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Climate Change Discourse.
Remediation and Recontextualisation in News and Social Media

Edited by Katherine E. Russo and Cinzia Bevitori

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Vol. 26, issue 1 (2022)

Marina Niceforo

Linguistic Remediation of the IPCC's Sixth Assessment Report in Twitter Discourse on Climate Change

Abstract: In the age of global environmental crisis, information about climate change is disseminated through a wide range of channels in a variety of textual genres, from scientific publications and normative texts to news, or blogs. Climate-related discourses available on social media offer valuable examples of remediation of technical-scientific information addressed to large groups of non-experts.
In line with the popularisation of scientific knowledge (Gotti 2014), the present study investigates the linguistic remediation of specialised concepts from the sixth IPCC report on climate change (released by the UN last February 28th, 2022) in a corpus of about 4200 tweets by international environmental organisations, institutions, and other public figures. The dataset, retrieved via web scraping tools, is analysed using qualitative analysis software (NVivo) to observe thematic and linguistic features of remediated discourse – in particular, about the four key terms and notions risk, vulnerability, adaptation, and resilience.
While computer-mediated discourse analysis (Herring 2004) and ecolinguistics (Stibbe 2015) provide the theoretical framework for this study, risk communication (Russo 2018, Bevitori and Johnson 2022) and appraisal theory (Martin and White 2005) enable considerations of expressive language and effective communication, authors' critical positioning, circulation of scientific information, and possible positive impact of remediated discourses on people's environmental attitudes and behaviours.

Keywords: *remediation, climate change discourse, social media discourse analysis, computer-mediated discourse analysis, ecolinguistics, popularisation*

1. Introduction

In recent years, the global climate crisis has started to show its more visible and violent impacts on the planet's ecosystems and on the life of people, especially those living in vulnerable areas. Rising temperatures and heatwaves, prolonged droughts, wildfires, floods, and resource scarcity, among other phenomena, have become more frequent and more intense in many parts of the world, affecting, and in some cases, heavily disrupting several human activities. The nefarious consequences of climate change have long been predicted by scientists and researchers worldwide, and scientific information on this subject, supported by largely shared evidence, is constantly produced by and within international institutions, bodies, and organisations. Among these, the United Nation's Intergovernmental Panel on Climate Change (IPCC) contributes specifically to the assessment of knowledge and science related to climate change.

Established in 1988, the IPCC provides "a framework for governments, scientists and IPCC staff to work together to deliver the world's most authoritative scientific assessments on climate change".[1] The Panel, which includes representatives of member governments and groups of scientists (Working Groups) elected periodically, has so far issued six assessment reports addressed to governments, which are generally intended as a reference framework for developing climate-related policies. The reports

[1] IPCC, "Summary for Policymakers", in Hans Otto Pörtner et al., eds., *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge U.P., 2022).

are drafted upon extensive review of relevant scientific publications in the field, and deal with aspects such as the physical science basis of climate change (Working Group I), climate change impacts, adaptation and vulnerability (Working Group II), and mitigation of climate change (Working Group III). The Sixth Assessment Report was approved and released on February 28th, 2022, with two main contributions by Working Groups II and III, respectively: *Climate Change 2022: Impacts Adaptation and Vulnerability*, and *Climate Change 2022: Mitigation of Climate Change*. With updated or new definitions since previous reports, it focuses specifically on the impacts of climate change, looking at ecosystems, biodiversity, and human communities at the global and regional level; moreover, it reviews vulnerabilities and the capacities and limits of the natural world and human societies to adapt to climate change.

Over the years, the attention of media and laypeople to the IPCC's reports has increased due to a wider coverage of climate change in news and popular discourse, as well as more frequent political discussion on the issue – although it could be argued that public interest in the subject has been growing *thanks to* data presented in the reports. The impact of old and new media in the circulation of climate-related information is obviously a determining factor; on the one hand, traditional media such as television, radio, and newspapers

> have … been important meditators of the climate change discourse … determining whether the potential connections between climate change and the events will be discussed, and how. This has historically made the so-called legacy media hugely influential when it comes to shaping public understanding of climate change and the new era of extreme weather that it may be ushering in.[2]

On the other hand, social media (also SM henceforth), and in particular social networking sites allowing interaction between participants[3] have opened to new practices of communication, knowledge distribution, and remediation, the latter referring to the "recontextualisation … reconceptualisation, and intralinguistic translation of exclusive expertise in knowledge that is suitable to the background of the addressee".[4] In response to the urgency of climate change events, the communicative affordances of social media offer a very interesting point of departure to analyse popularisation and remediation practices, particularly in user-generated discourse. In line with traditional distinctions between experts, initiates, and non-experts in specialised communication,[5] social media authors (whether writing on behalf of institutions or as individuals) configure as experts or initiates addressing other initiates or non-experts in a given field or topic. In online remediation, a "shift from subject-orientation to addressee-/audience-orientation … and from objectivation to subjectivation"[6] is observed. Moreover, it is also suggested that recontextualisation[7] of scientific knowledge is a form of adaptation to the appropriateness of the new communicative event and its usually informative purpose –[8] hence placing the focus on content rather than form, messages rather than concepts, and actors rather than objects. At a linguistic and communicative level, remediation processes of this kind require departing from the

[2] Nicholas Roxburgh et al., "Characterising Climate Change Discourse on Social Media During Extreme Weather Events", *Global Environmental Change*, 54 (2019), 51.
[3] Ruth Page et al., *Researching Language and Social Media: A Student Guide* (London: Routledge, 2022), 7.
[4] Michela Canepari et al., eds., *The Many Facets of Remediation in Language Studies* (Beau Bassin: LAP LAMBERT Academic Publishing, 2017), 9.
[5] Maurizio Gotti, "Reformulation and Recontextualization in Popularization Discourse", *Ibérica*, 27 (Jan-Jun 2014), 24.
[6] Canepari et al., *The Many Facets of Remediation in Language Studies*, 9.
[7] Helena Casalmiglia, and Teun A. Van Dijk, "Popularization Discourse and Knowledge About The Genome", *Discourse & Society*, 15.4 (2004), 370.
[8] Gotti, "Reformulation and Recontextualization in Popularization Discourse", 22.

typical features of intra- and inter-specialist communication (all widely covered in literature),[9] of which more will be said in the following sections. Considerations of stance and evaluation[10] can also be central in discussions about remediation (especially when communications are reformulated by non-neutral addressers), as well as aspects linked to risk communication – which also "faces the challenge of conveying specialized information to lay people, [since] bridging the gap between experts and lay decision-makers may be extremely difficult".[11] With reference to risk communication, climate change is frequently "depicted in apocalyptic tones", either for journalists or as instrumentalisations of the subject.[12] However, it is important to underline that "what defines risk in opposition to uncertainty and apocalypses, is the possibility of assessing event probabilities",[13] as all IPCC's reports prove.

The present paper aims to observe how core concepts from the 6th IPCC assessment report (AR6 from now on) are remediated and communicated in social media user-generated discourse. The study moves from the definitions of *risk*, *vulnerability*, *adaptation*, and *resilience* introduced in the report to investigate the discursive construction of these concepts in online popularising discourse. The analysis considers a corpus of about 4200 tweets published between February 28th, 2022 (release date of AR6) and March 27th, 2022; it starts from a thematic assessment of remediated discourse on Twitter, and subsequently focuses on remediation at a lexical, syntactic, and textual level – assuming the IPCC report as the source specialised text. Furthermore, the paper offers a critical reflection on how strong ideological positioning affects remediation processes and people's perception of climate change issues. More specifically, social media communication is hereby investigated as a driver of societal change, opening to a reflection on the impact of digital discourses on people's values, attitudes, behaviours, and lives in general. While the qualitative nature of this study and the mixed nature of the dataset do not allow us to make assumptions on effective climate change and risk communication, it is suggested that linguistic remediation can be more appealing to laypeople and inspire positive change because of certain discursive features.

2. Theoretical framework and literature review

When investigating (digitally-mediated) discourses about climate change, it could be useful to implement narration-oriented frameworks – since remediation is strictly connected to the ways in which stories are constructed through language and discourse. It must be noted that this subject is naturally interdisciplinary since it embraces multiple conceptual dimensions (economic, social, environmental, etc.) and thematic layers; for this reason, climate-related discourses are typically intertextual and tend to break genre distinctions.[14] Given their multi-thematic nature, discourses that originate within particular social fields or institutions may be recontextualized in others "as 'colonization' of one field or institution by another, but also as 'appropriation' of 'external' discourses,

[9] Among others, see John M. Swales, "Discourse Analysis in Professional Contexts", *Annual Review of Applied Linguistics* 11 (1990): 103-114; Maurizio Gotti, *Investigating Specialized Discourse* (Bern: Peter Lang, 2008).
[10] James R. Martin, and Peter R. White, *The Language of Evaluation*, Vol. 2 (Basingstoke: Palgrave Macmillan, 2003).
[11] Katherine E. Russo, *The Evaluation of Risk in Institutional and Newspaper Discourse: The Case of Climate Change and Migration* (Napoli: Editoriale scientifica, 2018), 20.
[12] Mike Hulme, "Mediated Messages about Climate Change: Reporting the IPCC Fourth Assessment in the UK Print Media", *Climate Change and the Media* (2009), 117-128.
[13] Russo, *The Evaluation of Risk in Institutional and Newspaper Discourse*, 21.
[14] For an overview of climate-related discourses, see for example: Richard Alexander, *Framing Discourse On The Environment: A Critical Discourse Approach*. (London: Routledge 2010); Reiner Grundmann, and Ramesh Krishnamurthy, "The Discourse of Climate Change: A Corpus-based Approach", *CADAAD Journal* 4.2, 2010, 125-146; Kjersti Fløttum, and Øyvind Gjerstad, "Narratives in Climate Change Discourse", *Wiley Interdisciplinary Reviews: Climate Change*, 8.1, 2017, e429.

often incorporation of discourses".[15] As a consequence, information remediated in diversified climate narrations can be ideologically divisive and highly polarised – with obvious impacts in terms of linguistic choices, discursive construction, and understanding of these issues –, especially when produced in mixed, non-specialised contexts such as social networking sites. To give an example, a large number of remediated climate change stories produced by climate-savvy people, including activists, often spark heated debate because of their marked ideological positioning.

Looking at climate-related discourses as inscribed in given social and communicative contexts, it is possible to interpret linguistic elements by focussing on ideological motivations and beliefs, as well as stance, framing, and communicative purposes. Appraisal or ecolinguistic frameworks can be very insightful in this sense, yielding information about different aspects of climate change discourses, such as actors, objects, and events. In the first case, all three systems of appraisal (attitude, graduation, and engagement) and their sub-categories[16] can help to (a) analyse critical positioning of speakers/writers on a given topic, (b) identify whether discursive foci fall on natural objects and events (e.g. impacts will be devastating), or on people (e.g. governments' inaction will lead to devastating impacts), and (c) observe the intensity of claims and propositions (e.g. impacts will be absolutely devastating). Moreover, the appraisal principles of minimality ("the item to be annotated … should be as short as possible, while at the same time including all the words that convey Attitude"),[17] and contextuality ("using any information available to understand the meaning of the evaluative expression under consideration")[18] can be particularly helpful. In the case of ecolinguistics, the parameters of salience and intrinsic value[19] can be used to measure the relevance of nature in environmental discourses based on the value attached to nature *in itself*, and not as an object for human convenience.

2.1 *CDS and Computer-mediated Discourse Analysis*

When it comes to popularising discourses on climate change, other inputs may come from Critical Discourse Studies (CDS). The CDS understanding of discourse as a social practice or "language in use"[20], as well as its problem-oriented approach to the analysis of language, fits well with research on climate change – undoubtedly a socially-complex problem. On the one hand, in the dynamic, participatory space provided by social media, the production and circulation of information and knowledge has become even more fragmented, multiplied, intensified, and accelerated at the same time – giving this channel unrivalled reach and impact. On the other, the communicative affordances of social media are but one aspect of digitally-mediated communication, as all kinds of media influence "knowledge, beliefs, values, social relations [and] social identities".[21] While Social Media Critical Discourse Studies (SM-CDS) focus especially on democratisation processes between producers and receivers of information, as well as power relations and dynamics in different

[15] Norman Fairclough, "A Dialectical-relational Approach to Critical Discourse Analysis in Social Research", in Ruth Wodak and Michael Meyer, eds., *Methods of Critical Discourse Analysis Vol. 3* (London: Sage 2016), 86-108.
[16] Martin and White, *The Language of Evaluation*; Matteo Fuoli, "A Stepwise Method for Annotating APPRAISAL", *Functions of Language*, 25.2 (2018), 229-258; Luca Cavasso, and Maite Taboada, "A Corpus Analysis of Online News Comments Using the Appraisal Framework", *Journal of Corpora and Discourse Studies*, 4 (2021), 1-38.
[17] Luca Cavasso and Maite Taboada, "A Corpus Analysis of Online News Comments Using the Appraisal Framework", *Journal of Corpora and Discourse Studies*, 4 (2021), 12.
[18] Ibid., 13.
[19] Arran Stibbe, "Positive Discourse Analysis: Rethinking Human Ecological Relationships", in Alwin F. Fill, and Hermine Penz (eds.) *The Routledge Handbook of Ecolinguistics* (London: Routledge, 2017), 165-178.
[20] Ruth Wodak, and Michael Meyer, eds., *Methods of Critical Discourse Studies* (London: Sage, 2016), 140.
[21] Norman Fairclough, *Media Discourse* (New York: Edward Arnold, 1995), 2.

communicative contexts,[22] the present study is rather concerned with the democratising and popularising power of SM discourses on climate change, intended as a central theme in social and political discussion, also in terms of dominant discourses and views.[23] The critical interpretation of power roles (the IPCC vs other users) in climate discourses is another possible application, for example to describe stance and dissatisfaction with the Panel's work – whether for political reasons, or for topics, issues, and aspects neglected or underrepresented in the report.

More in general, the present paper draws on computer-mediated discourse analysis (also CMDA),[24] digital ethnography or discourse-centred online ethnography,[25] *netnography*,[26] and similar frameworks in applied linguistics – all maintaining that the focus should be on users above other aspects.[27] Indeed, while the medium specificities affect certain textual features (consider, for example, the use of emojis, or space limitations on certain platforms) and the ways in which online discourses are carried out, it is generally agreed that discourse analyses should take into account other elements, such as participants' social context[28] and sharing behaviour.[29] In this sense, Herring clarifies that the labels *familiar*, *reconfigured*, and *emergent* for computer-mediated communication should be used to describe the characteristics of discourse phenomena on digital channels, rather than old and new genres.[30] The early idea that online and offline communications are basically different in nature has been overcome in contemporary studies: today, it is more and more difficult to trace the boundaries between not only individual personalities and identities on-and-off technological devices, but also communicative styles of physical and behind-the-screen persons. This resonates well with the abovementioned remediation and recontextualisation practices, given that both function "via language, that is, the system through which we interpret and construct our understanding of reality",[31] and in light of the fact that "discourses are part of the socio-cultural repertoire … that shapes what can be thought of and how".[32]

Another central point in CMDA has to do with text collection from social media platforms. Of course, it is part of the researcher's duties to establish methodologically valid selection criteria to collect linguistic material for analysis. Among them, hashtag-based search[33] is a very popular method

[22] Majid KhosraviNik, "Critical Discourse Analysis, Power, and New Media (Digital) Discourse", in Yusuf Kalyango, and Monika Weronika Kopytowska, eds., *Why Discourse Matters: Negotiating Identity in the Mediatized World* (Bern: Peter Lang, 2014), 283-301; Majid KhosraviNik, and Johann W. Unger, "Critical Discourse Studies and Social Media: Power, Resistance and Critique in Changing Media Ecologies" in Ruth Wodak and Michael Meyer, eds., *Methods of Critical Discourse Studies* (London: Sage, 2016), 205-233; Page et al., *Researching Language and Social Media.*

[23] Monika Bednarek et al. "Winning the Discursive Struggle? The Impact of a Significant Environmental Crisis Event on Dominant Climate Discourses on Twitter", *Discourse, Context & Media*, 45 (2022), 100564.

[24] See Susan C. Herring, "Computer-mediated Discourse Analysis: An Approach to Researching Online Behavior" in Sasha Barab et al., eds., *Designing for Virtual Communities in The Service of Learning* (Cambridge: Cambridge U.P., 2004), 338-376; Jannis Androutsopoulos and Michael Beißwenger, "Introduction: Data and Methods in Computer-mediated Discourse Analysis", *Language@internet*, 5.2 (2008), 9; Susan C. Herring and Jannis Androutsopoulos, "Computer-mediated Discourse 2.0" in Deborah Tannen et al., *The Handbook of Discourse Analysis*, 2 (2015), 127-151.

[25] Jannis Androutsopoulos, "Potentials and Limitations of Discourse-centred Online Ethnography", *Language@ Internet*, 5.8 (2008); Sarah Pink et al., *Digital Ethnography: Principles and Practice* (London: Sage, 2015).

[26] Robert Kozinets, *Netnography: The Essential Guide to Qualitative Social Media Research* (London: Sage 2019).

[27] Suzie Wong Scollon, *Nexus Analysis: Discourse and the Emerging Internet* (London: Routledge, 2004); Rodney H. Jones and Sigrid Norris, *Discourse in Action: Introducing Mediated Discourse Analysis* (London: Routledge, 2005); David Barton and Carmen Lee, *Language Online: Investigating Digital Texts and Practices* (London: Routledge, 2013).

[28] Herring, "Computer-mediated Discourse Analysis"; KhosraviNik and Unger, "Critical Discourse Studies and Social Media".

[29] Giuseppe A. Veltri, and Dimitrinka Atanasova, "Climate Change on Twitter: Content, Media Ecology and Information Sharing Behaviour", *Public Understanding of Science*, 26.6 (2017), 721-737.

[30] Susan Herring, "Discourse in Web 2.0: Familiar, Reconfigured, and Emergent", *Discourse*, 2.0 (2013), 1.

[31] Canepari et al., *The Many Facets of Remediation in Language Studies*, 9.

[32] Jens O. Zinn, and Marcus Müller, "Understanding Discourse and Language of Risk", *Journal of Risk Research*, 25.3 (2022), 272.

[33] See Evandro Cunha et al., "Analyzing the Dynamic Evolution of Hashtags on Twitter: A Language-based Approach", *Proceedings of the Workshop on Language in Social Media* (2011), 58-65 for an overview of relevant studies.

that can yield results quickly and effectively, and work as a keyword-dependent tool for data scraping. A vast part of the literature has dealt with hashtags as proper discursive features[34] and as a form of 'conversational tagging';[35] the communicative and functional aspects of hashtags have been at the centre of critical studies, for instance on 'hashtag activism' in different contexts.[36] Interestingly, when used for ideological, social, or political purposes, hashtags become "a resource for making a range of meanings [and] render social media communication more open to processes of 'ambient affiliation' whereby users share and contest social bonds".[37] When dealing with broader textual aspects, however, this sampling method may be limited, as it "may not provide a corpus representative of broader public discourse on a particular issue due to the self-selecting nature of hashtag use";[38] McGlashan notes that

> the pre-selection of a specific hashtag or hashtags may limit the researcher's access to the potentially heterogeneous discourse participants and practices that constitute a community, and by extension, it may limit researchers' access to a potential variety of topics, sentiments and discourses within a community.[39]

Building on affiliation and group identity, he suggests that *following* criteria, rather than hashtags, could be a valid method for looking at ideal communities of practice on social media. In general, the use of hashtags as a sign of community affiliation should not be taken for granted, not only because the very concept of 'community' remains ambiguous,[40] but also because there is no evidence of in-group/out-group construction patterns in hashtag usage in this sense.[41]

All the above fits perfectly with climate change narrations produced within social media contexts. As previously anticipated, such discourses are examples of linguistic remediation based on precise ideological grounds, mostly rooted in scientific evidence and strong environmental belief, and clear communicative purposes, namely informing and spreading climate change knowledge. The present study highlights that, through remediation, user-generated discourses perform an important social function: by raising awareness, they promote popular engagement, with possible positive impact on pro-environment actions and behaviours. From a critical standpoint, stronger ideological positioning of users is reflected into more evident remediation and reformulation of topics and messages – for instance through clearer and more expressive language.

3. Data Collection and Methodology

The following analysis observes linguistic remediation of four concepts and definitions in AR6 (*risk*, *vulnerability*, *adaptation*, and *resilience*) in a dataset made up of tweets published between February

[34] Michele Zappavigna, *Searchable Talk: Hashtags and Social Media Metadiscourse* (London: Bloomsbury Publishing, 2018); Korina Giaxoglou, "#JeSuisCharlie? Hashtags as Narrative Resources in Contexts of Ecstatic Sharing", *Discourse, Context & Media*, 22 (2018), 13-20.
[35] Jeff Huang, Katherine M. Thornton, and Efthimis N. Efthimiadis, "Conversational Tagging in Twitter", *Proceedings of the 21st ACM Conference on Hypertext and Hypermedia* (2010).
[36] Alexah Konnelly, "# Activism: Identity, Affiliation, and Political Discourse-making on Twitter", *The Arbutus Review*, 6.1 (2015), 1-16; Sherri Williams, "Digital Defense: Black Feminists Resist Violence with Hashtag Activism", *Feminist Media Studies*, 15.2 (2015): 341-344; Guobin Yang, "Narrative Agency in Hashtag Activism: The Case of# BlackLivesMatter", *Media and Communication*, 4.4 (2016), 13; Caroline Dadas, "Hashtag Activism: The Promise and Risk of "Attention", *Social Writing/Social Media: Publics, Presentations, Pedagogies* (2017), 17-36; Ying Xiong et al., "Hashtag Activism and Message Frames Among Social Movement Organizations: Semantic Network Analysis and Thematic Analysis of Twitter During the# MeToo Movement", *Public Relations Review*, 45.1 (2019), 10-23.
[37] Michele Zappavigna, *Searchable Talk*, 11.
[38] Ibid., 7.
[39] Mark McGlashan, "Collective Identity and Discourse Practice in the Followership of the Football Lads Alliance on Twitter", *Discourse & Society*, 31.3 (2020), 313-314.
[40] Herring, "Computer-mediated Discourse Analysis", 338.
[41] Zappavigna, *Searchable Talk*.

28th, 2022, and March 27th, 2022. The timespan considered for tweet retrieval corresponds to the first peak in global Google searches for "sixth assessment report ipcc";[42] indeed, although statistics about Twitter trending hashtags and topics may vary slightly, it is safe to assume that social media discussion on AR6 took place around this period, that is shortly after the report release. At the beginning of data collection, tweets were collected via *SNScrape*, a web scraper for social networking services operated through *Python*, by looking at the specific search query "IPCC OR AR6 (risk OR resilience OR vulnerability OR adaptation) lang:en until:2022-03-27 since:2022-02-28". This query limited search to tweets published in English in the chosen period, containing at least one of the reference words 'IPCC' or 'AR6', and including one or more of the key terms 'risk', 'resilience', 'vulnerability', and 'adaptation'. The operation yielded a total of 4238 tweets (about 153.700 tokens) where the four keywords appear in the form of lexical words and/or hashtags. The corpus was then processed via qualitative analysis software *NVivo* to look for thematic distribution across tweets; given the number of tweets, coding was done automatically, as will be further explained in Section 4. However, consistent with qualitative methodologies, a manual reading of data was also performed in order to expand *NVivo*'s results and gather further insight on user-generated discourse. This was especially needed for observation at a textual level, implying a cross-check of selected samples on Twitter to verify whether critical positioning and stance were attributable to individual sources, rather than institution representatives. Given the mixed nature of the dataset – which accounts for user-generated discourse and institutional communication –, manual reading was also recommended to ensure the overall quality and representativeness of the sample.

The first aspect under investigation was thematic distribution (textual level) of the four main topics in the corpus: assigned codes ('nodes' in *NVivo*), listed by frequency, enabled to assess which issue(s) received more attention and extensive coverage on Twitter, thus giving one first hint as to the most popular remediated topics. Secondly, the analysis considered specific parts of speech, namely verbs, adverbs, and adjectives (lexical and syntactic levels), for a functional analysis of discourse aiming to describe the linguistic changes taking place in the remediation process. For this research objective, data was analysed against the background of two reference sources within AR6, both presented in detail in the next section for reasons of expository clarity: on the one hand, the definitions and descriptions of *risk*, *resilience*, *adapatation*, and *vulnerability*; on the other, the report's "calibrated language" classification[43] used to measure likelihood of climatic events and shared level of confidence among authors. While the first part of the analysis refers to textual aspects, points of contact with analytic categories of functional discourse analysis (transitivity, mood, and modality) and appraisal (attitude, graduation, and engagement) emerge in this latter part. In particular, the reference methodological framework of the study draws from Grego's contrastive classification of specialised vs. non-specialised discourse,[44] with observable features at the lexical, syntactic, and textual levels, summarised in Table 1.

	Specialised discourse	**Non-specialised discourse**
Lexical level	High word formation, borrowings, noun strings, abbreviations, Latinization.	Few or no abbreviations, few or no noun strings, (over)Anglicization.
Syntactic level	Nominalization, high modality, passive voice, depersonalization.	Little use of nominalization, little use of modality, personalization wherever possible.
Textual	Thematization, schematization,	Schematization, exemplification, oversimplification,

[42] Google Trends, www.trends.google.it.
[43] IPCC, "Summary for Policymakers", 7.
[44] Kim Grego, "'The Physics You Buy in Supermarkets': Writing Science For the General Public: The Case of Stephen Hawkings", in Susan Kermas, and Thomas Christiansen, eds., *The Popularization of Specialized Discourse and Knowledge Across Communities and Cultures* (Bari: Edipuglia, 2013), 152.

level	cohesive conjunctions, hedging, omissions, crypticity (exclusiveness).	definitions, reformulation, explanations, multi-media elements (from visuals to interactive elements).

Table 1. Features of specialised vs. non-specialised discourse (adapted from Grego 2013: 152)

In the last part of the analysis, further observations on expressive language, effective risk communication, authors' critical positioning towards climate change topics, and impact on laypeople are in line with Grego's discursive strategies in non-specialised communication,[45] namely:

(a) (over)explanation / (over)exemplification / (over)simplification;
(b) irony;
(c) argumentation;
(d) personal references;
(e) (critical) social references.

3.1 *Ethical Considerations*

All tweets presented in the following analysis were retrieved from Twitter accounts of public environmental groups or associations, or individual profiles of public figures, including journalists, institutions' representatives, researchers, and other activists. To comply with data protection regulations, all tweets are cited in anonymous form; in particular, whole tweets are cited only when the source is a public group or organization, while only parts of tweets are cited in all other instances to prevent backtracking.

4. Results and Discussion

4.1 *Thematic Distribution*

For what concerns distribution of climate change topics in the corpus, preliminary coding was done via *NVivo*'s automatic coding function. This function groups textual data based on patterns and ideas that do not necessarily emerge from quantitative observation; within the dataset, *NVivo* identified 6 main thematic nodes (and a total of 63 codes) applying to all 4238 tweets. In particular, assigned nodes were:

- climate change
- adaptation
- risk
- impacts
- action
- cost

At a first glance, themes such as 'adaptation', 'risk', and 'climate change' could be easily expected, as well as the emerging 'action' and 'impacts'. However, one may notice the absence of patterns pertaining to 'vulnerability' and 'resilience', or the presence of the apparently less relevant node 'cost'; this is easily explained if looking at the overall frequency of these terms in AR6. Indeed, explicit reference to both 'vulnerability' and 'resilience' across the report is more scattered and quantitatively

[45] Ibid., 154.

limited, compared to other key terms; this naturally affects themes in the resulting remediated discourse, where the focus tends to be more on the more urgent and impactful consequences of inaction – as the nodes 'risks', 'impacts', 'action', and 'cost' show – rather than actual resilience strategies for coping with vulnerability.

A closer look at sub-nodes adds further details as far as thematic distribution is concerned, as these contain cross-references to one or more of the main nodes – as in 'climate action', 'climate adaptation', 'climate change impacts', or 'adaptation action' to mention but a few. Some sub-nodes express action or active processes, for instance those within 'action' ('action phase', 'collaborative action', 'global action', 'taking action'), or 'adaptation' ('adaptation efforts', 'adaptation planning', 'adaptation progress', 'adaptation solutions', 'adaptation strategies', 'available adaptation options'). Another group of sub-nodes focuses, mainly via attributes, on how and where identified actions should take place ('cultural heritage adaptation', 'ecosystem-based adaptation'). Finally, the sub-nodes of 'cost' ('decommission cost', 'future cost', 'total process cost', 'vertical cost') and 'risk' ('describing risk', 'existential risk', 'future risks', 'greater-than-normal risk', 'real risk', 'reducing flood risk', 'risk calculus') are even more closely related to theoretical and practical aspects of climate-related action. Some clusters of 'cost' (*NVivo* creates tree maps for each node) are particularly meaningful from a thematic point of view: in the clusters "adaptation cannot be at the cost", "and we cannot afford the cost", "can no longer risk the cost", the modal 'can' and the first person plural 'we' add to the explicit communication of risk. Indeed, Russo[46] notes that epistemic modality is "realized by a range of explicit and linguistic forms: modal auxiliary verbs; sentence adverbs; adjectives (Fowler, 1985: 73) and … classified on the basis of the degree of certainty". Similarly, the expressions "cost-effective", "cost of climate change", "cost of Loss and Damage", "cost of adaptation", "cost of inaction", "cost of losses and adaptation", and "cost of mitigation" refer to risks possibly arising from climate inaction, and are generally in line with personalisation, simplification, and more expressive risk communication observed in non-specialised discourse.

To further observe themes in collected tweets, a word frequency query was run, following Bernard and Ryan's methods for qualitative analysis,[47] where frequency is considered as a parameter for themes identification. Looking at the four key terms, 'adaptation' appeared as the 2nd most frequent word in the whole corpus, followed by 'vulnerability' (#12), 'risk' (#13), and 'resilience' (#32). Interestingly, while 'vulnerability' and 'resilience' appear less frequently in AR6, both terms seem to be more relevant in Twitter's remediated discourse: this might be due to a practical need to schematise and summarise the report's contents and key thematic points for non-expert audience on SM. In addition, the climate-relevant 'impacts' and 'mitigation' appeared at #7 and #30 respectively. Overall, the lists of nodes, sub-nodes, and frequent words indicate that greater focus is placed on adaptation as the most pressing issue remediated from AR6; close reading of tweets confirmed that most discussion about the report revolved around issues of adaptation planning, risk management, and impacts of climate change – perhaps because these aspects are more easily measurable, especially when talking about effective transnational policymaking. In the case of vulnerable countries, for instance, the proper names 'africa', 'australia', and 'india' appear quite early in the frequency wordlist, but more generic reference to 'regions', 'local' and 'global' 'ecosystems', 'groups', 'communities', and 'countries' and 'governments' can also be found.

Finally, it is worth commenting on the first most frequent word in the dataset, 'https'. At the beginning, this item could seem an unpleasant intruder in a list of otherwise relevant content words; although raw data from software analysis is often imperfect, this element can expand the general discourse on remediation. As a matter of fact, a large majority of the tweets included external links not

[46] Russo, *The Evaluation of Risk in Institutional and Newspaper Discourse*, 94.
[47] Gery W. Ryan, and H. Russell Bernard, "Techniques to Identify Themes", *Field Methods*, 15.1 (2003), 85-109.

only to the IPCC's report, but also to newspaper articles, blogs, websites, images, and other types of sources referring to contents and aspects of AR6. This peculiar formal aspect of computer-mediated communication (largely explored in literature starting from Herring 2004) can be a rightful part of recontextualisation- and remediation-centred investigations, considering the intertextual nature of digital written texts, with hyperlinks serving to expand, clarify, or explain possibly less clear/less relevant concepts and notions. Such intertextuality opens to further considerations of information and scientific knowledge dissemination, with possible communication risks and biases arising from the typically unregulated manipulation of discourse on SM. While there is unfortunately no space to delve into these considerations, future critical investigations may focus specifically on the ideological implications of the above aspects.

4.2 *Linguistic remediation by parts of speech*

The second part of the analysis focussed on individual parts of speech in the corpus. As regards remediated concepts, the following definitions from AR6[48] introduce the four key terms and notions under consideration:

- *Risk*: "the potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems".
- *Vulnerability*: "the propensity or predisposition to be adversely affected and encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt".
- *Adaptation*: "in human systems, … the process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities. In natural systems, adaptation is the process of adjustment to actual climate and its effects; human intervention may facilitate this".
- *Resilience*: "the capacity of social, economic and ecosystems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure as well as biodiversity in case of ecosystems while also maintaining such a capacity for adaptation, learning and/or transformation".

It must be specified that, albeit updated in AR6, all the above are definitions of well-known technical terms already introduced in previous IPCC reports. Together with these, extended descriptions of the same concepts from other parts of the report were also taken into account.

For what concerns the level of shared confidence and assessed likelihood of climate-related outcomes, including anthropogenic actions and natural events, the report adopts the already mentioned calibrated language, where the following terms and expressions are used:[49]

LEVEL OF CONFIDENCE

- *very low*,
- *low*,
- *medium*,
- *high*,
- *very high.*

ASSESSED LIKELIHOOD OF AN OUTCOME OR A RESULT

[48] IPCC, "Summary for Policymakers", 7-9.
[49] Ibid., 7.

- *virtually certain (99–100%),*
- *very likely (90–100%),*
- *likely (66–100%),*
- *as likely as not (33–66%),*
- *unlikely (0–33%),*
- *very unlikely (0–10%),*
- *exceptionally unlikely (0–1%).*

Also in this case, the IPCC's calibrated language is a functional convention already established in previous reports which vouches for the overall conceptual and linguistic accuracy of the report. As anticipated, the analysis crossed these classifications with traditional analytical categories of transitivity, mood, modality, and attribution, as well as attitude, graduation, and engagement from appraisal frameworks, to investigate remediation of related concepts.

At the lexical level, compounding – "human-induced climate change",[50] "near-term climate risk reduction"[51] – and noun strings – "evidence of observed impacts, projected risks, levels and trends in vulnerability, and adaptation limits demonstrate that",[52] "current unsustainable development patterns"[53] – are largely used in AR6. In general, there is a lower tendency to compounding and forming long noun strings in the dataset ("risks from climate change", "there are limits to adaptation"), in line with oversimplification and explanation needs. The report's range of adjectives expressing the level of confidence is scarcely observable after remediation, with only 235 references overall; the same can be observed for adverbs and adverb phrases used for assessed likelihood: only 'likely' appears more times in the dataset, whereas 'virtually certain' and 'extremely unlikely' are each found in one instance. Several other adjectives and adverbs in various degrees of expressiveness are used instead, namely: 'potential'/'potentially', 'probable'/'probably', and the polarising 'impossible' ("warming could make survival impossible", "impossible to refute"). Other attributes include 'critical', 'crucial'/'crucially', 'vital', 'decisive', 'severe', and 'serious', to 'bad', 'hard', 'grim', 'grave', 'stark', 'overwhelming', 'terrible'/'terribly', 'devastating', 'destructive'/'destructively', or 'ravaging'.

The widespread presence of key circumstance adverbs 'now' and 'immediately' (804 references in total, including stemmed words and synonyms) is registered, for example in the expressions "we need to act now", "immediately scale up", and "we are quickly running out of", typically used to signal imperative mood and material processes. In line with minimality and contextuality,[54] the single words or strings making up the dataset, considered in their context, tend towards graduation through the use of intensifiers ('absolutely', 'extremely', 'real'), negative expression of affect ('grim predictions', 'truly eye-opening', 'horrifying impacts') and negative judgement ('adaptation efforts are falling behind'), while less frequent expression of attitude is observed.

Looking at syntax, nominalization and modality – "multiple climate hazards will occur simultaneously, and multiple climatic and non-climatic risks will interact",[55] "comprehensive, effective, and innovative responses can harness synergies"[56] – as well as passive voice – "adaptation planning and implementation has been observed",[57] "future vulnerability of ecosystems to climate

[50] Ibid., 9.
[51] Ibid., 22.
[52] Ibid., 31.
[53] Ibid., 14.
[54] Cavasso and Taboada, "A Corpus Analysis of Online News Comments Using the Appraisal Framework", 12-13.
[55] IPCC, "Summary for Policymakers", 20.
[56] Ibid., 31.
[57] Ibid., 22.

change will be strongly influenced"[58] – are frequently found in the report. As regards modals, the widespread use of 'must', completely absent in the report, is perhaps the most striking remediation feature in the corpus; other modal verbs expressing obligation and necessity, namely 'need to' and 'have/has to' are more frequent in the tweets. Similarly, 'going to' appears in at least 73 instances in the corpus, while it is missing in AR6; conversely, the modal 'will' – here used for future possibilities – has similar frequency of use in both texts. In general, modals of uncertainty are infrequent in the report and across tweets, with only few instances of 'might', 'may', and 'should'. Remediation is evidenced not only through dissimilar use of modals, but also through a stronger tendency towards polarisation (imperative and declarative mood). For the same reason, personalisation, especially through the first person pronoun for plural 'we' can be detected, while passive voice is signaled by the large presence of 'will be' + verb adjective structures (e.g. 'Risks will be magnified', 'communities will be impacted'). All of this reflects into clear, linear syntax characterised by coordination and explicit clause relations ('The IPCC report warns that we cannot adapt our way out of the climate crisis'), and frequent expression of negative judgement attached to the agents involved in or determining climate-related consequences, for example through activity and communication verbs (e.g. the report shows/ says/ demonstrates), and existential verbs (e.g. the report is clear) introducing that- and if- clauses (declarative mood) – all adding to readers' engagement.

At a textual level, thematisation – "Integrated, multi-sectoral solutions that address social inequities, differentiate responses based on climate risk and cut across systems, increase the feasibility and effectiveness of adaptation"[59] –, cohesive conjunctions – "exacerbate vulnerability and social and economic inequities and consequently increase"[60] –, hedging – "the feasibility of implementing adaptation options in the near-term"[61] –, and crypticity – "the effectiveness of adaptation to reduce climate risk … will decrease with increasing warming"[62], "climate resilient development action"[63] – appear in AR6. Conversely, a more evident reliance on reformulation, explanation, and simplification is typical in remediated discourse. Going back to discursive strategies in non-specialised communication,[64] (over)explanation and (over)simplification work through explicit cause-effect relations ("the report makes it clear that"), existential 'there is'/'there are' ("There are limits to adaptation"), if- clauses, and/or bullet lists ("If 1.5° target is met: 1 billion people in coastal regions are at risk. If temperatures rise between 1.7 to 1.8° half of the world's population are at risk of heat based life threatening climate conditions").

Overall, all the above linguistic elements and parts of speech in the dataset make for broad critical positioning of Twitter's users. Assuming that observed remediated discourse is informed by pro-environment ideology, these and other discursive strategies are used to construct effective communication of scientific information from AR6. Among them, irony ("Think climate change doesn't directly affect you yet? Think again", "Having stated the obvious", "I'm not sure we fully realise"), argumentation ("Many people underestimate the risks", "scientists have raised the alarm, yet we're not even approaching emergency footing", "adaptation and mitigation cannot be neglected"), personal references ("Our scientists", "we're running out of time", "our efforts to adapt", "I can only think of"), and (critical) social references appear. In this sense, some emblematic tweets ("WE HAVE NO IDEA JUST HOW BAD THINGS ARE GOING TO GET! … A world of 2C of warming is a world of terrifying unknowns" (capitalisation in the original), "the IPCC report is a code red for

[58] Ibid., 14.
[59] Ibid., 23.
[60] Ibid., 31.
[61] Ibid., 23.
[62] Ibid.
[63] Ibid., 31.
[64] Grego, "'The Physics You Buy in Supermarkets'", 154.

humanity") enabled a cross-check of the sources, confirming that larger use of remediation strategies at the textual level is made by individuals and environmental organisations, rather than public figures and institutions. This latter part of the investigation could be further developed in dedicated studies looking at ideological positioning and stance in different genres or discourse types, and user-generated discourse in particular.

5. Conclusive remarks

The present paper has dealt with the remediation and communication of core concepts from the 6th IPCC assessment report in SM discourse. As it was expected, the discursive construction of *risk*, *vulnerability*, *adaptation*, and *resilience* at the thematic, lexical, syntactic, and textual levels follows typical patterns of popularisation. However, given the practicalities of computer-mediated communication, resulting remediation on SM has specific characteristics not observable in other media, such as the pervasive use of hyperlinks, or the possibility to include images and emojis, among other things. Future research may deal with such characteristics in more detail to further validate and replicate what suggested in this study. In general, observed remediated discourses on SM play the important function of making knowledge accessible to laypeople by breaking down specialised or technical terms and concepts. In the analysed dataset, the majority of remediated texts are produced within a scientifically confident environment, have a marked informative (or persuasive) purpose, and act as a link between scientific literature and popular communication.

Without claiming to be representative, results suggest that linguistic remediation is heavier and more evident in the presence of stronger ideological positioning by SM users, with both positive and negative consequences on risk communication. On the one hand, ideology-driven communication in popularising discourses may positively influence people's understanding of climate change and pro-environment behaviour; from an ecocritical standpoint, more evident remediation can be associated to well-planned narrations of climate change facts and stories, making for excellent case studies of emotional, value-driven storytelling. On the other hand, polarised communication may hinder dissemination of objective, unbiased scientific information: as much as scientific evidence may be alarming, extreme views and messages, even when justified by positive persuasive purposes, can have negative impacts on people, for example engendering feelings of failure, anxiety, or doom. Moreover, irresponsible communication may lead to misinformation and knowledge impoverishment. All this holds not only for climate change topics, but also for public discussions about similar, critical topics of popular interest.

In light of what observed so far, some critical remarks can be made. The qualitative nature of the study, the size of the sample, and the presence of mixed sources do not allow to make generalisations about remediated climate change discourses on Twitter. Further applications of the present paper may better confirm research hypotheses about the features of remediation and popularisation on SM, for example through mixed methods and software-assisted analyses. While limitations of this kind are acknowledged in this sense, all sampling decisions and practical methodologies were coherent with the initial research questions. In future, it could be interesting to look at source-specific differences, to further compare features of popularising discourses in institutional vs. user-generated content, also to assess which type of discourse is more practically effective for laypeople. Assuming that different sources account for different textual genres, the present paper has, at this stage, privileged general aspects of linguistic remediation, regardless of genre distinctions.

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