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Investigating Mediated Climate Change Communication: A Best-Practice Guide

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Abstract: The article presents a best-practice guide for researchers interested in analyzing media communication about climate change (MCCC). It has been written by six researchers with extensive experience of studying how the climate issue is covered by media from various perspectives, be they scientific, democratic, or ideological. The suggested “best practices” concern (a) how to design MCCC research; (b) various ways to investigate MCCC in terms of modalities such as issue-attention, framing, or visualization; and (c) comparative approaches. The intention is to share knowledge about what seems to “work” or “not work” in the case of MCCC, as well as to stimulate discussion about how research on MCCC should develop in the future.

Keywords: climate change, media, methods, content analysis, communication

1 Introduction

Mass media such as newspapers, radio, TV, or the internet are “important arenas and important agents in the production, reproduction, and transformation of the meaning” of climate change (Carvalho 2010: 172). Therefore, many scholars have analyzed media communication about climate change (MCCC), thereby providing insights into how media portray scientific knowledge (e.g. Boykoff & Boykoff 2007), the representation of skeptical voices (e.g. Painter, 2011), the framing of policy options (e.g. Olausson 2009), etc.

In the process, MCCC research has also produced much knowledge about how such analyses can be done successfully, which research strategies work well, or which objects and concepts lend themselves well to analysis. This *meta-knowledge*, however, often remains implicit. The article at hand makes it explicit: It identifies problems many MCCC researchers encounter, and offers tested solutions – “best practices.”¹

¹ Our recommendations focus on the analysis of media content only, not its production or consumption. The latter aspects are not less relevant, but the respective fields differ considerably in their theories and approaches, so that a coherent “best practice” guide spanning all of these fields does not seem feasible.

In the presentation of these “best practices,” we will first focus on how to design MCCC research (section 2), then move on to the investigation of specific aspects and modalities such as frames, narratives, or visual representations (section 3), and finally cover comparative MCCC research (section 4).

2 Best practice in designing MCCC research

Every research project starts with a number of basic yet fundamental decisions about its direction and scope, its conceptual and methodological framework, and its research design. These decisions are crucial, and often pre-determine the subsequent successes and failures of projects.

2.1 When preparing the project

Position yourself within this broad, interdisciplinary research field. Not every project has to be interdisciplinary in itself. But any researcher interested in analyzing MCCC should be aware of the disciplinary variety of this field. In the past 15 years, MCCC research has not only mushroomed but also diversified (see Schäfer & Schlichting 2014). It has spread to a wide range of disciplines from communications to political science, sociology, geography, cultural anthropology, and others. Therefore, the relevant literature appears in many different journals (see Table 1 for some important examples), both disciplinary and interdisciplinary, that revolve around issues such as climate change, sustainability, or risk.

Journal	Journal Focus / Self-Description	Impact Factor (May 2016)	Example studies on MCCC
Climatic Change (Springer), since 1977	dedicated to the totality of the problem of climatic variability and change; provides an opportunity to communicate studies to people in other climate-related disciplines	3.430	Billett (2010); Boykoff (2008); Boykoff (2010); Ungar (1999)
Environmental Communication (Routledge/Taylor & Francis), since 2007	major international forum for examination/evaluation of communication in representing [environmental issues]; [aims to] develop new understandings of how scholarly research can contribute to finding solutions	0.817	Special Issue Olausson & Berglez (2014); Dirikx & Gelders (2010); Mellor (2009)
Geoforum (Pergamon/Elsevier), since 1970	inter-disciplinary, publishing innovative research and commentary in human geography and related fields	1.759	Boykoff & Boykoff (2007); O'Neill (2013)
Global Environmental Change (Elsevier), since 1990	interdisciplinary, addresses issues of public policy, economics, equity, risk and resilience, science policy, international development, and health and well-being	5.089	Gavin & Marshall (2011); O'Neill et al. (2013); Sampei & Aoyagi-Usui (2009); Schmidt et al. (2013); Antilla (2005)
Journalism Studies (Routledge/Taylor & Francis), since 2000	forum for critical discussion and study of journalism as a subject of academic inquiry and arena of professional practice	0.881	Aykut et al. (2012); Bacon & Nash (2012)
Public Understanding of Science (Sage), since 1992	all aspects of inter-relationships between science (including technology and medicine) and public	1.766	Carvalho (2007); Grundmann & Scott (2012); Gavin et al. (2011); Olausson (2009); Shanahan & Good (2000); Takahashi

			(2011); Weingart et al. (2000); Zehr (2000)
Risk Analysis (Wiley-Blackwell), since 1981	focal point for new developments in the field of risk analysis	2.502	Carvalho & Burgess (2005)
Science Communication (Sage), since 1979	interdisciplinary, analysis of communication within research communities, communication of scientific and technical information to public, science/technology communications policy	1.517	Corbett & Durfee (2004); Reis (1999); Gordon et al. (2010); Koteyko et al. (2010)
Wiley Interdisciplinary Reviews (WIREs): Climate Change (Wiley-Blackwell), since 2010	Interdisciplinary, encyclopedic reference for climate change scholarship, forum for gaining a wider set of perspectives	3.415	Anderson (2011); Moser (2010); O'Neill & Smith (2014); Schäfer (2012)

Table 1: The most relevant journals in the field of MCCC

In view of this variety, researchers should devote extra attention to literature research, and deliberately employ broad search strategies. Introductory articles are good starting points, e.g. general overviews of MCCC (such as Anderson 2009; Moser 2010; Schäfer 2015) or articles focusing on specific areas such as political implications (e.g. Carvalho 2010), risk (Smith 2005), framing (Dewulf 2013), visual representations (O'Neill and Smith 2014, or online communication (Schäfer 2012). Many such articles are assembled in the Oxford Encyclopedia of Climate Change Communication (http://climatescience.oxfordre.com/browse?t0=ORE_CLI:REFCLI027).

Clarify what role media play in your project: The interdisciplinary nature of MCCC research also makes it necessary for researchers to clarify their perspective on and contribution to the field. MCCC can be analyzed as an indicator for different phenomena: for how people in different nations perceive climate change (CC); for how power struggles between different stakeholders play out in the media, or as a stimulus for audiences. There is no one single reason for studying MCCC, and because the relevant research emanates from various disciplines, misunderstandings and/or conflicting views on how to view media abound. It is particularly important to note that media institutions are autonomous organisations with agency and agenda-setting power, characterized by particular traditions, routines, and policies (cf. Berglez 2011). Media organisations can broaden or constrict the terms of public debate through decisions impacting how an issue is portrayed (and what is left out of) an issue narrative (Happer & Philo 2013). Similarly, audiences are not 'empty vessels' waiting to be 'filled' with information: media consumers play an active part in deciding whether to accept, reject or negotiate mediated representations (Hall 1973). Best practice in MCCC research would see scholars demonstrating an awareness of the social context in which media organisations operate, recognising basic concepts such as news values, agenda-setting,

objectivity and so on; as well as clarifying their epistemological position. This is particularly important given the interdisciplinary nature of the MCCC field.

2.2 When choosing a research design

Research designs specify “how you plan to carry out your research project and, particularly, how you expect to use your evidence to answer your research question” (Gschwend & Schimmelfennig 2011: 1). They largely determine what can be achieved with a study and should therefore be designed carefully.

Clearly decide whether the purpose of your study is descriptive or explanatory. Research designs can be descriptive – laying out the nature of MCCC in a certain context – or explanatory – identifying causes of MCCC taking a particular form in a given setting. Both designs are valuable, but as MCCC research in the past two decades has strongly focused on descriptive studies, the value of adding new descriptions is limited. Therefore, explanatory research designs seem particularly advisable, for example on questions like: Why does MCCC in one media outlet differ from MCCC in another? Why does MCCC in country A differ from that in country B? Why did MCCC expand in the 2000s almost everywhere? Are NGOs, governments, or others more successful in building the media agenda, and are these outside stakeholders more powerful than journalists in determining the nature of MCCC?

Adapt your explanatory research design to the causal inference you are interested in and the number of observations you have available. The distinction between description and explanation is not tantamount to the difference between qualitative and quantitative research. Qualitative research typically looks at a small number of cases in-depth using non-standardized methods, whereas quantitative research studies many cases with standardized methods. But both research strategies can be descriptive as well as explanatory (Mahoney & Goertz 2006). Qualitative research can produce “dense descriptions,” but can also explain the nature of cases by reconstructing how they came about using process tracing or systematic comparisons between cases that differ in theoretically significant dimensions (George & Bennett 2005). For example, a description of how a climate summit is framed can be supplemented and explained by a reconstruction of the journalists working at the event, their resources, perceptions, and decisions. Or the frame description in the one media outlet can be compared with that in a second outlet operating in a different journalism culture that might promote a different output.

Similarly, quantitative research can be descriptive, showing for example what proportion of news items exhibits a particular position, frame or argument. This descriptive information can then be explained using multivariate statistics determining the relative explanatory power of various factors (like regression analysis) or by determining the necessary and sufficient conditions for the outcome using set-theoretic methods such as Qualitative Comparative Analysis (Ragin 2008). Generally, MCCC scholars should be aware of the difference between explanations following a factor-centric logic, aiming to assess the explanatory power of one or a few causal factor, and outcome-centric designs, geared toward explaining an outcome as fully as possible by identifying the whole range of relevant explanatory factors. Factor-centric designs require more prior knowledge of the most important explanatory factors, whereas outcome-centric designs are more suited for exploratory projects in which causal factors still need to be identified.

		Type of causal inference	
		Factor-centric: <i>Assessing the explanatory power of one or a few causal factors</i>	Outcome-centric: <i>Explaining a particular outcome as completely as possible</i>
Number of observations	<i>Large N</i>	Statistical control (e.g. in regression analysis)	QCA (i.e. Qualitative Comparative Analysis)
	<i>Small N</i>	Cross-case comparison	Case studies (i.e. in-depth, within-case causal analysis, process tracing)

Table 2: A typology of explanatory research designs (adapted from Gschwend & Schimmelfennig 2011: 14)

2.3 When developing research categories and instruments

Do not re-invent the wheel unless it is really necessary: MCCC is a maturing field in which many conceptual, methodological and technical tools, as well as datasets, have been developed. These can be used for or adapted to new projects and subjected to secondary analysis. When conceptualizing your research, bear in mind that it may be useful to seek out and employ tools that have been developed and tested in other studies. This can improve the quality and/or robustness of your study, help alleviate the spatial and temporal constrictions of much MCCC research (Schäfer & Schlichting 2014) and strengthen the cumulative production of knowledge. Therefore, MCCC scholars should look for existing conceptual tools – such as issue attention, different framing approaches, and discourse or narrative theory (see below for more details) – and try to use empirical and methodological instruments from

other research. Some scholars make their coding sheets available in their publications and many more provide them if asked. In addition, a broad and growing range of software tools are available, some commercial, like MaxQDA with Add-ons QDAMiner and WordStat (e.g. Schmidt et al. 2013; Schäfer et al. 2014), NVivo (e.g. O’Neill 2013), or WordSmith (e.g. Grundmann & Krishnamurthy 2010), and some free of charge, such as the Discourse Network Analyzer (e.g. Fisher et al. 2013), the NLTK Python Toolkit (e.g. Kirilenko et al. 2012; Kirilenko & Stepchenkova 2012), or network visualizers, such as Gephi or Pajek (e.g. Pearce et al. 2014; Hellsten et al. 2014).

2.4 When selecting the media material to analyze

Avoid convenience sampling. Aim instead to use purposive sampling based on clear criteria or random sampling. Media content can be selected for study in three ways: through random sampling (in which each case from the general population has the same chance of being selected), purposive sampling (aiming to select the most relevant cases), or convenience sampling (using cases that are easily available). Convenience sampling is the least satisfactory of the three methods and should only be used where the data collected still makes it possible to draw scientifically justifiable conclusions. Sometimes, however, such sampling may be necessary because data sources are incomplete or unavailable. For example, LexisNexis provides access to newspaper content from many countries, but African and Latin American countries, as well as some others where digitization of media content is lagging behind, are strongly underrepresented. Such cases may still justify the inclusion of conveniently sampled data, but its appropriateness should be reflected upon and explained in project publications. If purposive sampling is employed, the criteria guiding the selection have to be laid out. These often involve claims about the importance of the selected media outlets for society as a whole or for specific audiences like decision-makers. Many studies select national broadsheets, for example, because these are known to be influential for the media system, setting the agenda and providing frames that are taken up by other media. Other purposive strategies are to select media by circulation or reach (with widely distributed media being preferred) and/or by ideological position (with samples aiming to represent different positions). In selecting online and social media such as YouTube or Twitter, similar criteria need to be found to justify purposive sampling. Whereas media outlets are almost never selected randomly, sampling periods, mostly days, are often chosen randomly. Again, clear criteria – which in this case must ensure the randomness of the selection – should be employed. To represent a year’s worth of coverage, for example, two randomly sampled constructed weeks have been shown

to be an adequate choice, i.e. randomly sampling two Mondays, Tuesdays, Wednesdays, etc. from all the days in a year (Riffe et al. 1993).

3 Best practice in investigating aspects and modalities of MCCC

3.1 When analyzing issue salience

Issue attention is probably the most basic characteristic of media coverage (for an overview see Schmidt et al. 2014) It may refer to the amount of newspaper space, airtime or webspace devoted to MCCC. Because their carrying capacity is finite, media can only cover a limited number of issues. The ones that are covered are thus signaled as important to the audiences, triggering “agenda setting” effects (Sampei & Aoyagi-Usui 2009).

Think about what your measure says, and whether it needs to be normalized: Generally, all markers of an issue’s salience that can be employed by journalists can serve as indicators of issue attention, for example its placement in a journalistic product (on front pages, or early in radio or TV news shows), or the number of words or amount of airtime devoted to it. All of these measures have different advantages and caveats. For some questions it is interesting, or sufficient, to simply count the number of articles or news segments that have been published on CC. To analyze issue attention as a process of selecting one issue over others given limited editorial space, however, it is necessary to normalize these measures, e.g. by relating the number of CC-related articles to all articles published in a given medium over a given time span (see Schmidt et al. 2013; Schäfer et al. 2014). Such measures control for the size of the news hole and thus yield data comparable across outlets, time periods, or countries.

3.2 When doing lexical analysis

Words and phrases, such as “global warming”, “climate change” and “carbon footprint”, are the building blocks of MCCC. Their meanings are however not stable in different contexts; they can become positively or negatively charged, attenuated, or amplified by surrounding words such as skepticism, catastrophe, alarmism, consensus, uncertainty, or risk. Lexical analysis scrutinizes the use of such words or phrases. Diachronically, it analyzes how this use has changed over time, how words move from a discourse within science to a discourse within the wider society, or how whole discourses shift by using words such as “catastrophe,” “confidence,” or “consensus” as lexical markers. Conversely, synchronic lexical analysis describes the use of words (at the same time) in different media or online fora (e.g. Nerlich

2010). In a syntagmatic perspective, it examines the use of words in immediate linguistic contexts, e.g. by employing corpus linguistics to study collocations, and in a paradigmatical perspective, it reconstructs whole semantic fields of words or phrases that are associated with each other and may replace each other in a sentence, such as climate change, global warming and greenhouse effect, or skepticism, denialism and luke-warmism (see for example, Nerlich 2015).

If you are doing lexical analysis you should keep a critical eye on lexical creativity and emergence. A whole new language may emerge around a noun such as “carbon,” for example (Koteyko 2010), and new phrases might be developed such as “extreme weather” (Nerlich & Jaspal 2014) or, more recently, “polar vortex,” which in the long run may contribute to shifting the debate about CC.

Combine the decontextualized information produced by automated big data analyses with microscopic in-depth studies of lexical devices. The emergence of tools that enable searching, aggregating, and analyzing online data allows researchers to examine MCCC with an unprecedented breadth and scale. At the same time, however, it brings new challenges for the study of the content, context, and influence of MCCC and for the role of different stakeholders from science, politics, and the business sector in them. Multiple web-based channels often make it difficult to assess how and by whom the online content is accessed, used, and co-produced. Although software packages exist that can quickly process patterns across the universe of Big Data, the de-contextualized nature of results remains a key problem. (see Koteyko et al. 2015) It is therefore advisable to combine such “big data” studies with “small data” ones, looking closely at the use of words, in particular metaphors and other framing devices.

Avoid using value-laden terms from the discourse you are studying as if they were neutral descriptors. Scholars who study the use of words such as alarmism or warmism or catastrophism have to be careful not to become lexically entrapped and use them as quasi-neutral descriptors within their research and in communicating it to the broader public. Scholars should only discuss such words as objects of their study.

3.3 When doing discourse analysis

Discourse analysis today is a rather broad field, comprising researchers from many different disciplines who have developed their studies in different directions. Provided that the intention is to focus on how MCCC might promote certain values, norms, and ideologies, critical discourse analysis (CDA) is a relevant theory and method. Discourse, both written and spoken, is defined as “a form of social practice” (Fairclough & Wodak 1997: 258) that constitutes society through the discursive production of various institutions (media, politics, law, medicine, politics, economics, education, etc.) and cultures (everyday life, nations, identities, etc.). The critical dimension of CDA derives from the idea that discourse potentially “reproduces social domination, that is, the power abuse of one group over others” (van Dijk 2012: 63). There are three main ways of doing CDA: the sociocognitive approach, which involves the relation between cognition, discourse and society (van Dijk 1988; 2012); the discourse-historical approach (Reisigl & Wodak 2012), which concentrates on the transformation of discourse over time as well as on the ideological effects of various recontextualization practices; and the cultural/materialist or dialectical-relational approach (Fairclough 2001), which seeks to understand the relationship between the discursive and non-discursive and the role of power – for example, the ways in which various discourses of MCCC shape the understanding of CC and its effects, and the ideological consequences of the discursive practices (Berglez & Olausson 2014). In general, CDA, which thus combines sociolinguistic and critical theory, prioritizes analyses of language use, focusing for example on lexical choice, rhetoric, coherence, argumentation, and nominations. It is often emphasized that CDA should be combined with visual and multimodal approaches (Machin 2007).

Thus, it is important to orient oneself in the field of CDA in order to identify a suitable approach. If one aims to publish in linguistically oriented journals, such as *Discourse & Society*, detailed analyses of linguistic elements seem necessary, but if one’s discursive study of MCCC is supposed to appear in theoretically and methodologically broader journals, for example *Environmental Communication* or *Public Understanding of Science*, less detailed analyses tend to work as well. Even so, one’s reasoning needs to be characterized by rigor and transparency, and one needs to argue for the scientific relevance of one’s approach.

3.4 When doing framing analysis

Frames are probably the most frequently used concept for analyzing media content in general and MCCC in particular (for overviews see Dewulf 2013; Nisbet 2009). Framing analysts are

generally interested in how media select certain aspects of CC and make them more salient (Entman 1993; 2007). But despite its undoubted relevance, applying framing analysis to MCCC comes with challenges, many of them due to the diversity of framing approaches and frames found so far.

Specify the object of framing you are interested in. Framing requires an object, a point of reference. In MCCC, this is obviously often CC itself, even though this is not always made explicit. But in future work, it may be necessary to shift the actual object of framing before starting the research. In many countries MCCC has shifted from focusing on the phenomenon and the science of CC itself to talking about its societal impacts and possible solutions – even though this societal turn is less notable in the US and the UK (Painter 2011).

Specify the type of frame analysis and frames that you are interested in. Framing approaches are manifold, ranging from more structural approaches with an interest in “thematic” (i.e. rich in contextual information) versus “episodic” frames (Iyengar 1991) to approaches that analyze more substantively defined frames (Matthes & Kohring 2008). The latter are again diverse, ranging from those using generic, cross-issue frames, such as conflict or human interest frames (Semetko & Valkenburg 2000; for an MCCC example see Dirikx & Gelders 2010), to those that are issue-specific. Generic approaches lend themselves to issue-comparisons, whereas issue-specific approaches are better suited for in-depth analyses. The diversity within which researchers have to navigate here makes it necessary to clearly state one’s position and interests. It is also necessary to survey the large array of available tools and approaches, and to check whether you can use any of them instead of reinventing them yourself (e.g. see the Supplementary Information in O’Neill et al, 2015 for an example of a thorough description of how the researchers arrived at their CC frame schema, and for clear instructions for coders). This may make your work easier and your results more beneficial to the accumulation of knowledge in the MCCC community.

3.5 When doing narrative analysis

A number of studies have investigated narratives in MCCC (e.g. Krøvel 2011; Schwarze 2006; Smith 2012). They contain two distinct understandings of narration and how to analyze it: the analysis of narrative style and of topical narratives.

Clearly define what you mean by narrative and choose your analytical approach accordingly. Analyses of narrative style – rooted in literary and film studies – assume that media communication uses stylistic elements familiar from fictional genres. Instead of presenting the most important facts first (as news reporting usually does), narrative reports might tell a story with a beginning that presents a problem or conflict, a middle part in which various agents act on the problem, and a conclusion in which the problem is solved or brought to a new level. This is accomplished using stylistic devices such as emotionalization, personalization, or fictionalization (Glaser et al. 2009). This type of narrative analysis lends itself to the study of fictional MCCC (in movies, novels, etc.), but also to investigating the degree of narrativity found in primarily factual news reporting (see Wozniak et al. 2015).

A second, more popular approach among MCCC scholars aims to identify topical narratives. For example, Viehöver (2010) lists six typical narratives that dominated media discourse on CC between 1970 and 2011, for instance the narratives about the “global greenhouse effect as an anthropogenic catastrophe,” “climate change as a paradisiac warm age,” and “climate change as fictional invention.” Foust and O’Shannon Murphy (2009), in a critical rhetorical analysis of the US elite and popular press, also find MCCC to be permeated by what they call “apocalyptic framing.” The latter example already shows that topical narratives and issue frames are not easily distinguishable and are sometimes confused in the literature.

Distinguish between framing and narration, and focus on narrative qualities to identify topical narratives. Narratives of CC are not equivalent to the propositional content of issue frames, but convey their message specifically through the use of particular stylistic devices. Smith (2012: 747) argues that uncertain events and real-world facts are “clues” that need “genre guesses” so that meaning can be constructed. He identifies four genres in MCCC: (1) low mimetic (business as usual); (2) romantic (heroes triumph over adversity); (3) tragic (all efforts fail); and (4) apocalyptic (the future of the planet is at stake). Once a genre has been suggested, characteristic actor constellations are invoked. For example, Krøvel (2011) identifies one dominant narrative at the Bali COP 2007 that features a representative from a small state stepping up against the US, invoking the story of David against Goliath. More generally, recurring constellations of victims, villains, and heroes constitute the narrative DNA of MCCC. To live up to its full potential and distinguish itself from framing analysis, narrative analysis of MCCC ought to clearly specify the narrative devices by which the message is rendered as a story rather than an argument. These narrative qualities, rather than

the propositional content alone, constitute the basis for the effectiveness of MCCC narratives vis-à-vis audiences (Shen et al. 2014).

3.6 When doing visual analysis

Many actors – journalists, advertising agencies, scientists, artists, or NGOs – (re)create and (re)interpret CC visuals like scientific figures, photographs, cartoons, or maps. It has been shown that such visual representations shape the how audiences think about climate change (Leiserowitz 2006; O’Neill & Nicholson-Cole 2009; O’Neill et al. 2013), and that visual framings may shape the cultural politics of CC (O’Neill 2013). Therefore, studies have investigated visual MCCC in newspapers (e.g. DiFrancesco & Young 2010; Achong & Dodds 2012; O’Neill 2013), TV (Lester & Cottle 2009), and film (Mellor 2009). As an emerging subfield of MCCC, this offers significant opportunities for further research (see O’Neill & Smith 2014). Scholars aiming to exploit these should:

Combine the standardized analysis of visual content with in-depth visual discourse analysis. Visual MCCC analysis can employ several different methodological approaches (for overviews see Rose 2012; O’Neill 2013). Many studies first use some form of content analysis, and then triangulate their results by subjecting specific visuals to more in-depth visual CDA. The content analysis provides a quantitative overview of the types and frequency (or “loudness,” Chong & Druckman 2007) of climate visuals. Content analysis of images should use a similar procedure to that for text, following best practice in terms of piloting codebooks and testing for inter-coder reliability. They should also keep in mind that a content analysis is only as valid as the codes operationalized, and in previous visual MCCC these codes have sometimes been somewhat opaque (e.g. coded as a “positive” or “negative” image). Visual MCCC researchers should be careful not to make normative judgments on image datasets, and instead carefully define and explain their coding categories.

The second stage, an in-depth exploration of particularly salient example images, provides qualitative evidence of the composition and tone of images (their “strength,” Chong and Druckman 2007). One approach to this qualitative exploration is to examine the denotative content (the image’s “literal” meaning), the connotative content (how the objects portrayed relate to culture), and the ideological content (explaining how this intrinsic meaning comes to be) of individual images (cf. CDA). This qualitative analysis of specific images should also

draw on the positioning provided by image captions and any associated text, as these will situate the viewer in a particular relationship with the image (Burgess 1990; Hall 1973).

Study CC visuals in combination with other communicative modes and in comparison to other issues: Visual MCCC research to date has tended to study CC visuals in isolation from both other issues and other communicative devices. A study by DiFrancesco and Young (2010), which examined visuals and text together, shows why this can be problematic: the text and the visual devices were shown to pull in different narrative directions. Similarly, Lester and Cottle (2009) placed CC in a wider context by comparing television coverage of CC with that of other global risk issues, enabling them to comment specifically on the status of climate change reporting compared to reporting on other issues. Visual MCCC researchers should be open to combining visual research with other types of media analysis, and to using comparative approaches across issue domains.

3.7 When analyzing more than one modality in your research

Do more multimodal research. Much MCCC is multimodal in character, combining, for example, text and images (as in newspapers, magazines, or websites) or moving images and sound/speech (as in film and online videos). In addition, online content often combines multimodal products with (textual) user comments. But the vast majority of MCCC research looks at one modality only, mostly written text. In analyzing this text, studies typically focus either on argumentative or narrative aspects, not both. Even analyses of television news or documentaries do not always grasp the different modalities, and often fail to take account of their (mutually supportive or contradictory) interrelations. It is therefore fair to say that most analytical approaches to MCCC do not come close to audiences' reception experience, which comprises different modalities simultaneously (for exceptions see Roosvall & Tegelberg 2013; DiFrancesco & Young 2011; Nielsen & Schmidt Kjærgaard 2011).

Carefully integrate methods and procedures designed for different modalities. Multimodal analysis will be all the more convincing if it integrates the analytical techniques used on different modalities into a coherent research strategy. In an inductive, interpretive approach this can mean developing a set of content categories (e.g. visual types, or frame elements, etc.) from the material and checking to what degree they can be found across different modalities. In a more deductive and standardized research strategy this can entail developing

a standardized coding instrument that uses identical concepts and variables (e.g. actor types) across modalities wherever possible. Finally, multimodal research can operate on both the micro and the macro level of MCCC. On the micro level, it looks at how text and images, or sound and moving images, interact in the individual report or video. But multimodal analysis can also help elucidate relations between modalities on the aggregate level of entire debates or discourses by showing, for example, what types of images are regularly combined by journalists with what kinds of narratives or frames (Wozniak et al. 2015).

4 Best practice in comparative MCCC research

Comparative approaches are particularly relevant for MCCC research because CC is a transnational phenomenon and because political solutions, to a considerable extent, are sought at the international level. In addition, many involved actors and institutions are transnationally organized, for instance the IPCC or the UNFCCC, NGOs such as Greenpeace, transnational corporations like Shell, and news agencies like Reuters. At the same time, national journalism and issue-specific discourse cultures have been shown to persist with respect to issue attention (e.g. Schäfer et al. 2014), framing (e.g. Olausson 2009), or the degree of skeptical voices (Painter 2011). Cross-national and cross-cultural comparisons are ideal for highlighting and explaining the interplay between national and transnational aspects. Not every comparison, however, is equally important and valuable. We would therefore like to give a number of recommendations about how to maximize the theoretical impact of comparisons.

4.1 When deciding on the purpose of your comparison

Comparisons can serve at least five different purposes. To begin with, they can be used to thoroughly *describe* MCCC in different contexts, including similarities and differences. For the most part, existing research has done that for “Western” countries, but we know much less about other countries (see the meta-analysis of Schäfer & Schlichting 2014). Based on such descriptions, comparisons can serve to *develop typologies and classify cases*. Comparisons further serve to *explain differences and similarities* (cf. Berglez & Nassanga 2015). Explanation, in comparative research, fundamentally means connecting specific features of the respective context (e.g. country or media characteristics) to specific outcomes (e.g. features of MCCC). An elaborate methodology has developed, particularly in political science and increasingly in the field of communication (see Esser & Hanitzsch 2012), that specifies research designs following a quasi-experimental logic and allow for targeted testing of explanatory hypotheses. Furthermore, comparisons can be used to *normatively assess*

different outcomes in different contexts: Is MCCC better or worse in context A or context B? Finally, comparisons can also be used to *identify best practice* models and their preconditions. While all of these purposes are valuable, MCCC research can benefit most from developing more complex typologies of MCCC around the world and from invigorating the explanatory aspect of comparative analyses.

Design your research in a way that enables you to explain the differences and similarities you find without resorting to speculation. This entails thinking about what differences you are likely to find based on earlier research, as well as developing ideas about what explanatory factors are likely to drive these outcomes. There is no general rule about how to arrive at such ideas, as research is an open and creative process. One plausible idea is that the degree to which CC is seen as a real threat in MCCC is partly dependent on the degree to which a country is susceptible to harm from CC (e.g. Schmidt et al. 2013). But beyond such relatively simple assumptions we do not yet have good theories about why certain visuals, verbal expressions, or narratives may be used more often in one particular context than in another. More systematic comparison and theory building is needed here.

4.2 When selecting cases for comparison

Case selection is crucial in comparative research because it determines the scope of empirical claims: For what types of cases and in which universe of cases do your claims hold?

Select the appropriate category of cases and use a transparent and consistent case selection rule. Clearly explain why you compare particular cases. It is not self-evident that a cross-national comparison is the best choice because not every variation in an outcome can be attributed to differences between countries (see Berglez 2013: 51–55). Depending on your research question, interesting cases to compare may be different organizations or individuals. For example, you might want to compare national with transnational media outlets, governments with NGOs, or individual science journalists with general news reporters. A comparison of the *Guardian* and the *Wall Street Journal* is perhaps less of a “national comparison” than a comparison of two papers promoting different political ideologies. By thinking hard about the appropriate types of cases you will be able to avoid committing “methodological nationalism,” i.e. uncritically taking for granted that society is always “equated with society organized in nationally and territorially delimited states” (Beck 2006: 24).

Use theoretically important criteria in selecting your cases. Once you have decided on the types of cases you want to compare, you have to clearly explain why you select the particular instances that you study. In the case of MCCC, the selection of countries might be guided by the following kinds of rationales: How much is a country affected by, vulnerable to, or responsible for CC (Schmidt et al. 2013)? How do journalistic cultures vary between the countries studied and how will those cultures affect MCCC (Hanitzsch 2011)? How strongly do people in a country believe in postmaterial values (including ecological conservation) and how does that influence the support for sustainable development in mediated climate change discourse in that country (Norris & Inglehart 2009)? Selecting countries on the basis of theoretical considerations about the impact of the selection criterion on the outcome of interest ensures that cross-national differences can be interpreted in a meaningful way. Such a theoretically guided case-selection procedure thus supports the kind of explanatory research we have introduced in Table 2 above. It is particularly suitable for small-N, factor-centric designs used in cross-case comparisons.

4.3 When collecting your data

Check the data availability in comparative research. In cross-national comparisons it is not always possible for researchers to access the ideal kind and amount of data for their analyses. Often, media data – print media articles, news programs, TV shows etc. – are not archived, particularly in countries that generally lack the research infrastructure and resources to organize large databases. For example, TV footage is hardly available for many researchers at all – unless they tape it themselves, which is not possible after the fact. That is particularly true for developing countries and emerging economies, where TV coverage is even more important than in industrialized countries because of high illiteracy rates.

Another problem is that sometimes media data is available but not organized in a way that allows for keyword searches. In these cases, other methods of selection have to be considered, such as analyzing MCCC focusing on certain events, or during certain, randomly selected time periods. A third difficulty is that access to media material might be restricted or too expensive for researchers – which again is particularly true for TV coverage. But because media beyond newspapers, and particularly TV, are of paramount importance in MCCC, scholars should make a deliberate effort to acquire and analyze these media more often. As Table 3 indicates, a number of interesting databases are available for acquiring and selecting

data, but researchers should make sure that they can access the data they need before starting their analysis.

Database	Content and Scope	Link
LexisNexis (Reed/Elsevier)	full-texts of English- and other language media, contains several thousand newspapers, weeklies and magazines from 1980s onwards; also contains legal documents, press releases, news agency materials	www.lexisnexis.com
Factiva (Dow Jones)	full-texts of 35,000 news sources from 200 countries in 28 languages; also contains company profiles, financial data, online data such as tweets	http://www.dowjones.com/factiva
ProQuest (UMI)	full-text archives of newspapers, periodicals, dissertations, and other databases	https://www.proquest.com
PressDisplay (Newspaper Direct)	online newspaper kiosk with over 1,900 publications from 92 countries in 43 languages, shows full replicas of publications including pictures etc., only 30–60 days back	www.pressdisplay.com
Vanderbilt TV Archive (Vanderbilt University)	library of US TV news programs from ABC, CBS, CNN, NBC, partly from as early as the 1960s onwards, with transcripts of topics; also contains footage from selected events like live presidential speeches, Vietnam War, Watergate hearings	http://tvnews.vanderbilt.edu
Internet Archive (non-profit project)	free archive of digital snapshots of webpages, usenet pages and other documents from as early as 1996 onwards	https://archive.org

Table 3: Overview of media databases that can be used for MCCC analysis

4.4 When weighing the option of a large-scale international collaboration

Be aware of the advantages and disadvantages of large scale, international collaborations. Comparative research, particularly when it aims to include more than a small number of countries and cases spanning the globe, is challenging in many ways. In terms of project organization, two options are available:

On the one hand, scholars may analyze different national cases themselves. This option has a number of advantages; it is better able to guarantee that data and instruments are comparable across countries and are dealt with homogeneously, and it minimizes organizational stress. This comes at a price, however. It is almost impossible for one research team to have enough cultural knowledge about all cases analyzed. As a result, this analytical strategy is recommended for either relatively small-n analyses, or for large-n analyses of objects requiring less in-depth knowledge of the countries in question.

On the other hand, MCCC scholars might organize collaborative projects with representatives from the countries they are analyzing. Such projects are more appropriate for studies that require a deeper knowledge of the cases in question (see Berglez & Nassanga 2015). They enable research teams to go beyond the study of, for example, English language newspapers only, and to analyze domestic publications in various languages. The researchers will have a better understanding of the national media situation and the selected media, but also of the

social and political situation at the time of media scrutiny. Furthermore, collaborative projects allow for diverse and varying alliances within the group, resulting in the joint writing of articles by several participants. Among the small number of such projects in MCCC research, the most prominent is the MediaClimate group (Eide & Kunelius 2010; 2012), which includes 21 partners, covering all continents and mainly situated in the countries involved in the research.

Actively try to mitigate the disadvantages of transnational collaborations. However, once again the advantages of projects such as MediaClimate, COMPON, or others come at a price. Project organization is more difficult, from acquiring funding for large scale projects to guaranteeing attendance at meetings and making sure the instruments and methods are employed similarly across the cases studied by the different research teams. These difficulties can, however, be mitigated.

One means of doing so is to hold regular meetings, and if these are connected with international conferences, many of the researchers would be present anyway. This allows many project researchers to participate, especially those with smaller travel budgets. The MediaClimate network, for example, has met in South Africa, which enabled many people to do fieldwork during COP17, as well as in locations such as Bangladesh, Turkey, Finland, France, and Norway.

A second means is to select a manageable scope of analysis when working with a diverse group. MediaClimate has focused on the coverage of certain events, such as the global climate summits, and has limited its research material to two newspapers for three weeks.

A third means is to employ a clear-cut methodology. By virtue of their diverse countries of origin, the participants in such networks represent a range of research traditions, and thus the need arises not to make the joint research too complicated. MediaClimate has developed joint codebooks for its content analysis which operationalize basic dimensions of media debates and have been tested and adjusted through intersubjectivity tests. This can be complemented by country-specific analyses conducted by the individual research teams, thus capturing the full diversity of MCCC around the globe.

5 Conclusion

This best-practice guide was compiled in response to our belief that there is a great deal of meta-knowledge in the MCCC field that is worth sharing with a wider readership. This is a paradoxical task, however. Formulating best-practices may appear unduly prescriptive – “this is how things have been done in the past, and you should do it like this as well” – whereas research is based on creativity, innovation, and challenging established modes of thinking. Our aim is not to repress innovation, but to share ideas on what might work based on the experience of six scholars. Concerning the field’s research “needs,” we would like to emphasize the following goals to work towards:

- *More explanations:* There is no shortage of descriptive research on MCCC in various contexts (different countries, types of media, etc.), but there is definitely a need for more explanatory work, aiming to explain various aspects of why and how MCCC operates.
- *More multimodal solutions:* As in many other areas of media and communications research, more multimodal inquiries are needed in which texts, (moving) images, sound/speech, etc. are analyzed in conjunction with each other – as this is how communication is produced and consumed.
- *More focus on TV and social media:* Despite huge changes in the media landscape, many studies still focus on newspaper print, but to a (far) lesser extent on television and online media. This is despite the fundamental changes we have seen in how people consume and make news over the last decade or so.
- *More basic media theory:* We think that MCCC could be better connected to basic media and communications theory, for example in terms of agenda-setting, media logic, and mediatization.
- *More international collaboration:* More international collaboration is welcomed and needed, despite the various challenges and barriers to such research.

We think that further development and improvement of MCCC research is important. Mediated communication is an essential part of sustainable development, which includes the handling of climate change. This does not mean that we are suggesting activist research, or that the main goal of science should be to promote particular developments in society. Instead we believe that because climate change is becoming ever more important in ever more countries and organizations, it would be unwise not to use the accumulated knowledge about MCCC to discuss how media could play a positive, democratically relevant role in matters of climate mitigation and/or adaptation.

References

- Achong, K. and Dodds, R. (2012) “Anthropogenic Climate Change Coverage in Two Canadian Newspapers, the Toronto Star and the Globe and Mail, from 1988-2007”, *Environmental Science & Policy* 15: 48-59
- Anderson, A. (2009) “Media, Politics and Climate Change”, *Sociology Compass* 3(2): 166–182.
- Anderson, A. (2011) “Sources, Media, and Modes of Climate Change Communication: The role of celebrities”, *WIREs Climate Change* 2(4): 535–546.
- Antilla, L. (2005) Climate of Scepticism. US newspaper coverage of the science of climate change”, *Global Environmental Change-Human and Policy Dimensions* 15 (4): 338–352.
- Aykut, S.C., Comby, J-B, Guillemot, H. (2012) “Climate Change Controversies in French Mass Media 1990-2010”, *Journalism Studies* 13(2): 157–174.
- Bacon, W., Nash, C. (2012) “Playing the Media Game. The relative (in)visibility of coal industry interests in media reporting of coal as a climate change issue in Australia”, *Journalism Studies* 13(2): 243–258.
- Beck, U. (2006) *The Cosmopolitan Vision*. Cambridge & Malden, MA: Polity Press.
- Berglez, P., Nassanga, G.L. (2015) “What is the Difference between Cross-National Comparisons and Semi-Comparative Work? The example of Swedish-Ugandan climate change communication research”, *Journal of Development and Communication Studies* 4(1): 33-48.
- Berglez, P., Olausson, U. (2014) “The Post-Political Condition of Climate Change: An ideology approach”, *Capitalism, Nature, Socialism* 25(1): 54-71.
- Berglez, P. (2011) “Inside, Outside, and Beyond Media Logic: Journalistic creativity in climate reporting”, *Media, Culture and Society* 33(3): 449-465.
- Berglez, P. (2013) *Global Journalism: Theory and practice*. New York: Peter Lang.
- Billett, S. (2010): Dividing Climate Change. Global warming in the Indian mass media”, *Climatic Change* 99(1): 1–16.
- Boykoff, M.T. (2010) “Indian Media Representations of Climate Change in a Threatened Journalistic Ecosystem”, *Climatic Change* 99(1): 17–25.
- Boykoff, M.T. (2008) “Lost in Translation? United States television news coverage of anthropogenic climate change, 1995-2004”, *Climatic Change* 86: 1–11.
- Boykoff, M.T, Boykoff, J.M. (2007) “Climate Change and Journalistic Norms. A case-study of US mass-media coverage”, *Geoforum* 38(6): 1190–1204.
- Burgess, J. (1990) “The Production and Consumption of Environmental Meanings in the Mass Media”, *Transactions of the Institute of British Geographers* 15: 139-161
- Carvalho, A. (2007) “Ideological Cultures and Media Discourses on Scientific Knowledge”, *Public Understanding of Science* 16(2): 223–243.
- Carvalho, A. (2010) “Media(ted) Discourses and Climate Change. A focus on political subjectivity and (dis)engagement”, *WIREs Climate Change* 1(2): 172–179.
- Carvalho, A., Burgess, J. (2005) Cultural Circuits of Climate Change in UK Broadsheet Newspapers, 1985-2003”, *Risk Analysis* 25(6): 1457–1469.
- Chong, D., Druckman, J.N. (2007) “A Theory of Framing and Opinion Formation in Competitive Elite Environments”, *Journal of Communication* 57(1): 99-118.
- Corbett, J. B, Durfee, J. L. (2004) “Testing Public (Un)certainty of Science – Media Representations of Global Warming”, *Science Communication* 26(2): 129–151.
- Dewulf, A. (2013) “Contrasting Frames in Policy Debates on Climate Change Adaptation”, *WIREs Climate Change* 4(4): 321–330.
- DiFrancesco, D.A., Young, N. (2011) “Seeing Climate Change: The visual construction of global warming in Canadian national print media”, *Cultural Geographies* 18(4): 517-536.
- Dirikx, A., Gelders, D. (2010): To Frame is to Explain. A deductive frame-analysis of Dutch and French climate change coverage during the annual UN Conferences of the Parties”, *Public Understanding of Science* 19(6): 732–742.

- Eide, E., Kunelius, R. (eds.) (2012) *Media Meets Climate*. Gothenburg: Nordicom
- Eide, E., Kunelius, R., Kumpu, V. (eds.) (2010) *Global Climate – Local Journalisms*. Bochum/Freiburg: Projekt Verlag
- Entman, R. (1993) “Framing. Towards a clarification of a fractured paradigm”, *Journal of Communication* 43(4): 51-58
- Entman, R. (2007) “Framing Bias: Media in the distribution of power”, *Journal of Communication* 57(1): 163–173.
- Esser, F., Hanitzsch, T. (eds.) (2012) *The Handbook of Comparative Communication Research*. New York, London: Routledge.
- Fairclough, N. (2001) “The Dialectics of Discourse”, *Textus*, XIV.2.
- Fairclough, N., Wodak, R. (1997) “Critical discourse analysis” in van Dijk, T.A. (ed.): *Discourse Studies. A Multidisciplinary Introduction, Vol. 2*. London: Sage.
- Fisher, Danar R., Waggle, J., Leifeld, P (2013) “Where Does Political Polarization Come From? Locating polarization within the U.S. climate change debate”, *American Behavioral Scientist* 57(1): 70–92.
- Foust, C. R., O'Shannon Murphy, W. (2009) “Revealing and Reframing Apocalyptic Tragedy in Global Warming Discourse”, *Environmental Communication* 3(2): 151-167.
- Gavin, N.T., Leonard-Milsom, L., Montgomery, J. (2011) “Climate Change, Flooding and the Media in Britain”, *Public Understanding of Science* 20(3): 422–438.
- Gavin, N.T., Marshall, T. (2011) “Mediated Climate Change in Britain. Scepticism on the web and on television around Copenhagen”, *Global Environmental Change* 21(3): 1035–1044.
- George, A.L., & Bennett, A. (2005) *Case Studies and Theory Development in the Social Sciences*. Cambridge, Mass.: MIT Press.
- Glaser, M., Garsoffky, B., Schwan, S. (2009) “Narrative-based Learning: Possible benefits and problems”, *Communications* 34(4): 429-447.
- Gordon, J.C.; Deines, T.; Havice, J. (2010) “Global Warming Coverage in the Media. Trends in a Mexico City newspaper”, *Science Communication* 32(2): 143–170.
- Grundmann, R., Krishnamurthy, R. (2010) “The Discourse of Climate Change”, *Critical Approaches to Discourse Analysis across Disciplines* 4(2): 113–133.
- Grundmann, R., Scott, M. (2012) “Disputed Climate Science in the Media”, *Public Understanding of Science* 23(2): 25-44.
- Gschwend, T., Schimmelfennig, F. (eds.) (2011) *Research Design in Political Science*. Basingstoke: Palgrave Macmillan.
- Hall, S. (1973) “The Determinants of News Photographs”, in Cohen, S., Young, J. (eds.) *The Manufacture of News: Deviance, social problems and the mass media*. Rossendale: Constable/Revival Books.
- Hanitzsch, T. (2011) “Populist Disseminators, Detached Watchdogs, Critical Change Agents and Opportunist Facilitators”, *International Communication Gazette* 73(6): 477–494.
- Happer, C., Philo, G. (2013) “The Role of the Media in the Construction of Public Belief and Social Change”, *Journal of Social and Political Psychology* 1: 321-336
- Hellsten, I., Nerlich, B.; Porter, A. (2014) “Imagining the Future at the Global and National Scale: A comparative study of British and Dutch press coverage of Rio 1992 and Rio 2012”, *Environmental Communication* 8(4): 468-488.
- Iyengar, S. (1991) *Is Anyone Responsible? How Television Frames Political Issues*. Chicago: University of Chicago Press.
- Kirilenko, A., Stepchenkova, S. (2012) “Climate Change Discourse in Mass Media. Application of computer-assisted content analysis”, *Journal of Environmental Studies and Sciences* 2(2): 178–191.
- Kirilenko, A., Stepchenkova, S., Romsdahl, R., Mattis, K. (2012) “Computer-assisted Analysis of Public Discourse”, *Quality & Quantity* 46: 501–522.
- Koteyko, N. (2010) “Mining the Internet for Linguistic and Social Data. An analysis of ‘carbon compounds’ in Web feeds”, *Discourse & Society* 21(6): 655–674.

- Koteyko, N., Nerlich, B., Hellsten, I. (2015) Climate Change Communication and the Internet: Challenges and opportunities for research” *Environmental Communication*, 9(2): 149-152.
- Koteyko, N., Thelwall, M., Nerlich, B. (2010) “From Carbon Markets to Carbon Morality. Creative compounds as framing devices in online discourses on climate change mitigation”, *Science Communication* 32(1): 25–54.
- Krøvel, R. (2011) “Journalistic Narratives of Success and Failure at the Bali Climate Change Conference in 2007”, *Intercultural Communication Studies* 20(2): 89-104.
- Leiserowitz, A. (2006) “Climate Change Risk Perception and Policy Preferences: The role of affect, imagery, and values”, *Climatic Change* 77(1): 45-72
- Lester, L., Cottle, S. (2009) “Visualizing Climate Change: Television news and ecological citizenship”, *International Journal of Communication* 3: 920-936
- Machin, D. (2007) *Introduction to Multimodal Analysis*. New York: Hodder Arnold.
- Mahoney, J., Goertz, G. (2006) “A Tale of Two Cultures: Contrasting quantitative and qualitative research”, *Political Analysis* 14(3): 227-249.
- Matthes, J., Kohring, M. (2008) “The Content Analysis of Media Frames. Toward improving reliability and validity”, *Journal of Communication* 58(2): 258–279.
- Mellor F. (2009) “The Politics of Accuracy in Judging Global Warming Films”, *Environmental Communication* 3(2): 134-150
- Moser, S.C. (2010) “Communicating Climate Change. History, challenges, process and future directions”, *WIREs Climate Change* 1: 31–53.
- Nerlich, B. (2010) “‘Climategate’: Paradoxical metaphors and political paralysis”, *Environmental Values* 19(4): 419-442
- Nerlich, B.; Jaspal, R. (2014) “Images of Extreme Weather: Symbolizing human responses to climate change”, *Science as Culture* 23(2): 253-276
- Nerlich, B. (2015) Lukewarmers. Blog post on the Making Science Public Blog: <http://blogs.nottingham.ac.uk/makingsciencepublic/2015/05/14/lukewarmers/>
- Nielsen, K.H., Kjaergaard, R.S. (2011) “News Coverage of Climate Change in Nature News and ScienceNOW during 2007”, *International Communication* 5(1): 25-44.
- Nisbet, M.C. (2009) “Communicating Climate Change: Why frames matter for public engagement”, *Environment: Science and Policy for Sustainable Development* 51(2): 12-23.
- Norris, P., Inglehart, R. (2009) *Cosmopolitan Communications. Cultural diversity in a globalized world*. Cambridge: Cambridge University Press.
- Olausson, U. (2009) “Global warming – Global Responsibility? Media frames of collective action and scientific certainty”, *Public Understanding of Science* 18(4): 421–436.
- Olausson, U. & Berglez, P. (2014) “Media Research on Climate Change: Where have we been and where are we heading?” *Environmental Communication* 8(2): 139-141.
- O’Neill, S. (2013) “Image Matters: Climate change imagery in US, UK and Australian newspapers”, *Geoforum* 49: 10-19
- O’Neill, S., Boykoff, M.T., Niemeyer, S.; Day, S.A. (2013) “On the Use of Imagery for Climate Change Engagement”. *Global Environmental Change* 23 (2) : 413–421.
- O’Neill, S., Nicholson-Cole, S. (2009) “Fear Won’t Do It”: Promoting positive engagement with climate change through visual and iconic representations”, *Science Communication* 30(3): 355-379
- O’Neill, S., Smith, N. (2014) “Climate Change and Visual Imagery”, *Wiley Interdisciplinary Reviews: Climate Change* 5: 73-87
- O’Neill, S., Williams, H.T.P, Kurz, T., Wiersma, B., Boykoff, M. (2015) “Dominant Frames in Legacy and Social Media Coverage of the IPCC Fifth Assessment Report”, *Nature Climate Change* 5: 380–385
- Painter, J. (2011) *Poles Apart. The international reporting on climate scepticism*. London: Reuters Institute for the Study of Journalism.

- Pearce, W., Holmberg, K., Hellsten, I., Nerlich, B. (2014) Climate Change on Twitter: Topics, communities and conversations about the 2013 IPCC working group 1 report”, *PLOS ONE*: <http://dx.doi.org/10.1371/journal.pone.0094785>
- Ragin C.C. (2008) *Redesigning Social Inquiry: Fuzzy sets and beyond*. Chicago and London: University of Chicago.
- Reis, P. (1999) “Environmental News. Coverage of the earth summit by Brazilian newspapers”, *Science Communication* 21(2): 137–155.
- Reisigl, M., Wodak, R. (2012) “The Discourse-Historical Approach (DHA)”, in Wodak, R., Meyer, M. (eds.) *Methods of Critical Discourse Analysis*. Los Angeles, London, New Delhi, Singapore and Washington DC: Sage.
- Riffe, D., Aust, C.F., Lacy, S.R. (1993) “The Effectiveness of Random, Consecutive Day and Constructed Week Sampling in Newspaper Content Analysis”, *Journalism Quarterly* 70(1): 133-139.
- Roosvall, A., Tegelberg, M. (2013) “Framing Climate Change and Indigenous Peoples. Intermediaries of urgency, spirituality and de-nationalization”, *International Communication Gazette* 75(3): 392-409.
- Rose, G. (2012) *Visual Methodologies: An introduction to researching with visual materials*. London: Sage
- Sampei, Y., Aoyagi-Usui, M. (2009) “Mass-media Coverage, its Influence on Public Awareness of Climate-change Issues, and Implications for Japan's National Campaign to Reduce Greenhouse Gas Emissions”, *Global Environmental Change* 19(2): 203–212.
- Sarwono, B, Ali, Z., Eide, E. (2012) Ignored Voices. The victims. The virtuous. The agents. Women and climate change coverage, in Eide, E. & Kunelius R. (eds) *Media Meets Climate*. 281-297
- Schäfer, M.S. (2012) “Online Communication on Climate Change and Climate Politics. A literature review”, *Wiley Interdisciplinary Reviews-Climate Change* 3(6): 527–543.
- Schäfer, M.S. (2015) “Climate Change and the Media”, in Wright, J.D. (Ed.) *International Encyclopedia of the Social & Behavioral Sciences, 2nd edition, Vol 3*. Oxford: Elsevier. 853–859.
- Schäfer, M.S., Ivanova, A.; Schmidt, A. (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): 152-176.
- Schäfer, M.S., Schlichting, I. (2014) “Media Portrayals of Climate Change. A meta-analysis of the research field”, *Environmental Communication* 8(2): 142-160.
- Schmidt, A., Ivanova, A., Schäfer, M.S. (2013) “Media Attention for Climate Change around the World. A comparative analysis of newspaper coverage in 27 countries”, *Global Environmental Change* 23(5): 1233-1248.
- Schwarze, S. (2006) “Environmental Melodrama”, *Quarterly Journal of Speech* 92(3): 239-261.
- Semetko, Holli A., Valkenburg, P.M. (2000) “Framing European Politics. A content analysis of press and television news”, *Journal of Communication* 50: 93–109.
- Shanahan, J.; Good, J. (2000) “Heat and Hot Air. Influence of local temperature on journalists' coverage of global warming”, *Public Understanding of Science* 9(3): 285–295.
- Shen, F., Ahern, L., Baker, M. (2014) “Stories that Count: Influence of news narratives on issue attitudes”, *Journalism & Mass Communication Quarterly*, 91(1), 98–117.
- Smith, J. (2005) Dangerous News. Media decision making about climate change risk, *Risk Analysis* 25(6): 1471–1482.
- Smith, P. (2012) “Narrating Global Warming”, in Alexander J.C. et al. (eds.) *The Oxford Handbook of Cultural Sociology*. Oxford: Oxford University Press.
- Takahashi, B. (2011): Framing and Sources. A study of mass media coverage of climate change in Peru during the V ALCUE”, *Public Understanding of Science* 20(4): 543–557.
- Ungar, S. (1999) “Is Strange Weather in the Air? A study of US national network news coverage of extreme weather events”, *Climatic Change* 41(2): 133–150.
- Van Dijk (1988) *News as Discourse*. Hillsdale, NJ, Hove & London: L. Erlbaum.
- Van Dijk (2012) “Critical Discourse Studies: A sociocognitive approach”, in Wodak, R., Meyer, M. (eds.) *Methods of Critical Discourse Analysis*. Los Angeles, London, New Delhi, Singapore and Washington DC: Sage.

Viehöver, W. (2010) "Öffentliche Erzählungen und der globale Wandel des Klimas", in Arnold, M. et al. (Eds.) *Erzählungen im Öffentlichen: Über die Wirkung narrativer Diskurse*. Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.

Weingart, P. Engels, A. Pansegrau, P. (2000) Risks of Communication. Discourses on climate change in science, politics, and the mass media", *Public Understanding of Science* 9(3): 261–283.

Wozniak, A., Lück, J., Wessler, H. (2015) "Frames, stories, and images. The advantages of a multimodal approach in comparative media content research on climate change", *Environmental Communication* 9(4): 469-490.

Zehr, S.C. (2000) "Public Representations of Scientific Uncertainty about Global Climate Change", *Public Understanding of Science* 9(2): 85–103.