

Frames, Stories, and Images: The Advantages of a Multimodal Approach in Comparative Media Content Research on Climate Change

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Abstract

This paper presents a multimodal research design for the standardized content analysis of climate change coverage in print media. The concepts of framing, narration, and visual representation are integrated into a single coding instrument that can be applied to large-scale media samples from different countries. The proposed research design combines existing measures and novel operationalization. Intercoder reliability scores are reported from a pretest covering newspaper material from Germany, India, South Africa, and the USA. Most variables can be reliably applied across these very different countries, with some exceptions in the more exploratory narrative segment of the analysis. The paper also shows how a multimodal approach to coding climate change coverage can help to avoid potentially one-sided interpretations based on single-mode approaches.

Keywords: comparative research, content analysis, issue framing, visual analysis, narration, climate change

Introduction

The mass media have a mission to report novelties, reduce complexity, and tell engaging stories. When an issue is long-term, multi-faceted, and largely unobtrusive—as it is the case with climate change—these ambitions create challenges to news production. One journalistic mechanism to respond to such challenges is the use of narrative or visual “hooks” on which to “hang” a news report. The resulting combination of elements—facts and statements, story structure, and images—can lead to journalistic articles in which the configuration of these elements seems incoherent at first sight.

To give but one example, consider the article “Canada singled out for lack of greening” (Figure 1), published in the South African newspaper *The Star* on 30 November 2011, during the United Nations climate change conference (Conference of the Parties - [COP]) in Durban.

Figure 1. Article published in the Star on 30 November 2011.



An exclusive look at *narrative elements* reveals a central storyline in which the Canadian Government is identified as the “villain” who impedes necessary progress in combating climate change through its pursuit of economic self-interest. “Canada,” writes *The Star's* foreign editor Peter Fabricius, “is being tarred and feathered” by various members of the

global civil society. While the Canadian Government is given the opportunity to respond, the larger number of critical statements in combination with an abrasive choice of words (Canada is labeled “the bad joke at COP” by one actor) presents to the reader a clear-cut morality. But the exclusive focus on such narrative features misses the additional argumentative thread in the last two paragraphs as well as the self-contained story told by the accompanying photograph. An expanded reading of the text emerges when we consider the line-up of *actors* present in the article and the *arguments* advanced. While most of the arguments on Canada's looming abandonment of the Kyoto Protocol run in accordance with the storyline, two actors additionally endorse the “Green Climate Fund” in their respective statements. While only marginally contributing to the article's narrative, these endorsements of a specific measure for adaptation to climate change are relevant discursive contributions in and of themselves. Yet the *visual mode* of the article tells us even more. News editors tend to accompany texts on political maneuverings in climate change discussions with striking images, for instance, those provided by environmental nongovernmental organizations (ENGOS) of their PR stunts. Although suggesting a close connection to the written text through layout choices, the photograph tells the reader a separate story. Greenpeace, not mentioned in the written story at all, did not only build the sand sculpture depicted but also provided the photograph, making it both the subject and supplier of a news item. The actor constellation described by the photograph and its caption differs from the written text: South Africa, appearing proactive and demanding in the text, is now the addressee of demands by Greenpeace.

While the three communicative modes employed in this article do not strictly contradict each other, they also do not form a cohesive whole despite their presentation in a composite form. Only a concurrent and systematic analysis of the different communicative modes on the textual and visual levels will get us closer to understanding the complete picture drawn by news reports on climate change and will move content analysis of climate change coverage closer to readers' actual multimodal reception experience. Issue frames may be similar across countries but the way in which they are embedded in stories and images accounts for the specific cultural resonance that news enjoys among its audiences. Shen, Ahern, and Baker (2014, p. 100) emphasize that news frames need narratives as rhetorical structures to be effectively communicated. Narratives connect political debate about problems and solutions with media users' experiences and identities by offering

enduring symbolic systems (Bird & Dardenne, 1997) and exemplars for identification. Images, in turn, can provide a connection to collective memory by drawing on iconic representations that have become familiar short cuts in making sense of complex issues such as climate change (Hannigan, 1995; O'Neill, 2013).

Framing, narrative, and visual analysis are rooted in different epistemological traditions. News framing analysis has often (but not always) been applied in standardized content analysis predicated on the manifest and explicit features of news texts. By contrast, narrative and visual analyses traditionally follow an interpretive paradigm aiming at reconstructing latent meanings through contextualization. Any attempt at standardizing narrative and visual analysis will inevitably lose some interpretive subtlety. However, this loss is offset by three advantages: first, through its standardized and intersubjectively reliable coding procedure, content analysis essentially emulates how the average media user would interpret a particular text. Standardized analysis is not so much interested in the full range of possible interpretations but in the dominant and widespread reading and is thus particularly close to the culturally resonant and collectively remembered qualities of narratives and visuals. Standardized narrative and visual analysis therefore adds validity to the investigation of widely circulating, mass-mediated representations. Second, a standardized procedure allows us to study the interrelations between frames, narratives, and visuals across a large number of items. Even though we have presented a single item in the beginning of this paper, we are ultimately interested in the relations between frames, narratives, and visuals on the macrolevel of societal or media-specific discourses about climate change. This is more easily and economically achieved in a standardized fashion. And third, a standardized procedure allows for etic comparisons that use a common yardstick to compare discourse characteristics from different countries or cultures (Wirth & Kolb, 2004). Only etic comparisons enable us to directly compare levels of prevalence for a particular frame, story structure, or image across contexts. For example, to say that climate-skeptic framing is twice as common in the media of country A, than in the media of country B, presupposes an etic strategy using standardized measures. We acknowledge the specific productivity and value of interpretive approaches in analyzing narratives and visuals (as well as frames, for that matter), but the three advantages mentioned here can only be realized together when we use a standardized approach.

Single-mode and Multimodal Studies of Climate Change Coverage

Our approach focuses on multimodality in print coverage. This refers to the two *representational modes* of information, written text and visual representations, as well as two *communicative modes*, framing and storytelling or narration. An impressive body of empirical studies on media representations of climate change has emerged over the past years both with a background in political communication and environmental communication studies. This research has vastly improved our understanding of media attention cycles to climate change and the drivers of this attention (Schäfer, Ivanova, & Schmidt, 2012), the composition of actors appearing in media reports (COMPON, 2010; Dotson, Jacobson, Kaid, & Carlton, 2012), as well as the topical foci through which climate change is most commonly framed (Shehata & Hopmann, 2012). Recent studies also highlight the use of metaphors in media constructions of the issue (Foust & O'Shannon Murphy, 2009; Nerlich & Koteyko, 2009), the ideological contexts in which media representations operate and which they also help shape (Carvalho & Burgess, 2005), as well as the use and role of visual representations of climate change in media debates (DiFrancesco & Young, 2011; O'Neill, 2013). This variety of theoretical and methodological approaches pays tribute to the complexities of how media content constructs social reality. But it also complicates the comparison and synthesis of empirical evidence and—more importantly—can sometimes obstruct the view on how different representational and communicative modes interact in shaping media representations and their perception by audiences. Studies employing critical discourse analysis (Fairclough, 1989) highlight the intertextual relationships between media texts and the extra-media contexts in which they are produced. A number of single-country studies on climate change coverage using critical discourse analysis (Asplund, 2011; Boykoff, 2008; Carvalho & Burgess, 2005; Carvalho, 2005, 2007; Doyle, 2011a) present elaborate reconstructions of the interconnectedness of textual and contextual elements. Yet we wish to shift the focus on media content and elaborate its multimodal structure. In the existing literature, we find the following three main approaches:

Large-scale quantitative media content analyses

These are used to map and compare national trends in media attention to climate change over time. Schäfer et al. (2012) analyze media attention cycles on climate change in 27 countries between 1996 and 2010. They find that media attention has grown in all countries

but to varying degrees. Correlating their data on media coverage in three countries with real-life events, they conclude that international political events and activities of international environmental NGOs are primary drivers of media attention. Research teams from 13 different countries also employ quantitative content analysis as one component in the research project “Comparing Climate Change Policy Networks” (COMPON). By mapping national trends in media attention to climate change between 1997 and 2008, they find a cross-nationally consistent spike in newspaper coverage on climate change in 2007, most likely due to the release of the Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report (COMPON, 2010). In addition, the various research teams are analyzing the allocation of six pre-established frames (Boykoff, 2008) in newspaper coverage in 2007 and 2008. By coding actors appearing in news reports and their policy stances, the researchers also develop actor–discourse networks for their respective national media samples (COMPON, 2010). As these studies show, climate change coverage is mostly triggered by institutional or communicative events and is characterized by both synchronous global trends and national particularities in terms of intensity and the structure of media debate. But large-scale quantitative approaches are somewhat inept in uncovering the more complex meaning structures of media debate. Eide, Kunelius, and Kumpu (2010), for this reason, combine their standardized analysis of actors and topics in climate change coverage with case studies.

Single-mode case studies

Research on climate change coverage is characterized by a large number of case studies that focus on one particular mode of representation (written text or visual representation) and one communicative mode (framing or narration, although these concepts are not always clearly distinguished). We derive from these studies valuable starting points for our own considerations of combining different modes of media debate into one research tool.

Framing analyses dominate in this area. Trumbo (1996) operationalizes frames as the claims presented in the headline or lead of a news story and finds four general categories that correspond with Entman's (1993) four dimensions of frames. Recent qualitative approaches to climate change frame analysis include an analysis of reports about climate science studies in US newspapers by Antilla (2005) who encounters four discernible frames; a discourse analysis by Billett (2010) who finds that the English-language Indian press frames the issue

along a “risk-responsibility-divide”; a combination of critical and discourse analysis by Gunster (2011) who diagnoses a greater willingness of alternative media to radically criticize established economic and political institutions; and a story frame analysis by Antilla (2010) which shows that *The Washington Post* employs a nationally distinct “debate” frame. Other studies quantify the presence of story frames using precedents from previous studies. Shehata and Hopmann (2012) find strikingly similar media framing in the USA and Sweden; Gordon, Deines, and Havice (2010) diagnose a prevalence of an “ecology/science” frame and “conflict” frame in a Mexico City-based newspaper; and Cramer (2008) identifies the “environmental” frame to be the dominant one in three South African newspapers.

Another stream of research aims at identifying climate change *narratives in media coverage*. Viehöver (2012) lists six typical narratives that dominate media discourse in Germany between 1970 and 2011, for example, the narratives about the “global greenhouse effect as anthropogenic catastrophe” or “climate change as fictional invention.” Krøvel (2011) investigates the media coverage about the climate change conference in Bali 2007. He identifies a range of narratives employed by journalists from various countries of which only very few are prevalent, thus making climate coverage very one-sided. One of the dominant narratives is about a representative from Papua New Guinea stepping up against the USA, which invokes the story of David against Goliath. Krøvel criticizes that the coverage fails to reflect the events in more complex patterns that would allow more critical alternative interpretations. Smith (2012) reconstructs the general public discourse on global warming and especially emphasizes and criticizes the appearance of the “apocalyptic” narrative. Foust and O'Shannon Murphy (2009), via a critical rhetorical analysis of US elite and popular press, also find the media coverage of climate change to be permeated by what they call “apocalyptic framing”—a theme we take up in our own approach. We also propose to clearly distinguish between the two concepts of framing and narration: while frame analysis enables us to understand the exchange and prevalence of *arguments* between actors in media debate, narrative analysis informs us about how the *story* of climate change is arranged and told, involving elements such as suspense, dramatic conflict, emotion, and eventual resolution.

Single-mode studies concerned with the *visual representation* of climate change (for an overview see Grittmann, 2012) refer to what Hansen and Machin (2008) call “the visual turn” (p. 780) in critical discourse analysis based on the work by Kress and van Leeuwen

(1996, 2001). Hansen and Machin (2008) offer a critical discourse analysis of scripts, values, and identities conveyed in a collection of “green issue” images by the picture agency Getty Images and diagnose a reconceptualization of these issues in terms of a culture of branding. Grittmann (2012) chooses a qualitative-iconographic approach in her analysis of visual representations of climate change in German print media. Her systematic image type analysis yields motif categories for causes and consequences of global warming as well as for suggested remedies. Doyle (2011b) provides an analysis of the visual negotiation of the temporalities of climate change in IPCC reports, Greenpeace campaign materials, and BBC television documentaries from 1990 to 2007. O’Neill (2013) quantifies the frequency and type of climate imagery in online newspaper articles and qualitatively analyzes a salient subset of these images for tone and composition revealing two prominent variants, the “contested” and the “distancing” visual frame.

Studies combining verbal–textual with visual analysis

A smaller number of studies combine analyses of verbal–textual and visual elements of media coverage. Dotson et al. (2012) include an assessment of the number of published illustrations in their quantitative content analysis of Chilean newspapers' climate change coverage. Roosvall and Tegelberg (2013) study pictures in conjunction with texts in their content and frame analysis of media coverage of indigenous people in Canadian and Swedish newspapers. In a more standardized approach, Nielsen and Schmidt Kjærgaard (2011) study two online science news services. They compare their results of a deductive frame analysis (i.e., measuring the presence of pre-defined frame types) on the textual level with a visual content analysis coding types and functions of visuals as well as the main theme and the depicted actors. DiFrancesco and Young (2011) quantify depictions of human, natural, and industrial subjects and visuals' geographical context and combine their findings with a quantitative content analysis and an in-depth discourse analysis of image–language relations. These latter studies offer a good starting point for developing a standardized, comparative, multimodal approach to investigating climate change coverage.

Application and Reliability of the Multimodal Coding Scheme

In our own analytical approach to *news frames*, we follow the notion by Entman (1993) that a news frame consists of up to four functional elements: problem definition, causal

interpretation, moral evaluation, and treatment recommendation. The definition of distinct frame features allows for an analytical operationalization that is theoretically valid and facilitates reliable and reproducible empirical analysis (Matthes & Kohring, 2008). *Narration*, in our understanding, is not a discrete characteristic of longer “stories” in media coverage as opposed to shorter, purely factual news items. Rather, we regard narrativity as a gradual concept that can be found, at least potentially, in every news report (Wolf, 2002). Features like dramatization and the use of emotional expressions define the degree of general narrativity in an article; genre clues can tell us what kind of narrative genre an article corresponds to; and actors can be identified as fulfilling particular narrative roles (e.g. victims, villains, heroes). Finally, we regard *news images* as concrete visual content elements of media presentations, which are either used to illustrate a written text or are presented as stand-alone visuals. We specifically look at the depicted content as well as the formal and basic stylistic elements of news photographs. The three representational and communicative modes are measured on different levels of analysis: individual actor-statements within the verbal text of the article for *framing*, photos and graphical depictions for *visual representations*, and the verbal text of the article at large for *narration*. Not all three modes are simultaneously employed in every single news item. In the following, we explicate the categories used in each of these three modes as well as our experiences in measuring them quantitatively.

In developing the coding instrument, we conducted an intensive, qualitative inspection of our cross-national media sample. The codebook was then tested for intercoder reliability on the basis of newspaper articles about the UN climate change conferences in Durban (COP17) and Doha (COP18) that appeared in our sample of German, Indian, South African, and US newspapers (*Süddeutsche Zeitung*, *Frankfurter Allgemeine*, *The Times of India*, *The Hindu*, *Daily Sun*, *The Star*, *The New York Times*, and *The Washington Post*).¹ To select the pretest material from these newspapers, we first randomly sampled 50 issues from the coverage of COP17, which contained 53 news items on the topic. We then sampled 27 additional articles from the coverage of COP18 to ensure that 20 news items were pretested for each of the four countries and to ensure some variety in the sampling base. Article-level measures (not reported in this paper) were pretested on the resulting 80 items.² Four items turned out to be stand-alone visuals that contained only minimal text in the caption. Therefore, 76 textual articles were pretested for the narrative variables. Since

not all articles contained visuals, we randomly sampled additional photographs in order to include enough visual material from all four countries in the pretest ($n = 91$). Finally, 205 actor-statements, which were nested in the 80 original news items, were pretested for the framing variables. Six coders participated in coding the various subsets of the material.

In the Appendix, we report average percent agreement, Brennan and Prediger's kappa (1981) and Krippendorff's alpha (2004) for the framing, narration, and visual representation variables, respectively. Brennan and Prediger's kappa corrects for chance agreement between coders by subtracting from raw agreement a chance agreement term based on the number of available categories. Krippendorff's alpha employs a covariance-based correction for chance (Hayes & Krippendorff, 2007). Krippendorff's alpha is particularly sensitive to coder disagreement in rare categories (Krippendorff, 2011, p. 103), which is not the case for Brennan & Prediger's kappa. Many of our variables concern content elements that occur relatively rarely. Both measures have a range from -1 to 1 , with scores above 0 representing a success of the coder training. The framing and visual representation variables achieved at least a $.70$ level with either kappa or alpha, as appropriate. Intercoder reliability is somewhat lower for the narrative variables with all variables achieving a $.55$ level in either kappa or alpha and all but four variables reaching at least $.60$. As we explain below, we deem this level generally acceptable because of the innovative and exploratory nature of our standardized narrative analysis.

Etic comparisons in cross-national content analyses are based on the assumption that the coding instrument works equally well in all contexts studied. Despite this assumption, very few comparative content studies report country-specific reliability scores as we do in the Appendix. Variations between countries in intercoder reliability are quite limited overall indicating that the large majority of our variables are applicable across countries. Some narrative variables worked less well in two of the four countries (South Africa and the USA) in our pretest. This is an important reminder that despite intensive qualitative inspection of material from all countries and deliberate attempts at constructing context-neutral variables, a residue of cultural bias may persist in groups of coders mainly drawn from one of the countries studied (in this case Germany). Coders may be more familiar with the way an issue is covered in their home country and use their mother tongue more naturally than a foreign language. This may mean that with respect to some language-based content features coders agree somewhat more strongly in their coding of material

from their home country than from other countries. To be sure, this is no argument against etic comparison as such because emic comparisons (understanding cultures “from within”) face an even greater challenge to ensure comparability of findings. But our pretest experience serves as a reminder that comparative content analysts should always be aware of such potential cultural bias and report country-by-country measures of reliability. Once documented, researchers can respond to cross-national differences in reliability by anything from making verbal caveats to omitting affected variables (or countries) from the comparison.

News Frame Analysis

In identifying frames, we advocate using an inductive-quantitative approach to allow for the detection of frame compositions not previously theorized and to facilitate the analysis of larger media samples. We take into account that media debates on climate change are likely to exhibit discrete discursive patterns that would go unnoticed if preset frames were used. We employ the approach developed by Matthes and Kohring (2008): Frames are not measured holistically but the main elements of frames—problems, causes, moral evaluation, and remedies—are operationalized as variables that are measured individually. A hierarchical cluster analysis of actor-statements based on the detected frame elements then yields systematic patterns of the actors' groupings across articles. These groupings are then interpreted as frames. This approach promises high theoretical validity since we actually measure what is conceptualized in the definition of frames. The inductive approach does not limit frame identification to researchers' pre-existing knowledge and enables us to detect the emergence of new frames over time. Of course, detecting the co-occurrence of frame elements is not tantamount to reconstructing meaningful relationships between them. Researchers have to infer meaning from the co-occurrences found through cluster analysis. And the number of different clusters is not always unambiguously clear (Matthes & Kohring, 2008, p. 269). But only a disaggregated coding of frame elements and subsequent statistical clustering can cover large amounts of media texts and facilitate etic comparison. The Appendix shows our definitions of frame elements. Most variables are self-explanatory, but note that we understand the frame element “moral evaluation” as the attribution of responsibility for climate *action* because more general moral evaluations of the issue were absent from the media texts.

Focusing on the strategic aspects of issue framing we are interested in which news actors offer which frames. Journalists are considered important news actors in our analysis for two reasons: first, they act as gatekeepers in deciding which extra-media actors (or “frame sponsors,” Gamson & Wolfsfeld, 1993) will have the opportunity to promote their frames in a news item (“frame sending,” Brüggemann, 2014). Second, a journalist also “frames the frames provided by external actors” and thus engages in “frame setting” (Brüggemann, 2014, p. 66; see also Ferree, Gamson, Gerhards, & Rucht, 2002, pp. 9–13). Consequently, our coding instrument treats journalistic statements as self-contained actor-statements in the same way that it treats statements by external actors.

Actor-statements cannot be defined *ex ante* by formal criteria but by semantic criteria (Gerhards & Schäfer, 2006, p. 72): an actor-statement consists of any number of related direct or indirect quotes by one and the same actor within an article. This definition also includes positions mentioned by the author of the article but clearly attributed to an external actor, i.e., assessments apparently based on prior communicative acts such as press releases or research reports. If the author of the article mentions *noncommunicative* undertakings of an actor, the statement is attributed to her and not regarded as a self-contained statement (e.g., “Mexico is raising efficiency standards” is not an actor-statement by “Mexico,” but by the journalist). Coders achieved a satisfactory level of almost 90% agreement in identifying actor-statements.

For every actor-statement the actor's name, type (individual or collective actor), occupation or office, and origin as well as the type of quotation (direct or indirect), and the length of the actor-statement are coded. Coders also examine whether the actor denies the reality and/or the problematic character of climate change to ascertain the presence of so-called climate skeptics in news coverage. However, in the dailies we study here *explicit* denial of the reality of climate change or its problematic character is virtually absent so that these two variables could not be coded reliably (see Appendix).³ The type of “we” reference measures the scope of the communities to which actors refer by using the word “we” (or “us,” “our”) and serves as an indicator for the transnational character of the debate that was coded quite reliably. The frame element variables also work well overall and in each country, with the exception of the “responsibility for action against climate change” variable. This variable does not work equally well across the countries studied here, and other studies have also reported modest levels of reliability for attributions of responsibility

(Gerhards, Offerhaus, & Roose, 2007; Peters & Heinrichs, 2005). Given our pretest results, this variable must be treated with reservation, particularly in cross-country comparison.⁴

Narrating Climate Change

McComas and Shanahan (1999) explain: “humans use narratives to weave together fragmented observations to construct meanings and realities” (p. 36). Accordingly, narratives can also be used by journalists as organizing principles that integrate actors and their viewpoints, objects, and abstract concepts into a coherent news story thus making the issue more comprehensible and tangible for audiences. Bird and Dardenne (1997) characterize the relationship between news and narration as follows:

The facts, names, and details change almost daily, but the framework into which they fit—the symbolic system—is more enduring. And it could be argued that the totality of news as an enduring symbolic system “teaches” audiences more than any of its component parts, no matter whether these parts are intended to inform, irritate, or entertain. (p. 335)

Thus, we do not limit our understanding of narration to the presence of an Aristotelian sequential arrangement (cf. Hinyard & Kreuter, 2007). Instead, we consider a prototypical narrative as consisting of a set of factors which Wolf (2002, p. 35) calls “narratemes.” Narration can be understood as a *gradual* concept. A single story does not have to display all possible narratemes to constitute a narrative. Factual journalistic news stories in an inverted pyramid style can also contain narratemes to varying degrees. We analyze narration by measuring: (1) the degree of narrativity in a news story; (2) the narrative genre in which the story is written; and (3) the presence of agents assuming specific narrative roles.

(1) To measure the *degree of narrativity* in a news story, we refer to the four main narrative characteristics suggested by Glaser, Garsoffky, and Schwan (2009) which they deduced from narrative theory and psychological models of narrative impact (e.g., Brewer & Lichtenstein, 1981; Green, Strange, & Brock, 2002; Gerrig, 1993): (a) dramatization, referring to the traditional story structure with a beginning, middle, and end; (b) emotionalization, referring to the presentation of information in an emotional way; (c) personalization, signifying that narratives are always about agents, mostly humans, causing events; and (d) fictionalization, referring to the inclusion of fictional (e.g., prognostic) content. To investigate whether these main characteristics can be properly detected in our diverse,

multilingual media material we conducted a qualitative pre-study to assess their applicability for the study of news reports. Based on our experiences, several adaptations were necessary. We re-conceptualize emotionalization as “emotion” and code its presence when the emotion of an actor is explicitly referred to in the news story. Personalization is relabeled “narrative personalization” to avoid confusion with the established understanding of the concept of personalization in political communication studies (for an overview see Van Aelst, Sheafer, & Stanyer, 2012). The characteristic of narrative personalization is coded as present when the story focuses on agents (individual, collective, or institutional actors) who either cause events or are affected by circumstances caused by other agents, systems, or nature. Values on these four features are combined to construct an index of narrativity for each news item.

(2) Our operationalization of *narrative genres* is based on “genre guesses” described by Smith (2012) and Schwarze (2006). Smith (2012, p. 747) explains that uncertain events and real world facts are “clues” that need “genre guesses” so that meaning can be constructed by reducing complexity and providing implications for the formation of opinions. Smith identifies four genres: (a) low mimetic (a story presents business as usual, an unexciting routine); (b) romantic (a hero overcomes an obstacle and triumphs over adversity); (c) tragic (human striving is futile and all efforts fail in the end); and (d) apocalyptic (the struggle for the future destiny of the planet or civilization is central). In a somewhat similar typology Schwarze (2006) distinguishes three narrative genres: (a) melodrama, (b) comedy, and (c) tragedy. In applying the typologies to our material during the pre-study we realized that in news texts Schwarze's comedy and tragedy genres coincide with Smith's (2012) romantic and tragedy genres, respectively. A consolidated typology yields the following five genres:

- (a) low mimetic
- (b) tragic
- (c) romantic/comedic
- (d) apocalyptic
- (e) melodramatic

However, narrative genres are not always that distinct and clearly identifiable holistically in journalistic work. Therefore, we used the catalog of narrative genres as a starting point for a

disaggregated operationalization. These come closer to the aforementioned “genre clues” that inform audiences about which genre might be present. Narrative genres are thus broken up into three properties that are coded independently: “overall theme,” “tone,” and “(expected) outcome” of the action narrated in the news item. For “overall theme” we translated the genre catalog into more tangible categories that summarize the kind of overall progression of events in the story, assigning it an abstract and issue-independent label: the low mimetic genre translates into “everyday business,” the tragic genre into “failure after struggle,” the romantic/comedic genre into “triumph over adversity,” the apocalyptic genre into “struggle over destiny of planet or civilization,” and the melodramatic genre into “(social/political) conflict.” The “tone of a story” is measured by the eponymous variable in which coders have to ascribe one of five different tones as being dominant in a story: (a) fatalistic, (b) optimistic, (c) unexcited/neutral, (d) passionate, and (e) pessimistic. Finally, we measure the “(expected) outcome” by coding whether a story's conflict is (or is expected to be) fixed or not.

(3) The third part of the narrative analysis deals with character specifications and identifies classical *narrative roles* in the story: “victim,” “villain,” and “hero” which Schwarze (2006) explicitly mentions in combination with the melodramatic genre. Other genres can be characterized by such actor constellations as well (cf. Krøvel, 2011). Every narrative role can only be coded once in every news story. If that is the case, we code whether the particular role is assumed by an individual, collective, or institutional actor, and record the name or designation of the actor. Finally, the type of action in which the character engages is coded.

Intercoder reliability reached moderate levels, which leaves room for improvement in future studies. We deem these levels appropriate given our exploratory undertaking of measuring narrative characteristics in news items quantitatively. As reported in the Appendix, however, not all narrative variables worked equally well in all countries. Reliability measures for the German and Indian subsamples are satisfactory with above average values. This is probably due to the coders' familiarity with the language in the case of Germany, which facilitates the detection of smaller linguistic nuances that are crucial for the identification of narrative cues. In the case of India we found that the style of coverage was quite expressive. Clear language and messages obviously enable a relatively unambiguous interpretation even by culturally distant coders. But especially in the South

African and US subsamples, quite a few narrative variables did not reach the liberal benchmarks. In both cases, narrative elements in news texts turned out to be more difficult to detect. We attribute this to the fact that both US newspapers and one from South Africa (*The Star*) featured quite fact-based news discourse replete with technical details and specialized background information but few overt narrative features. The other South African newspaper (*Daily Sun*) has a more tabloid style where articles are generally much shorter and less sophisticated offering fewer opportunities for narrative. What worked well across all countries is the identification of narrative personalization in general and of the acting agents that can be categorized as victims or heroes in particular. These variables represent core concepts of narration and can thus be used for multimodal analysis across countries. Other variables have to be treated with more care. We still urge researchers to take our proposal for a quantitative analysis of narratives in news coverage as an initial step that can be further elaborated. We also suggest combining this standardized approach with qualitative analysis of at least parts of the material to further validate results and deepen the understanding of narrative in environmental news discourse.

Analysis of Climate Change Visuals

DiFrancesco and Young (2011) argue “that visuals and text should be considered together as 'co-constructors' of environmental narratives that, in combination, convey complex and multi-dimensional messages to media consumers” (p. 520). Visuals can serve to dramatize environmental issues and “provide a kind of cognitive short cut compressing a complex argument into one that is easily comprehensible and ethically stimulating” (Hannigan, 1995, p. 77ff.). To understand modes of co-construction of meaning, a simultaneous analysis of language and visuals in print media coverage is indispensable. But multimodal analyses of visuals and their verbal context are still not the norm in media content research (Lobinger, 2012, p. 242).

Rodriguez and Dimitrova (2011) propose a four-tiered model of identifying and analyzing visual frames, distinguishing between the denotative, stylistic-semiotic, connotative, and ideological content of visuals. In a large-scale quantitative content analysis, the first two levels can be analyzed with sufficient validity and reliability: (1) visuals as *denotative* systems, referring to the objects and discrete elements actually depicted in the visual; and (2) visuals as *stylistic-semiotic* systems, referring to the stylistic choices and

pictorial conventions employed in a visual's design (Rodriguez & Dimitrova, 2011, p. 57). Contrary to O'Neill (2013), we clearly distinguish denotative—i.e., nonassociative—elements from even partly connotative attributes such as causes, impacts, or solutions of climate change that cannot be seen directly in the visual. As Messaris and Abraham (2001) point out, visuals lack an explicit propositional syntax so that connections and causal relationships are subject to the viewer's interpretation of implied meaning. Instead of attempting to code connotative attributes of news visuals, we code denotative elements only and later derive connotative meanings from the interrelations we find between denotative picture content and issue frames and narrative elements in the accompanying verbal news text.

Visuals encompass photographs and photomontages, cartoons and caricatures, charts, and graphs and maps, as well as logos and vignettes. The type as well as the size and source are coded for all visuals. The subsequent visual frame analysis is conducted for photos and photomontages only.

On the denotative level, we ask “who or what is actually shown in the photo?” Hence, we analyze which types of actors are shown in the photo and also code displays of environments, technological objects, or infrastructure, as well as PR stunt installations. For every type of person or object we code whether they are depicted or not depicted.

On the stylistic level, we include the pictorial convention of social distance (Bell, 2001) in our analysis by measuring the field size of the photograph. In doing so, we follow established definitions of film and television grammar as described by Kress and Van Leeuwen (1996, p. 130), although we use a classification with three instead of seven dimensions, which we deem sufficient for the purpose of our study.⁵ By analyzing camera angles (low-, regular-, and high-angle shots) we check for the occurrence of dominant (low-angle) or submissive (high-angle) depictions of people and objects (Hardin, Walsdorf, Walsdorf, & Hardin, 2002). The visual variables mostly worked in all four countries (see Appendix), with a few exceptions where an individual variable registered a somewhat lower score in an individual country.

Conclusion

We have proposed a research design that integrates three representational and communicative modes into one multimodal coding instrument and facilitates comparative research across media types, news genres, and national media debates to unlock macrolevel

interrelations between these three modes. We do not have enough space to report results in this paper but an example might serve to illustrate the potential of our approach. One common combination of frame elements includes the global temperature rise as the main consequence of climate change (problem), burning fossil fuels as the attributed cause, and the usage of clean energy as the solution. The wider significance of this frame combination, however, is created by the narrative weaved around it. This becomes especially obvious if we look at the overall theme and tone that the narrative adds to articles that exhibit this kind of framing. In the coverage of COP17 in Durban in 2011, four articles from newspapers in three different countries contextualized the same frame combination with four distinctly different narratives.

The German newspaper *Frankfurter Allgemeine* published an article on the first day of the negotiations that traces the failures in current climate change politics but uses a passionate tone to urge leaders to now take the necessary steps to persist in this struggle over destiny (overall theme). By contrast, the *Hindu* from India published an article during the first week of the conference entitled “A Glimmer of Hope at Durban” that thematically covers the conflicts that have emerged over time at previous COPs but, as the headline suggests, the article is marked by an optimistic tone as it sees prospects for resolving these conflicts. Quite a contrasting narrative is offered by an article published in South Africa's the *Star* right after the conference ended, in which the author argues in a fatalistic tone that the conference clearly was a failure that did not leave much to proceed with and that the South African leadership is partly responsible. Another article from the *Hindu* published a few days after the conference does not see many groundbreaking accomplishments either but reports this in an unexcited/neutral tone showing little surprise at the result and emphasizing a “business as usual” theme.

Four different narrative themes and tones weaved around the same combination of frame elements—this demonstrates that (1) frame analysis alone would not have grasped the narrative tone and theme behind the issue frames, and (2) that narrative analysis alone would not have captured the common thread of issue frames that persists despite the different narratives. Thus, frame analysis would paint a much too uniform picture of the news items, whereas narrative analysis would overrate the differences between them. Both single-mode approaches would have missed the decisive “spin” contained in the multimodal

interrelations. But it is these interrelations that guide readers' perceptions and that should therefore gain more scholarly attention.

Multimodal repertoires can feature in explanatory research in at least two ways. On the one hand, they can be explained by context-specific conditions such as specific journalism cultures and national discourse cultures that create variation despite a nearly identical news landscape (the COPs as global staged political media events) and information infrastructure (e.g., the dominant position of news wires and photo agencies). In this uniform context, journalists' reporting routines and national peculiarities in how climate change is discussed determine which configurations of selected actor-statements and visuals as well as narrative elements actually reach audiences.

On the other hand, multimodal repertoires of climate change discourse also condition the potential practical relevance for media users. When a particular frame can be interwoven with different narratives, as we have shown above, and combined with varying images, the persuasive effects of that frame depend on the specific configurations of these elements. The centrality of multimodality in the reception process was highlighted by Shen et al. (2014) whose experimental results confirm that different combinations of frames and narratives influence people's issue attitudes and other cognitive responses differentially. Disentangling these contingencies in media effects studies constitutes one of the most stimulating challenges for future research on mediated climate change communication.

Our research design complements qualitative research on discursive patterns by offering a means to conduct large-scale analyses of media discourse on climate change that are directly comparable across contexts. Large-scale, cross-national comparative media content analyses using our instrument will also help ascertain the degree to which earlier case study results hold across diverse settings and will help reveal national and outlet peculiarities and key contextual factors (Livingstone, 2003). Future methodological development and empirical research should extend our approach to audio and audio-visual media content. While written transcripts can be analyzed for frame elements and narrative features with our existing categories, the additional communicative elements of sound and/or moving images necessitate further categories which account for criteria such as voice-overs, sound bites, or camera movements. We hope to have paved the way for such increasingly ambitious multimodal research in environmental communication.

Funding

This research was supported by the German Research Foundation (DFG).

Notes

1. Both the codebook as well as detailed examples of how newspaper articles were coded for all three modes can be found in the Online Appendix at <http://climate.uni-mannheim.de/>
2. Of these, 30 were published in the Politics section of the respective newspaper, 16 in Opinion or Letters to the Editor, 15 in Economy/Business, 8 in Science/Technology, 3 in Local News, 2 in 'Human Interest', and 1 in a Weekend Section. Five articles came from the Daily Sun (South Africa), which does not use a section structure. The length of articles varied between 25 and 1.744 words with an average length of 557 words. News items were sampled in four-week periods starting one week before the respective COP and ending one week after it. For digitally available newspapers, the following search string was used: (climate change OR global warming OR Durban OR Doha OR greenhouse effect OR Kyoto Protocol OR Climate summit OR Climate conference OR Climate talks OR Climate politics OR Climate science). Nondigital paper editions were scanned manually by looking for articles that featured any of the search words in their headlines or lead paragraphs. For both groups of items, a manual relevance check was performed to ensure sample homogeneity.
3. The very large discrepancy between alpha and kappa values can be explained by the fact that the denial features were coded very rarely, and there was some coder disagreement in these rare cases.
4. Kappa is inflated here because the number of possible categories was very high (225 countries/country groups/regions), and alpha is relatively low because such attributions of responsibility are relatively rare.
5. We distinguish between the standard shots of "close-up" (shows face and shoulders of the human figure or less), "medium shot" (ranges from showing the human figure in full but occupying almost the complete height of the picture frame to showing the human figure from the waist up), and "long shot" (in which the human figure occupies about half the height of the picture frame or less).

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Appendix. Intercoder reliability overall and across countries^a

Variables	Overall				Germany				India				South Africa				United States			
	N	PA	K _n	α	N	PA	K _n	α	N	PA	K _n	α	N	PA	K _n	α	N	PA	K _n	α
<i>Actor-statements</i>																				
Type of actor		95.4	.93	.86		99.0	.99	.91		91.4	.87	.83		100.	1.00	.79		95.3	.93	.85
Occupation/office of actor		82.3	.82	.80		89.4	.89	.84		83.7	.84	.81		89.0	.89	.86		89.0	.89	.75
Origin of actor		85.3	.85	.82		93.2	.93	.91		84.0	.84	.80		86.3	.86	.85		81.5	.82	.66
Type of quotation		93.9	.91	.91		94.4	.91	.91		94.8	.93	.92		96.4	.94	.95		93.0	.90	.89
Length of statement	205	75.9	.70	.83	55	76.3	.70	.86	42	81.0	.76	.76	30	77.5	.73	.89	78	73.5	.68	.84
Type of 'We' reference		88.6	.85	.62		97.7	.98	.73		90.3	.89	.65		80.5	.79	.66		86.5	.85	.54
Denial of reality of climate change		97.1	.96	.04		98.9	.99	-.01		94.4	.92	-.02		99.2	.99	.00		97.1	.96	.09
Denial of problematic character		95.9	.95	.11		98.9	.99	-.01		94.4	.92	-.03		97.8	.97	.49		95.1	.93	.08
<i>Problem definition</i>																				
Consequences of climate change ^b	1230	87.5	.86	.60	330	90.0	.88	.73	252	92.5	.92	.51	180	94.3	.93	.72	468	81.9	.79	.51
<i>Causal interpretation</i>																				
Causes of climate change ^c	1025	95.3	.94	.56	275	94.2	.93	.62	210	93.0	.92	.49	150	94.2	.93	.67	390	96.7	.96	.48
Countries responsible for climate change because of greenhouse gas emissions	205	98.2	.98	.69	55	98.3	.98	.78	42	96.8	.96	.46	30	98.4	.98	.75	78	99.2	.99	.66
<i>Moral evaluation</i>																				
Countries responsible for solving the problem by reducing their greenhouse gas emissions	205	97.7	.98	.43	55	96.4	.96	-.01	42	95.8	.96	.62	30	97.9	.98	-.01	78	98.9	.99	.40
<i>Treatment recommendation</i>																				
Remedies for climate change ^d	1435	93.1	.92	.56	385	94.4	.93	.67	294	90.2	.89	.40	210	90.1	.89	.62	546	94.6	.94	.56
<i>Narration</i>																				
<i>Narrativity</i>																				
Dramatizationg	76	80.5	.62	.60	18	91.7	.84	.80	19	84.2	.68	.50	19	72.2	.44	.49	20	80.0	.60	.60
Emotiong		81.1	.62	.55		89.8	.80	.78		93.7	.86	.84		75.6	.52	.30		71.0	.42	.37
Narrative personalizationg		82.5	.66	.64		84.3	.68	.70		80.0	.60	.60		77.8	.56	.40		88.0	.76	.71
Fictionalizationg		81.7	.64	.57		75.9	.52	.45		86.3	.72	.54		93.3	.86	.86		70.0	.40	.38
<i>Narrative genre</i>																				
Theme	76	63.4	.56	.56	18	66.7	.60	.60	19	70.5	.65	.60	19	57.8	.50	.47	20	61.5	.55	.50
Tone		66.6	.60	.57		75.0	.70	.65		67.9	.60	.54		70.6	.65	.57		59.5	.52	.46
Outcome		71.5	.63	.56		72.2	.63	.55		74.2	.65	.47		72.8	.64	.60		69.5	.60	.52
<i>Narrative characters</i>																				
Victim presentg	76	79.1	.58	.57	18	87.0	.74	.63	19	80.0	.60	.56	19	83.3	.66	.64	20	81.0	.62	.54
Victim—type of actor		78.1	.67	.54		87.9	.82	.64		76.8	.66	.55		82.7	.75	.63		74.5	.61	.43
Victim—name		81.8	.81	.65		87.0	.86	.66		79.5	.79	.61		83.3	.76	.70		82.0	.81	.61
Victim—action taken		74.3	.71	.47		85.2	.83	.6		69.0	.65	.41		79.0	.45	.56		73.0	.70	.43
Villain presentg	76	78.8	.58	.60	18	88.9	.78	.73	19	81.1	.62	.61	19	75.6	.52	.51	20	77.0	.54	.46
Villain—type of actor		71.3	.57	.59		81.5	.73	.72		73.7	.61	.61		66.1	.49	.50		71.5	.58	.40
Villain—name		77.5	.77	.73		88.9	.88	.86		76.8	.76	.69		76.7	.75	.67		81.0	.80	.63
Villain—action taken		62.7	.58	.49		77.8	.75	.69		65.8	.62	.47		51.1	.45	.28		67.5	.64	.38
Hero presentg	76	81.6	.64	.56	18	92.6	.86	.81	19	86.3	.72	.72	19	81.1	.62	.31	20	80.0	.60	.46

Variables	Overall				Germany				India				South Africa				United States			
	N	PA	K _n	α	N	PA	K _n	α	N	PA	K _n	α	N	PA	K _n	α	N	PA	K _n	α
Hero—type of actor		78.0	.67	.53		89.8	.85	.78		82.1	.73	.67		80.6	.72	.34		75.0	.63	.38
Hero—name		80.8	.80	.58		89.8	.90	.79		77.4	.76	.61		82.8	.81	.44		79.5	.79	.49
Hero—action taken		80.8	.79	.57		92.6	.92	.81		84.2	.82	.73		80.6	.79	.36		79.0	.76	.49
<i>Visuals</i>																				
Type of visual	91	91.6	.91	.84	18	92.0	.91	.78	31	85.4	.83	.75	20	93.0	.92	.80	22	100.0	1.0	1.0
Source of visual		77.2	.76	.74		67.8	.66	.61		69.2	.67	.57		85.3	.84	.79		97.3	.97	.93
<i>Denotative level</i>																				
Objects depicted in photoe	63	84.3	.83	.74	13	84.7	.84	.79	16	87.6	.87	.71	20	86.5	.86	.73	14	79.7	.78	.71
Persons depicted in photof		95.6	.95	.91	13	98.4	.98	.95	16	93.1	.92	.86	20	95.3	.94	.90	14	98.5	.99	.96
Origin of depicted persons	63	70.0	.70	.63	13	51.8	.52	.41	16	62.3	.62	.44	20	80.6	.81	.74	14	81.6	.82	.73
Activity of depicted persons		77.1	.75	.73		67.2	.64	.60		73.1	.71	.68		85.1	.84	.79		69.9	.79	.70
Location of depicted scene	63	81.4	.81	.77	13	77.7	.78	.71	16	80.8	.81	.70	20	88.4	.88	.80	14	83.0	.83	.68
<i>Stylistic-semiotic level</i>																				
Camera angle	63	81.8	.76	.65	13	64.6	.53	.47	16	88.7	.85	.83	20	85.5	.81	.59	14	87.4	.83	.80
Distance/field size		76.2	.68	.75		59.8	.47	.48		75.1	.67	.78		82.2	.76	.83		86.2	.81	.77

Note: Cell entries are average percent agreement (PA), Brennan and Prediger's kappa (κ_n), and Krippendorff's alpha (α) values indicating agreement between coders. N is the number of coding decisions in the pretest on which the calculations are based.

^a For computing and reporting the agreement coefficients for the consequence, cause, and remedy variables as well as for objects and persons depicted in photos the variables were re-coded into their respective categorical variables, e.g., the five binary cause variables were re-coded as five parameter values of one categorical variable “cause of climate change.” The number of coding decisions that feed into the reliability scores for such composite categorical variables increases accordingly (in this case 5 × 205 = 1025 coding decisions).

^b The following variables could be coded (0 = not mentioned, 1 = mentioned): Extreme weather events, melting ice/glaciers or rising sea levels, economic opportunities, economic difficulties and hardships, societal consequences.

^c The following variables could be coded (0 = not present, 1 = present): Natural causes, burning of fossil fuels/greenhouse gas emissions, deforestation, colliding national interests, other cause.

^d The following variables could be coded (0 = not present, 1 = present/endorsed, 2 = present/rejected): No action, clean energy, reforestation and avoided deforestation, adaptation in agriculture, adoption of legally binding, all-inclusive emissions treaty, more focus on ground level/“grassroots” efforts, financial assistance to disadvantaged countries.

^e The following variables could be coded (0 = not depicted, 1 = depicted): Urban landscape, green landscape/ mountain/ lake, ocean/ocean coast, snow/ ice/ glacier, desert or steppe, polar bear, other animal, transportation or conventional traffic, agriculture, conventional energy generation, green technology, other technology, PR stunt installation.

^f The following categories could be coded (0 = not depicted, 1 = depicted): Political actor, NGO representative/environmental activist, business/industry representative, scientist, celebrity, police/security personnel, average person.

⁸ Denotes binary variable (0 = not present, 1 = present).