print Media from 1996 to 2010", *International Communication Gazette*, 76.2: 152–76, <https://doi.org/10.1177/1748048513504169>
- Schreier, Margrit. 2013. *Qualitative Content Analysis in Practice* (Los Angeles: Sage).
- Smith, Nicholas, and Helene Joffe. 2013. "How the Public Engages with Global Warming: A Social Representations Approach", *Public Understanding of Science*, 22.1: 16–32, <https://doi.org/10.1177/0963662512440913>
- Stadt Otterndorf. 2016. *Nordseebad Otterndorf—Die Grüne Stadt am Meer: Wohnen, Leben & Arbeiten* (Otterndorf: Nordseebad Otterndorf), <https://www.stadtmarketing-otterndorf.de/fileadmin/user/broschueren/imagebroschuere-otterndorf-leben-wohnen-arbeiten.pdf>
- Statistisches Amt für Hamburg und Schleswig-Holstein. 2019. "Monatszahlen—Bevölkerung", <https://www.statistik-nord.de/zahlen-fakten/bevoelkerung/monatszahlen/>
- Stokes, Bruce, Richard Wike, and Jill Carle. 2015. "Global Concern about Climate Change, Broad Support for Limiting Emissions: U.S., China Less Worried; Partisan Divides in Key Countries", *Pew Research Center: Global Attitudes & Trends*, 5 November, <https://www.pewresearch.org/global/2015/11/05/1-concern-about-climate-change-and-its-consequences/>
- Taddicken, Monika. 2013. "Climate Change from the User's Perspective", *Journal of Media Psychology: Theories, Methods, and Applications*, 25.1: 39–52, <https://doi.org/10.1027/1864-1105/a000080>
- Trümper, Stefanie, and Irene Neverla. 2013. "Sustainable Memory. How Journalism Keeps the Attention for Past Disasters Alive", *Studies in Communication and Media*, 1: 1–37, <https://doi.org/10.5771/2192-4007-2013-1-1>
- Wang, Xiao. 2017. "Understanding Climate Change Risk Perceptions in China: Media Use, Personal Experience, and Cultural Worldviews", *Science Communication*, 39.3: 291–312, <https://doi.org/10.1177/1075547017707320>
- Warf, Barney, and Santa Arias. 2009. *The Spatial Turn: Interdisciplinary Perspectives*, Routledge Studies in Human Geography 26 (London, New York: Routledge).
- Wonneberger, Anke, Marijn H. C. Meijers, and Andreas R. T. Schuck. 2020. "Shifting Public Engagement: How Media Coverage of Climate Change Conferences Affects Climate Change Audience Segments", *Public Understanding of Science*, 29.2: 176–93, <https://doi.org/10.1177/0963662519886474>
- Zamith, Rodrigo, Juliet Pinto, and Maria E. Villar. 2013. "Constructing Climate Change in the Americas: An Analysis of News Coverage in U.S. and South American Newspapers", *Science Communication*, 35.3: 334–57, <https://doi.org/10.1177/1075547012457470>
- Zanocco, Chad, Hilary Boudet, Roberta Nilson, Hannah Satein, and Hannah Whitley. 2018. "Place, Proximity, and Perceived Harm: Extreme Weather



Events and Views about Climate Change”, *Climatic Change*, 149.3–4: 349–65,  
<https://doi.org/10.1007/s10584-018-2251-x>

