The representation of climate change:
A retrospective newspaper analysis

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Abstract

This paper presents the results of an in-depth analysis aimed to identify climate change representations in four major Italian newspapers over 11 years. The objectives of the study were to map the prevailing themes, to examine the underlying semantic structures that shape the content of these themes, and to investigate the way they have evolved. To this end, the study used the Automated Co-occurrence Analysis for Semantic Mapping (ACASM) procedure applied to a text corpus consisting of the journal articles. The results highlight four distinctive themes based on two basic structures through which climate change is represented in the Italian media.

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Additionally, the study revealed significant temporal variability in the use of the themes during the period examined. Drawing on the framework of Semiotic Cultural Psychology theory, the implications of the findings are discussed, offering valuable insights into the perception and social representation of climate change in the Italian media landscape.

Keywords: Climate change, global warming, content analysis, newspapers, sensemaking.

Introduction

In the last decade, several empirical research studies have surveyed the representation of climate change in the media. As an example, Jaspal and Nerlich (2014) in a qualitative thematic analysis of British newspapers highlighted three representations of climate change in terms of a collective multi-faceted threat, an attribution of blame and a speculative solution to a complex socio-environmental problem. Similarly, a computer-assisted content analysis on climate-change-related newspapers provided evidence that the climate change issue is increasingly covered by the politics section rather than by the science column (Kirilenko & Stepchenkovygka, 2012). Bailey and colleagues (2014), studying the media representation of climate change through lexical analysis, found that U.S. newspapers contained a higher density of epistemic markers and used more ambiguous grammatical constructs related to uncertainties than Spanish newspapers, but every source analyzed used similar terms for expressing the uncertainty related to climate change. Kay and Gaymard (2021) in a three- newspaper analysis highlighted that climate coverage focused on politics and international involvement. In conclusion, media resources play an important role in supporting information about climate change among the population, tackling the hard task of simplifying and transmitting the complex scientific information concerning climate change issues (Ranney & Clark, 2016). Thus, in this panorama the media play a significant role in shaping psychological phenomena like climate change denial (Boykoff, 2013) or climate change anxiety (Clayton, 2020; Maran & Begotti, 2021), as well as in promoting the population's awareness about the implications of

climate change (Schäfer, 2012) which in some cases results in the adoption of pro-environmental and resilient behaviors (Hakala & Seeck, 2009).

The impact of the media on human choices and behavior has been amply explained by the Framing theory, which underlines the role of framing in promoting people's specific conceptualization of an issue or in helping to orient their thinking (Chong & Druckman, 2007). According to Entman (1993), people frame, that is, select some aspects of a phenomenon perceived as more salient in a certain communication context, promoting specific problem definition, causal interpretation, moral evaluation, and/or recommendation. The concept of the frame has been widely acknowledged for its ability to explain the connection between the content of the message and the psychological mechanisms involved in media influence (Mazzara *et al.*, 2021), and it has been adopted to explain different phenomena such as public opinion (e.g., Fine, 1992; Lecheler & de Vreese, 2012), the economy (e.g., Martin, 2016) and climate change (e.g., Anshelm & Hultman, 2014; Knight & Greenberg, 2011; Stecula & Merkley, 2019). Specifically, studies focusing on climate change identified different frames through which the phenomenon is represented at the international level. For example, Anshelm and Hultman (2014) conducted a study of climate change discourse in Sweden and identified four distinct frames that are used in the climate change debate. These frames include industrial fatalism, green Keynesianism, eco-socialism, and climate scepticism. Stecula and Merkley (2019), studying the evolution of frames over time in U.S. media sources, found that, although frames related to the economic harm associated with climate mitigation policies have played a significant role in the past, their importance is declining. In contrast, frames advocating public support and commitment for climate action have increased, as well as frames highlighting the economic benefits of climate action.

Despite the relevance of the results attained, frames are understood in terms of specific and contingent topics attributed to the phenomenon studied. However, such a focus does not allow us to highlight the structure of culturally generalized meanings grounding such specific and contingent frames. This limit makes it impossible to acknowledge the specific way the phenomenon under investigation (i.e., climate change) is tackled/narrated as a result of a cultural and social tenet.

To overcome this limitation, in the present work we aim to focus on climate change in newspapers according to the Semiotic Cultural Psychology Theory (SCPT; Salvatore, 2016; Valsiner, 2007). The SCPT conceives frames in terms of themes that are active within narrative practices. Such themes are based on semantic structures that represent the basic components through which a given object is represented and that work in terms of latent dimensions of meaning– semiotic forces (Salvatore *et al.*, 2020) – orienting the way a specific issue is faced in narrative terms (Rochira *et al.*, 2020). Accordingly, themes characterizing climate change issues could be identified in terms of patterns of co-occurring words. In this view, themes do not express an underlying content, which is already present in the text. Rather, a theme constitutes a pattern of meanings that acts as a sort of semiotic affordance that guides the interpreter's interpretion (on the issue of texts and meaning, see Salvatore, 2016).

Adopting this perspective allows the topic of climate change to be placed in the perspective of clinical psychology that argues that the promotion of change – or, as in this case, resilience and pro-environmental behaviors – must take into account the interpretation of the social context within which people are embedded and in which the culturally based representations that guide individual attitudes and behaviors are formed (Carli & Paniccia, 1999; Salvatore & Freda, 2011).

Accordingly, the present study investigates, on the one hand, the themes conveyed in a sample of articles about climate change taken from Italian newspapers, tracking their evolution in time; on the other hand, it focuses on the generalized cultural meanings that organize such themes.

Conceptual framework

The Semiotic Cultural Psychology Theory (SCPT) assumes that the individual's psychological functioning is based on embodied patterns of meanings – understood in terms of generalized and affect-laden systems of assumptions (Salvatore *et al.*, 2016) – embodied in the systems of practices that make up the cultural milieu of the social group (Cole, 1998; Valsiner, 2007; Vygotsky, 1978) and therefore guide individual meaning-making. Thus, meaning making is inherently social and

cultural. The SCPT framework allows consideration of the affect-laden dimension of meanings and its ability to influence beliefs and behaviors, which is useful in explaining personal and public facts, such as media representations of major social issues.

According to the SCPT, the representation of a particular topic is the result of a consistent pattern of meaning (i.e., a theme) that foregrounds specific features or qualities while putting others in the background. Themes are generalized nuclei, employed in addressing the issue in the media texts analyzed. The emphasis is on the generalization aspect, as the analysis concentrates on the higher order meanings associated with the climate change issue, determining *how*, rather than *what*, the issue is framed, mainly, how the receiver of media information makes sense of it. Therefore, themes are underpinned in semantic structures, which in their turn are modelled as basic, semantic, *bipolar* components (Rochira *et al.*, 2020). In this analysis, bipolarity is the fundamental aspect of semantic components in the sense that the presence of one polarity implies the absence of the opposite meaning. For example, if something is "friend", this means it is not hostile (Marková, 2003; Salvatore *et al.*, 2017). In this way, a theme consists of the presence or absence of the qualities that the semantic components make relevant (Salvatore *et al.*, 2012).

The SCPT theoretical perspective is handy for the analysis of the underlying representations of different phenomena. In the area of media representation, with a focus on newspapers, numerous studies have explored the representation of various social objects (Mannarini *et al.*, 2020). Rochira *et al.* (2020) and Mazzara *et al.* (2021) analyzed migration, Buhagiar *et al.* (2020) focused on Islam, and Pop *et al.* (2020) analyzed the LGBT community. In the context of the COVID-19 pandemic, Venuleo *et al.* (2020) examined the semantic structures inherent in crisis-related narratives. The authors identified two key dimensions: the representation of the pandemic and the interpretation of its implications. Contesting the assumption of a universally disruptive meaning, the authors emphasized the need to recognize individual interpretations that are shaped by subjective meanings (Venuleo *et al.*, 2020). In addition, Lai *et al.* (2021) explored the complexities of communicative exchanges within online communities of young individuals struggling with eating disorders. Their investigation revealed the propensity of the so-called Pro-Ana (Pro-Anorexia) blog users to

normalize and idealize their eating behavior, potentially exacerbating the manifestation of psychotic traits associated with these disorders. Their findings underscored the importance of semantic structure analysis for better understanding and for effective intervention in these phenomena.

Taken together the above-mentioned studies highlight how the themes through which social phenomena are represented emerge from latent semiotic resources, which represent the social and individual means at disposal in facing the phenomena.

Aims

The newspapers' representation analysis is designed to map the themes characterizing Italian discussion on climate change and the latent sensemaking dimensions that ground and shape the content of such themes. Specifically, this study aims to: (a) identify the themes that emerge from media discourses on climate change; (b) identify the basic semantic structure underpinning the themes; (c) examine the variability in the themes through which climate change is narrated over time. Reaching such aims have three relevant implications. On the theoretical level, it contributes to the empirical analysis of the challenging issue of the relationship between the outputs (i.e., the contents) and organizational principles (i.e., the semantic structures) of social meaning-making processes (Salvatore & Venuleo, 2013). On the empirical level, it allows us to detect differences in themes of climate change representation in newspapers and track their evolution in time. On the applicative level, mapping and tracking the way climate change is narrated makes it possible to acknowledge the semantic dimension and to identify alternative themes, helpful in promoting pro-environmental and resilient behaviors.

Method

Sample

To define the set of newspapers and articles for the analysis, the following procedure was adopted.

The sample consists of articles from four Italian national newspapers: *Repubblica, Il Manifesto, Il Giornale, Corriere della Sera*. Since the media representation of the climate issue has increased over time (IPCC, 2022), information was collected from 2011 to 2022 to have a broad understanding of the representation of climate change in the last 11 years and track its evolution over time. The newspaper choice was based on digital accessibility. The criterion of article selection was the presence of the term "climate" or "climate change" [in Italian: *clima* or *cambiamento climatico*] within the article at least once. In addition, in order to be analyzed each article had to contain a minimum of three hundred words within the text corpus. Finally, the selected articles had to be deemed focused on the topic of climate change by two independent raters with university level education. The consensus in cases of disagreement was reached by discussion.

In the following step a series of preliminary frequency analyses were conducted on a pre-selected set of articles with the goal of obtaining a constant temporal representation within the chosen time units for the final analysis. The time units of the final analysis were semesters (January to June and July to December). As the number of valid articles a month varied from 1 to 30, the risk was that the content in each timeframe would be overrepresented by some particular periods or peak events. Therefore, each semester included around 5 articles per month. If the monthly rate exceeded this limit, articles were selected randomly, while if a certain month was underrepresented, articles from nearby months were added. The whole sample selected consisted of 1530 articles. The distribution of articles in blocks and newspapers is presented in Table 1.

Table 1. Distribution of the selected articles per time blocks and newspapers

Year	2011	2012		2013		2014		2015		2016		2017	
Semester	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**
Time block	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Repubblica	14	16	17	18	23	24	25	25	25	25	25	25	25
Il Manifesto	0	0	0	1	0	7	8	22	7	11	8	6	15
Il Giornale	2	1	3	2	0	1	1	2	2	8	2	5	3
Corriere della Sera	8	14	8	7	8	18	14	20	23	25	10	22	23
Total	24	31	28	28	31	50	48	69	57	69	45	58	66

Year	2018		2019		2020		2021		2022		Total
Semester	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	
Time block	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	
Repubblica	25	25	25	25	25	25	25	25	30	30	547
Il Manifesto	15	23	16	25	25	21	25	25	30	30	320
Il Giornale	6	4	14	5	24	18	25	25	30	30	213
Corriere della Sera	25	25	25	25	25	22	25	25	23	30	450
Total	71	77	80	80	99	86	100	100	113	120	1530

Data analysis

To identify the main themes and the semantic structure and to examine the positioning of the former within the latter, the data analysis employed the Automated Co-occurrence Analysis for Semantic Mapping procedure (ACASM, Gennaro & Salvatore, 2023; Salvatore *et al.*, 2012; 2017), which operates based on a semiotic understanding of meaning that takes into account sign transition (Valsiner & Rosa, 2007). In the context of textual analysis, sign transition manifests as

co-occurrences of lexemes, specifically syntagmatic associations, within the same contextual units, such as paragraphs. The ACASM procedure was conducted through the T-Lab software (Lancia, 2004). To this end, ACASM adopts a two-stage procedure (for technical details, see Gennaro & Salvatore, 2023).

In the first stage, the corpus is segmented into elementary context units (ECUs), which are groups of adjacent utterances. This procedure allows the length of the segments for thematic interpretation to be balanced while avoiding a lack of specific thematic associations. In our case, the following criterion was adopted: (1) each ECU begins just after the end of the previous ECU; (2) each ECU ends with the first punctuation mark (".", or "!", or "?") occurring after the threshold of 250 characters from the first character; (3) if an ECU is longer than 2000 characters, it ends with the last word found within that length, even if there is no punctuation mark.

Then all the lexical forms in the text were identified and assigned to their headwords. This procedure reduces lexical variation (e.g., word forms like "see", "seeing", and "saw" share the lemma "see", while "woman" and "women" both have "woman" as their lemma).

Subsequently, a selection process was conducted to exclude irrelevant lemmas from the analysis. This involved excluding stop-words, instrumental, empty, and indicative words (e.g., "namely", "indeed", "and", "this") that lack specific semantic content, initially through the application of T-Lab's stop-words list, followed by a refinement check conducted by the research team. Basic auxiliary verbs (i.e., "to be" and "to have") and the top 5 most frequent lemmas were also excluded to minimize noise and focus on specific semiotic patterns. The selection yielded a subset of the 1000 most frequent lemmas, striking a balance between computational feasibility within the algorithm's constraints and the ability to detect meaningful patterns in the data.

In light of this preliminary textual data arranging, the procedure reduced the text under analysis in a digital corpus where each cell within the matrix indicated the presence (1) or absence (0) of a particular lemma within a specific ECU.

In the second stage of the procedure, the digital textual representation obtained underwent a multidimensional analysis integrating Cluster Analysis (CA) and Correspondence Analysis (COR) to map,

respectively, the thematic contents of the text and identify the semantic structure organizing the text.

CA was employed on the digital matrix, which comprised elementary context units (ECUs) and lemmas, to cluster the ECUs in the textual corpus. The goal of CA was to identify clusters of headwords that tend to co-occur within a same ECU indicating similar semantic content or themes. Clustering was based on the similarity derived from the co-occurrence of words, grouping text units with shared co-occurring words together. This clustering approach allowed for a detailed representation of semantic content by encoding each unit of analysis with its specific co-occurring word set. The quality of the chosen cluster partition was then inspected using "cluster quality" measures: specifically, choosing the partition with the largest value for the Calinski-Harabasz and please add a space between ICC and (Rho) indices and the smallest value for the Davies-Bouldin index.

Subsequently, COR was conducted on the resulting matrix, with lemmas as rows and clusters as columns. Each cell in the matrix denoted the frequency of a lemma within a cluster.

COR aimed to reveal the underlying semantic structures associated with the themes identified through CA. In so doing, the factorial space obtained by the COR does not map the semantic structure of the text; rather, it detects the semantic dimensions in terms of which the patterns of co-occurring lemmas are (dis)-similar to each other. Each polarity represents a set of co-occurring signs that either appeared together or were absent. Additionally, COR enabled the representation of additional variables, known as illustrative variables, on the factorial dimensions. Although these variables did not contribute to the definition of the multidimensional space, they were associated with the established factorial dimensions. This facilitated the interpretation of the relationship between semantic structures and segment/article characteristics (time block in the specific case).

To examine the possible temporal variation of themes, a contingency table that provides the degree of association of each time block with each theme was extracted. Subsequently, for each time block the standard deviation of represented clusters was calculated. Standard deviation has been interpreted in terms of dispersion concerning the themes through which climate change is tackled. Specifically, the higher the standard deviation over time, the more the climate change

issue within a given time block is treated according to different narratives. Thus, higher standard deviation represents a more diversified and less tight representation of the climate change issue according to a dominant theme. Accordingly, a linear regression was run having the standard deviation as dependent variable and the six-month time blocks as independent variable.

Results

The matrix employed for analysis comprised 10277 ECUs organized in rows and 30377 lemmas in columns. The Cluster Analysis division into four themes was chosen as the optimal solution (Calinski-Harabasz = 70.50; Davies-Bouldin = 11.54; ICC = 0.02). The themes were defined by the most representative lemmas, which are presented in Table 2, and were interpreted by the research team through a consensus procedure (Harris *et al.*, 2012; Schielke *et al.*, 2009) as follows:

Theme 1. Climatic variations. Lemmas in this theme refer to the rising global temperatures (Temperature, Hot, Heat), the impact of climate change on the Earth's bodies of water (Water, Sea), the occurrence of extreme weather events (Drought, Extreme), changing weather patterns, the impact on biodiversity, and geographic regions and ecosystems affected by climate change (Phenomenon, Species, Area).

Theme 2. International negotiation. Lemmas referring to the formal agreements and commitments made by countries to address the challenges posed by climate change (Agreements, Commitments) as in the case of the Paris Agreement at the 2015 United Nations Climate Change Conference (Paris, Conference), the role of countries in addressing the problem (Country, China, United States), and the role of policymakers in setting climate policies (Trump, Obama, President).

Theme 3. Sustainability. Characteristic lemmas of this theme refer to the need for renewable and sustainable (Renewable, Sustainable) energy solutions (Energy, Energetic), the role of investment and corporate actions in addressing the climate crisis (Investment, Company), the energy industry and related fields, and the transition to sustainable energy systems, policies, and practices (Sector, Transition).

Theme 4. Activism. Lemmas referring to one of the best-known figures about the issue of climate change and her role in inspiring a global movement of activists (Greta, Thunberg, Activist, Movement), to the involvement of young individuals in climate change initiatives (Young, Boy, Student), to the Fridays for Future movement and the public spaces where protests and demonstrations related to climate change take place (Square, Fridays, Future).

Table 2. Lemmas characterizing the three themes

Theme 1 – Climatic variations				Theme 2 – International negotiation			
Lemmas	*F*	*TOTAL*	χ^2	*Lemmas*	*F*	*TOTAL*	χ^2
Temperature	1073	1285	1457.048	Agreement	806	921	2030.408
Water	883	1068	1170.725	Paris	766	936	1710.695
Hot	559	625	884.782	Country	1274	2128	1498.06
Drought	384	427	614.721	Trump	468	525	1216.172
Phenomenon	432	519	580.928	President	612	824	1136.787
Species	380	440	556.082	Conference	443	587	848.302
Extreme	387	471	504.71	Obama	310	340	837.166
Area	461	603	503.839	China	437	609	757.562
Sea	412	518	496.93	United States	408	605	622.352
Heat	289	314	486.216	Commitments	288	359	618.859
Theme 3 – Sustainability				Theme 4 – Activism			
Lemmas	F	TOTAL	χ^2	Lemmas	F	TOTAL	χ^2
Energy	884	1193	1430.301	Greta	407	449	1805.322
Renewable	596	682	1331.093	Young	380	461	1465.989
Energetic	685	853	1302.858	Square	267	309	1104.123
Investment	411	471	914.825	Activist	260	312	1019.061
Sector	408	531	709.869	Thunberg	206	225	926.351
Transition	362	484	595.899	Movement	243	306	885.734
Fossil	480	737	583.401	Boy	188	205	847.37
Sustainable	391	548	582.771	Fridays	166	173	797.96
Euro	305	390	549.652	Future	482	999	739.866
Company	316	421	523.912	Student	152	170	660.43

Note. All χ^2 values are significant below the level of .001.

The correspondence analysis on the lemmas x clusters matrix produced two factorial dimensions (Table 3). The consensus procedure used by the research team resulted in the following interpretations:

Factor 1. Institution – Environmental risks. The negative pole of this factor groups lemmas that refer to international governance and cooperation mechanisms, aimed at addressing climate change (Agreement, Paris, Target, Conference), the role of political leadership and the actions of individual nations (Country, President, Trump, Obama), the shift from fossil fuels to renewable energy sources (Emission, Energy), formal structures and practices of ecological balance (Institution, Sustainable), and organizations that can contribute to actions against climate change (Euro, Company). Positive pole lemmas, on the other hand, refer to the concept of rising temperatures and heat (Temperature, Hot, Heat), to the interconnectedness of water resources and the marine environment (Water, Sea), to the changes and climate effects which translate into occurrence and intensification of extreme weather events (Phenomenon, Extreme), to water scarcity (Drought, Area), and to the impacts of changing environmental conditions on biodiversity (Species).

Factor 2. Advocacy – Transition. The negative pole of this factor includes lemmas that refer to individuals engaged in raising awareness and driving action (Greta Thunberg, Young, Boy, Student, Activist), to the collective and organized efforts of activists (Movement, Fridays, Square) in addressing climate change (Climate). On the other hand, the positive pole of this factor groups lemmas that refer to the role of energy systems and the need for sustainable alternatives (Energy, Renewable, Energetic), to the economic aspects of climate change and the energy sector (Investment, Sector, Billion, Euro), to the contrasting energy sources and their environmental implications (Fossil, Source), to the importance of adopting sustainable practices and systems (Sustainable).

In Figure 1 it may be observed that Climatic variations (Theme 1) were situated within the positive polarity of the first factor, indicative of its association with the Environmental risks. Conversely, International negotiation (Theme 2) showed an alignment with the negative pole of the first factor, signifying its association with Institution. Sustainability (Theme 3) positioned within the positive pole of the second factor, which represents Transition, while concurrently tending to

associate with the negative pole of the first factor (Institution). Lastly, Activism (Theme 4) emerged on the negative pole of the second factor, thereby reflecting its linkage to Advocacy.

Table 3. Characteristic lemmas of factorial dimensions

Factor 1				Factor 2			
Institution		Environmental risks		Advocacy		Transition	
Pole (-)	V Test	Pole (+)	V Test	Pole (-)	V Test	Pole (+)	V Test
Agreement	-0.0122	Temperature	0.0181	Greta	-0.0203	Energy	0.0205
Paris	-0.0107	Water	0.0161	Young	-0.0162	Renewable	0.0191
Country	-0.0093	Hot	0.0121	Square	-0.0121	Energetic	0.0185
Emission	-0.0086	Phenomenon	0.0084	Activist	-0.0112	Investment	0.0135
President	-0.0075	Drought	0.0083	Thunberg	-0.0106	Sector	0.0108
Trump	-0.0068	Species	0.0078	Boy	-0.0092	Billion	0.0089
Energy	-0.006	Sea	0.007	Movement	-0.0086	Euro	0.0089
Target	-0.0055	Area	0.0068	Fridays	-0.0083	Fossil	0.0081
Conference	-0.0052	Heat	0.0067	Climate	-0.0072	Source	0.008
Obama	-0.0049	Extreme	0.0067	Student	-0.0071	Sustainable	0.0075

Note. Each pole contains the 10 most representative lemmas.

Figure 1. Themes position on the semantic space, defined by factor 1 in the abscise axis and factor 2 in the ordinate axis
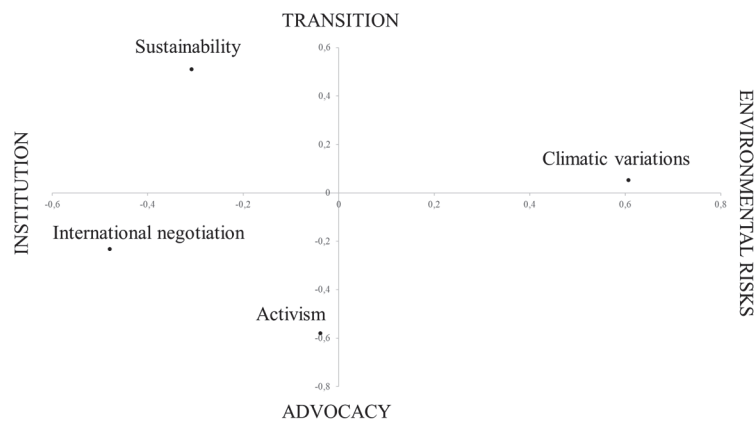
Finally, simple linear regression tested the significant role of time in predicting the variability of themes according to which the issue of climate change is tackled by newspapers. Specifically, the regression model was statistically significant ($R^2 = .418$, $F[1,21] = 15,090$, $p < .001$) and showed an increase in variability over time in themes dealing with climate change ($\beta = .647$, $p < .001$).

Discussion

This study aimed to map the themes characterizing the Italian public discourse on climate change from 2011 to nowadays. Specifically, it was designed to detect the themes adopted by four national newspapers addressing the phenomenon of climate change, to identify the semantic structures underlying the themes, and, finally, to assess themes variability from 2011 to 2022.

The results concerning the issues addressed by newspapers on climate change revealed four main themes. The first encompassed Climate variations, characterized by phenomena such as the rise in temperatures, extended periods of drought followed by sporadic episodes of intense rainfall, and the occurrence of hurricanes. The second theme pertained to international negotiations, involving key events, like the United Nations Framework on Climate Change Convention and the Paris Agreement. The third theme accounted for the issue of Sustainability, encompassing endeavours focused on seeking energy solutions, and investments, aimed at eradicating reliance on fossil fuels. Lastly, the fourth theme concerned the issue of Activism. It focused on the active efforts undertaken by individuals to draw attention to the issue of climate change amongst the public and policymakers.

The themes identified highlight a substantial agreement of Italian public debate on climate change with that of the international media. Specifically, a recurring theme pertaining to the consequences and impact of climate change, referred to as Climatic variations in this study, is found to align with findings from other scholarly investigations. Han *et al.* (2017) conducted an extensive content analysis of Chinese newspapers from 2005 to 2015 and similarly identified a theme focusing on the consequences of climate change in terms of its environmental impact. This finding gains further support from the work of Lopera and

Moreno (2014), who analyzed the coverage of climate change in the Spanish press between 2000 and 2010, as well as Chand (2017), whose content analysis specifically explored the newspaper discourse surrounding climate change in the Fiji Islands. In both studies, an evident theme was closely related to climatic consequences and impacts. Furthermore, the theme of climatic consequences and impacts was also identified in the analysis conducted by Kirilenko and Stepchenkova (2012), which examined articles published by the New York Times between 1995 and 2010, as well as in the content analysis carried out by Keller *et al.* (2020), focusing on climate change coverage in the Indian press from 1997 to 2016.

The consistency of these findings across diverse geographical contexts and different time periods suggests the acknowledgment of wide-ranging climate change effects as a cross-cultural concern.

Furthermore, the identification of the international negotiations theme in this study aligns with findings from other international investigations. Kirilenko and Stepchenkova (2012) detected this theme through their meticulous analysis of articles that discussed international negotiations in the political domain. Such observation shows that the discourse surrounding climate change extends beyond its environmental dimensions to encompass the political sphere of global collaboration and decision-making. Furthermore, Keller *et al.* (2020) provided an additional corroboration by finding the presence of the same theme in their assessment of climate change coverage in the Indian press. The inclusion of the theme of international negotiations substantiates the recognition of the pivotal role played by multilateral endeavours and international agreements in addressing the global-scale implications of climate change.

Moreover, the theme of Sustainability identified in this study aligns with the "solutions" theme identified by Lopera and Moreno (2014) which emphasizes the exploration of viable approaches to address the challenges posed by climate change.

Notably, unlike the international literature, Italian articles leave space for the theme of activism. However, it is possible that this aspect may emerge in studies focused on the most recent years, given the international demonstrations by activists (e.g., vandalizing artworks in museums and public squares) aimed at drawing public and political attention to the issue of climate change.

To sum up, the presence of overlapping themes concerning climate change in the international scientific landscape suggests a prevailing global framing of the climate change phenomenon through recurrent representations.

The second objective of this study was to detect the latent organizing dimensions of climate change issues. The semantic structures that emerged were related to the dichotomous opposition between the institutional and the environmental risks, on one hand, and to the opposition between the sense of advocacy and the need for ecological transition on the other hand. As semantic structures ground and shape the content of the representation, it can be seen that different themes are consistently associated within the semiotic space (i.e., the space where the semantic structures intersect). This means that the position of the themes represents the instantiation of the semantic structures Institution-Environmental risks and Advocacy-Transition. Important to note is that the identification of the semantic structures, underlying the (media) representation of climate change allows us to find connections between seemingly separate social objects (e.g., international negotiations and the environment). Consequently, the contents of the representation of climate change can be recognized as a spatio-temporal manifestation of a broader sense-making dynamics that shapes the experience of the internal and external environment, namely, the image that individuals and groups (in this case, newspapers) have of themselves and their relationship to the surrounding context.

Finally, differently from previous cited works, the linear regression model allowed us to track the role of time in promoting different ways to tackle the climate change issue. Over time there is an increase in the focus of climate change according to different thematic contents (i.e., themes), and this trend may be a consequence of the general increase in media interest in climate-related issues as well as the increased awareness of the multifaced nature of the issue (IPCC, 2022).

In the whole, our data highlight that, on the on hand, the themes according to which climate change is tackled by the media are substantially aligned to those identified in other countries (see Chand, 2017; Han *et al.*, 2017; Keller *et al.*, 2020; Kirilenko and Stepchenkova, 2012; Lopera and Moreno, 2014). Nevertheless, the last 11 years have seen the increase of different thematic content related to the climate change phenomenon reflecting the awareness and the need for a

multifaceted understanding (OECD, 2009). Moreover, beyond this data-driven interpretation, it could be hypothesized that the greater variability of themes reflects, on the one hand, greater interest and demand from readers; on the other hand, greater attention to the issue of climate change by newspapers. In both cases, such variability results in diverse representations that are able to capture the multifaceted nature of the phenomenon as an attempt to increase social commitment toward enacting pro-environmental and resilient behaviors. A future test of these interpretive hypotheses would enhance the role of the media as a preferred medium for increasing the salience of the phenomenon involved and enhancing individual engagement and agency toward it.

Limits and conclusion

First of all, this study focuses only on the Italian context; moreover, the low number of newspapers under analysis and the lack of comparison to the international newspapers in the same time span mark the poor generalizability of this exploratory study. Future research should address such limitations conducting cross-national comparative studies within the framework of SCPT, which would help to identify and understand potential variations in climate change representations across different countries and cultures. As was underlined in the introduction of this paper, individual meaning-making is embodied in the cultural practices within a certain social group. Thus, further cross-cultural studies within SCPT framework could contribute to a more nuanced understanding of how societal factors shape climate change perceptions and responses. For example, it would be interesting to investigate the relation between activism and theme variability in different cultures, as well as the relationship between theme variability and socio-economic factors. Additionally, including a broader range of newspapers in future research would provide a more comprehensive overview of climate change communication. Finally, future research should consider the influence of political orientation on climate change communication in order to verify whether different political orientations translate into different communicative models.

Nevertheless, this study is relevant both in the theoretical and

intervetion perspectives. At the theoretical level, the study makes a contribution to the analysis of the relationship between narrative content and the organizing principles (i.e., semantic structures) of social meaning-making processes (Salvatore & Venuleo, 2013).

At the empirical level, the ability to identify differences in the themes of climate change representation in newspapers and to track their evolution over time provides a deeper understanding of how climate change is represented in the media, capturing changes in narratives and identifying emerging themes. By examining the dynamic nature of these themes, a better understanding can be gained of the evolution of societal perceptions, attitudes and responses to climate change.

Moreover, at the applicative level, mapping and monitoring how climate change is narrated in the media can have practical implications in terms of promoting new or different narratives on the phenomenon at stake able to promote pro-environmental and resilient behaviors. In fact, identifying alternative themes beyond the dominant narratives provides opportunities to introduce different perspectives, emphasize the urgency of action, and encourage sustainable behaviors. Moreover, comprehensive mapping and monitoring about climate change communication could enable the design of targeted interventions that address specific issues and involve different social groups. This approach can promote pro-environmental attitudes, facilitate informed decision making, and foster resilient behaviors in the face of climate challenges.

In the final analysis, it could be argued that the issue of climate change is a matter of clinical psychology in light of its commitment toward the promotion of the psychosocial resources to sustain a complex socio-cognitive task that should be considered a strategic aim of institutional action, on a par with that of economic, infrastructural, and institutional resources.

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