The online Climate Change Communication in Spain

La comunicación online del Cambio Climático en España

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This article has been elaborated with data from the Observatory for Climate Change Communication in Spain launched by the MDCS research group of the Complutense University and the Ecology and Development Foundation (ECODES), with funding from the Ministry for Ecological Transition (MITECO) through grants for research projects 2019 and 2020.

How to cite this article / Standard reference
Teso-Alonso, G., y Lozano Ascencio, C. (2022). The online Climate Change Communication in Spain. *Revista Latina de Comunicación Social* 80, 65-87. https://www.doi.org/10.4185/RLCS-2022-1531

ABSTRACT
Introduction: The evolution of news coverage of climate change during the last twenty years coincides with the emergence, expansion, and consolidation of digital media in Spain. The objective of this study is to explore online communication on climate change in Spain, identifying the main sources of information and the characteristics of the communication they practice. **Methodology:** From a quantitative approach, all the records obtained during the first online probe carried out by the Observatory for Climate Change Communication are analyzed (data from Kantar Media). **Results:** There is a trend similar to conventional media in terms of seasonality, schedules, and coverage. The main general and specialized sources of information are identified, establishing a ranking with the thirty most relevant, and the "sentiment" associated with the speeches is analyzed. A content analysis protocol is applied to identify the sources of information about CC on the Internet and the thematic content. **Discussion**: The general press is the undisputed leader in the online environment due to the low volume of publications on climate change on radio and television on the Internet. Sectorial associations, companies, and municipal or regional institutions are the main sources of specialized information together with the press. The Europa Press news agency ranks first in terms of the volume of information published in the ranking of the thirty main sources of online information. **Conclusions:** We find great transversality of climate change as an informative reference, which is communicated by specialized sectors such as the economic and financial sector and by various media concerned by the ecological transformation in the social context of the climate emergency of 2019.

KEYWORDS: online communication; climate change; information sources; cybermedia; climate emergency; sectors; sentiment.

RESUMEN
Introducción: La evolución de la cobertura informativa del cambio climático durante los últimos veinte años coincide con el surgimiento, expansión y consolidación de los medios digitales en España. El objetivo de este estudio es explorar la comunicación *online* del cambio climático en España identificando las principales fuentes de información y las características de la comunicación que practican. **Metodología:** Desde un enfoque cuantitativo, **s**e analizan todos los registros obtenidos durante la primera sonda *online* realizada por El Observatorio de la Comunicación del Cambio Climático durante la primavera-verano de 2019 (fuente de datos: *Kantar Media*). Se aplica un protocolo de análisis de contenido para identificar las fuentes de información sobre CC en Internet y el contenido temático. **Resultados:** Se encuentra una tendencia a similar a la de los medios convencionales en cuanto a la estacionalidad, horarios y cobertura. Se identifican las principales fuentes de información generalistas y especializadas estableciendo un *ranking* con las treinta más relevantes y se analiza el "sentimiento" asociado a los discursos. **Discusión**: La prensa generalista es la líder indiscutible en el entorno *online* ante el escaso volumen de publicaciones sobre cambio climático de la radio y la televisión en Internet. Junto con la prensa, asociaciones sectoriales, empresas e instituciones municipales o autonómicas son las principales fuentes de información especializada. La agencia de noticias Europa Press ocupa el primer lugar por volumen de información publicada en el *ranking* de las treinta principales fuentes de información *online*. **Conclusiones:** Encontramos gran transversalidad del cambio climático como referencia informativa, que es comunicado por sectores especializados como el económico y financiero y por medios diversos concernidos por la transformación ecológica en el contexto social de emergencia climática de 2019.

PALABRAS CLAVE: comunicación *online*; cambio climático; fuentes informativas; cibermedios, emergencia climática; sectores; sentimiento.

CONTENT

Translation by **Paula González** (Universidad Católica Andrés Bello, Venezuela)

1. Introduction

1.1. News coverage of climate change in Spain in the last twenty years

In this section, a concise review of the evolution of the news coverage of climate change over the last twenty years will be carried out, a period that coincides with the emergence, expansion, and consolidation of digital media in Spain. Next, we will review the connections between both phenomena through the response of the audience, that is, how citizens use conventional and online media to access information on climate change will be exposed. This will help us to contextualize the object of study that is none other than online climate change communication in Spain.

Climate change communication during the last twenty years in conventional media can be described, in general terms, as a prolonged media irrelevance until the arrival of 2018. Except for peaks of greater coverage, climate change has traditionally been the object of little follow-up by the Spanish media (Parratt, 2009; Fernández and Jiménez, 2020; Francescutti et. al, 2013; Lopera, 2013; Gaitán

& Piñuel, 2013; Lozano, 2013; Mancinas, 2013; León & Erviti, 2015; Heras, Meira, & Benayas, 2016; Teso, 2016). Besides the annual coverage of climate summits as political events on an international scale, we can point out some milestones in the media coverage of climate change, among which 2007 stands out. This year, the international launch of the documentary "An Inconvenient Truth" starring Al Gore coincided with the presentation of the Nobel Peace Prize to the Intergovernmental Panel on Climate Change (IPCC) of the United Nations and Al Gore himself.

During the Copenhagen summit held in December 2009, Juantxo López de Uralde was arrested along with another Greenpeace activist, who managed to infiltrate the gala dinner for senior leaders to make visible their request for specific commitments and climate action. The aforementioned event had wide international coverage, although the immediate arrival of the 2008 economic crisis silenced climate change in the media for more than four years. The fifth IPCC report, which was published in 2013 and 2014, encouraged the seriousness and urgency of undertaking measures to curb the climate crisis, but it took until the end of 2015 for the new international agreement signed during the celebration of the Paris Agreement, to once again strongly place climate change on the national and international media scene. In 2016, the Encyclical Letter *Laudato Sí* of Pope Francis "On Care for Our Common Home" (2016)[1] made visible the dimension of ethics and justice in the problem of climate change. Donald Trump's messages drew the attention of the media in 2016 and 2017 due to his stubborn denial, which were joined by voices from other leaders such as Jair Bolsonario (Rejón, 2018).

The alarm message of the IPCC +1.5ºC report published in 2018, was amplified in the streets by the new student and social movements *Fridays for Future* and *Extinction Rebellion*. In 2019, these voices were joined by other support groups such as *Mothers for Climate* or *Teachers for Future*, who raised their voices in the face of the social alarm caused by the evident deterioration of the planet. In September 2019, the Climate Action Week took place, a time segment in which the Climate Action Summit convened by the United Nations on Monday 23rd coincides with the presentation of the IPCC Report on the impact of climate change on the oceans (IPCC, 2019) that took place on Wednesday 25th and the celebration of the massive global strike for the climate held in unison in 150 countries on September 27th. That week, from September 23rd to 29th, 2019, contributed to creating an atmosphere conducive to the celebration of COP 25 Madrid-Chile that took place in Madrid, an event that became a true informational tsunami in Spain at the end of 2019 (Fernández-Reyes & Teso, 2020). The arrival of the Covid 19 health crisis in March 2020 and the declaration of the state of health alarm, pushed back the prominence of climate change in the media to levels before 2018 (Fernández-Reyes & Jiménez, 2020).

1.2. The evolution of digital media in its first quarter of a century

Parallel to the history of climate change coverage in the media, we find the evolution of digital media in its first quarter of a century. Salaverría (2020) is in favor of using the term digital journalism to refer to the practice of journalism in the online environment, although other authors are in favor of the terms "such as digital journalism (Kawamoto, 2003), cyber journalism (Díaz-Noci & Salaverría, 2003), online journalism (Deuze, 2001; Steensen, 2011), multimedia journalism (Deuze, 2004), and a long list of similar labels (Karlsen & Stavelin, 2014)". (Salaverría 2020, p. 2).

The arrival of the economic crisis in 2008 not only impacted the media coverage of climate change but also impacted the media's business structures. The growth of media in the online environment

[1] Full text of the Encyclical Letter *Laudato Sí* available at: https://www.vidanuevadigital.com/wp-content/uploads/2015/06/Laudato-Si-ES.pdf

grew largely due to have coincided with a great economic crisis that reduced the income of traditional media outlets, forcing them to reduce their newsrooms (Díaz, 2011). The Madrid Press Association began to draw up a list in 2008 of the new media launched by journalists since the beginning of the great economic crisis. This list is reviewed and updated in the Reports of the Journalistic Profession[2] that this Association annually issues (2013, 2014, and 2015). The 2019 edition carried out a new count and review of these media outlets. The total number of media and other journalistic projects launched between 2008 and 2015 was 579. In October 2019, of those 579 media outlets, 52.15% remained active; 35.9% had closed or stopped updating; 5.51% were sporadically updated, and 6.39% had been transformed into blogs or sponsored content websites.

As Salaverría, Martínez- Costa, & Breiner (2018) point out, the economic crisis was not the only cause of the constant growth of digital media. Technological development applied to the digitization of information has positioned the Internet as a propitious scenario for media convergence, both of new and conventional media. On the other hand, mobile devices have transformed forms of consumption (López, 2015; Meso, 2006; Yunquera, 2016), enhancing accessibility and immediacy in the consumption of information.

Salaverría, Martínez-Costa, and Breiner (2018) carried out an exhaustive map of cyber-media or digital media in Spain in 2018 through a quantitative analysis of digital media. These authors identified a total of 3,431 media outlets. Of these, 89.3% (3,065) were active, compared to 10.7% (366) who had no activity. Of the active digital media outlets, a total of 1,077 (35.1%) were digital natives, compared to 1,559 (50.9%) who were non-native media. Active cybermedia (1809, 60%) combined online publication with a presence on two, three, or four platforms (press, radio, television, and/or mobile apps). Regarding content, a vast majority of the media opted for general information (68.5%). The authors identified a boom in local digital media outlets that address proximity information from a generalist approach. For their part, they perceived a decrease in specialized media that went from 40.3% in 2005 to 31.5% in 2018. The topics with the most presence among them are culture (30%), sports (14.6%), technical and professional publications (10.2%), and leisure and entertainment (9.8%). Economy (7.9%) and science and technology (3.8%) accumulated relatively low percentages of the total.

1.3. The main sources of information on climate change for citizens in 2020

To conclude the contextualization of the object of study that is addressed in this research, it is now necessary to address the response of citizens to media consumption when the information that is published is climate change. The transnational study *Digital News Report 2020* (Newman, Fletcher, et al., 2020) published by the Reuters Institute of the University of Oxford, informs us about the main sources of information on climate change used by the citizens of the countries participating in the Study (see Image 1). The report indicates that the percentage of the Spanish population that uses television news to be informed is 71%, while 83% access online media for the same purpose, including social networks. Similar percentages are present in other European countries such as Great Britain or Germany. It is, therefore, a multi-screen consumption associated with hyper connectivity without schedules in most of the countries of a globalized world.

[2] Reports available at: https://www.apmadrid.es/publicaciones/informe-anual-de-la-profesion/

PROPORTION THAT USED EACH AS A SOURCE OF NEWS IN THE LAST WEEK (APRIL 2020) – SELECTED COUNTRIES

	Online (incl. social media)	TV	Social media	Radio	Print (incl. mags)
UK	79%	71%	47%	35%	18%
USA	73%	60%	47%	21%	16%
Germany	69%	72%	39%	41%	26%
Spain	83%	71%	63%	24%	28%
South Korea	85%	65%	51%	14%	19%
Argentina	90%	77%	78%	24%	30%
Average change from January	+2	+5	+5	+2	-2

Q4. (Apr. 2020). Which, if any, of the following have you used in the last week as a source of news? *Base: Total sample: UK = 2191, USA = 1221, Germany = 2003, Spain = 1018, South Korea = 1009, Argentina = 1003. Note. Figures adjusted to exclude non-news users for comparability.*

Image 1. *Percentage of the population that has accessed the different media (television, radio, press, social networks, and online media) as sources of information on climate change.*
Source: Reuters Institute for the Study of Journalism. University of Oxford (2020, p. 10).

The global data provided by the respondents in this cross-national study indicate that the population pays more attention to climate change information broadcasted on conventional television than to any other source of information (35%). The second most important source of information (15%) is the websites of the main communication media (television, radio, and online press). In third place are the websites of media specialized on climate issues (13%) and in fourth place are social networks and blogs (9%), followed by conversations with friends and family as a source of information (6%). The print press and conventional radio are indicated as the fifth source of information on climate change for 5% of those surveyed respectively, while 7% admit not paying attention to climate change. The young people of Generation Z (18-25 years old) participating in this study explained their motivations for using social networks, showing their preference for the digital environment because it allows them to access a wide range of sources besides the main traditional media. They are interested in information published with a specific point of view and being able to consult digital sources with different perspectives.

1.4. Online climate change communication

Among the studies carried out on online climate change communication, three stand out due to their relationship with the object and focus of the study presented here.

In 2014, Dr. Joanna Boehnert of the *Center for Science and Technology Policy Research* of the *Cooperative Institute for Research in Environmental Sciences* (CIRES) of the University of Colorado, carried out an exhaustive study on the sources of information on climate change in the United States, the United Kingdom, and Canada, identifying the main actors and their information networks. The result is a great infographic that serves as a map of climate change communication in the indicated countries, including both the conventional media and the various sources of information

present on the Internet[3]. In her study, Dr. Joanna Boehnert carried out categorization of the different sources of information on climate change, the list of which is listed below:

1. *government*
2. *intergovernmental organization*
3. *association*
4. *scientific research*
5. *media*
6. *NGO / charity*
7. *research institute*
8. *website or blog*
9. *contrarian organization*
10. *contrarian blog*
11. *individual*
12. *corporation*

The second study corresponds to the analysis carried out by Arcila et al. (2015) on the coverage of climate change carried out by Spanish-speaking online media. This study focuses on the monitoring of the Cancun (2010) and Durban (2011) summits, comparing the coverage carried out by mainstream media and news websites. The results conclude that conventional media coverage of the Cancun (2010) and Durban (2011) summits and coverage of news websites showed similar tendencies. Amid the social context of the economic crisis, both mainstream and digital media reduced the news coverage of the Durban summit. This tendency was significantly more pronounced in digital media than in conventional media (Arcila et al., 2015).

Finally, we highlight the study entitled *Dominant counter-frames in influential climate contrarian European think-tanks* by Almirón, Boykoff, et al. (2020) that identifies the eight most important denialist think-tanks in Europe that publish in English, Spanish, German, and French. Most of these think-tanks were founded between 2003 and 2009, but their activity increased in the period between 2014 and 2018. The authors analyzed 1,669 texts and found that the IPCC AR4 and AR5 reports, issued in 2007 and 2014 respectively, served as a trigger for these European denialist think-tanks. The second most important think-tank in Europe for its volume of publications is the Juan de Mariana Institute, based in Madrid. The study found 112 texts published between 2001 and 2018 on its website.

2. Research objectives and questions

The general objective of this study is to explore the online climate change communication in Spain in 2019, in the social context of the climatic emergency before the arrival of the pandemic caused by SarsCov-2 in March 2020. This general objective is specified in the following specific objectives:

O.1. Identify and classify the main sources of information on CC in the online environment, not including social networks in the study.
O.2. Identify the main media, organizations, and institutions that communicate about climate change in the online environment and their area or territorial coverage of interest.
O.3. Identify the main topics that are communicated concerning climate change.
O.4. Formulate new working hypotheses for subsequent studies.

The research questions that have guided this exploratory study have been the following:

[3] This complete map is available at: http://ecolabsblog.wordpress.com

Q.1. Taking into account the volume of emerging online media in the last decade in Spain, the first question is whether the media (radio, television, press) are also the main transmitters of information on climate change on the Internet.

Q.2. Second, we wonder about which are the social and institutional agents in Spain that act as sources of information on climate change on the Internet and the general characteristics of their communication.

Q.3. We wonder about the topics in which the various online information sources that communicate climate change are specialized in, in the analyzed period.

3. Methodology

3.1. Analysis and sampling technique

The objective of this study is exploratory and descriptive with a quantitative approach since it intends to analyze the obtained data to explore the structure that underlies the whole. The characteristics of the sources of information on climate change identified on the Internet (excluding social networks) are described below. For this purpose, the content analysis technique has been applied, which has made it possible to identify the general principles of the phenomenon under study.

When trying to analyze an area of climate change communication little studied to date, a strategic non-probabilistic sampling has been chosen by virtue of the chosen time segments. The Observatory for Media Communication on Climate Change in Spain conducted three online probes during 2019: the first took place in spring-summer, the second in summer-autumn, and the third in autumn-winter (which included coverage of COP 25 in Madrid).

The first probe of 2019 has been chosen to explore online climate change communication because it seeks to identify those sources that communicate the phenomenon of climate change regardless of the impact of news events. The second probe, the summer-autumn probe, took place during September 2019 and included the so-called Climate Action Week, which was painstakingly prepared by activists around the world and joined by numerous events such as the Climate Action Summit organized by the United Nations in New York or the presentation of the IPCC Report (2019) on the impact of climate change on the oceans. The third probe, the winter probe, included the preparations for and the celebration of the Madrid-Chile climate summit (2019). Climate change then became a priority issue on the political and social agenda and received unusual news coverage (Fernández-Reyes, & Teso, 2019).

3.2. Data source and object of study

The data source for the Climate Change Communication Observatory has been the company *Kantar Media*, hired to monitor conventional media and online sources in Spain. The filters applied for the selection of the publications have been the terms: climate change, climate crisis, climate emergency, and global warming. Social networks are excluded from this study.

The analyzed object of study is made up of all the information on climate change published on the Internet during the first probe of 2019. For this first probe, all the publications on climate change released in the online environment for thirty-five consecutive days, between June 15th and July 20th, 2019, were recorded. A total of 2,651 pieces of information were identified that have constituted the 2,651 units of analysis of this study.

The tables and charts presented below have been prepared by the authors of this text and members of the research team of the aforementioned Observatory, from the primary data obtained by *Kantar Media.*

3.3. Analysis variables

The used analysis variables have been established by virtue of the data offered by the online source itself concerning its identity and activity. First, we have proceeded to study the type of data shown by the different sources of information that published content on climate change on the Internet. It has been chosen to work with quantitative data that allow identifying the different sources of information and classifying them based on the information provided by the source itself. Qualitative analysis variables have not been used. The applied analysis variables have been the following:

1. Date of publication.
2. Source name
3. Type of source. Sources are classified according to their main activity, differentiating if they are professional media or if they are institutions of another nature whose main function is not public communication, although they also disseminate content in the online environment (see the case of NGOs, companies, unions, etc.).
    a. Press. This category comprises the digital versions of mainstream newspapers and digital native newspapers.
    b. Radio.
    c. TV.
    d. Agency.
    e. Media magazine (they do not generate their own content, but collect what is published by other media).
    f. Online-hybrid medium (produces information in audio, video, text, photos, events, etc.). We have called "hybrids" to the media that cannot be classified in only one of the previous categories.
    g. Institutions/organizations/associations that are not media outlets: Companies; Unions; Foundations; Research centers; NGOs; Sectorial associations; Governments (regional, local, national).
    h. Other
4. The territorial coverage of interest to the source. Taking into account that publications in the online environment exceed the territorial limits of linear media coverage, this variable is related to the idiosyncrasy of the entity that communicates and its interest in the news coverage of international, national, regional, or local content, depending on the geographic area of the target audience.
5. Type of content published by the source:
    a. General
    b. Specialized.
6. If the source publishes specialized content, the topic is indicated. This variable offers a highly heterogeneous categorization: Economy; Sports; Primary sector (agriculture, livestock, and fishing); Defense, Energy; Market and Stock Exchange; Culture; etc.

4. Results

4.1. Seasonality and hours

A total of 2,651 pieces of information were obtained spread over the 35 days of the first probe, so that 1,358 analysis units were found in June 2019, 51.2% of the total, and 1,293 units in July 2019,

48, 8% of the total. This averages 90.5 information pieces per day during June and 64.6 during July, which indicates a downward tendency in the volume of information with the arrival of summer.

Table 1. *Monitoring days of the coverage of climate change in conventional media and on the Internet of the first probe carried out in 2019*

Recorded days of the 1st probe of 2019			
Day	June	July	Total
1	0	63	63
2	0	81	81
3	0	84	84
4	0	73	73
5	0	108	108
6	0	43	43
7	0	48	48
8	0	44	44
9	0	104	104
10	0	79	79
11	0	83	83
12	0	53	53
13	0	34	34
14	0	72	72
15	0	106	106
16	28	59	87
17	106	61	167
18	166	34	200
19	170	59	229
20	65	5	70
21	70	0	70
22	21	0	21
23	16	0	16
24	119	0	119
25	116	0	116
26	154	0	154
27	122	0	122
28	92	0	92
29	86	0	86
30	27	0	27
	1358	1293	2651

Source: self-made

Most of the information on climate change in the online environment is published on weekdays (84.8%) compared to weekends (15.2%). In Chart 1 it can be seen that the peaks correspond to weekdays and the troughs to weekends. This fact indicates that there is a tendency in the communication of climate change in the online environment similar to conventional media communication in terms of the increase in the volume of publications on weekdays.

Received: 07/01/2021. **Accepted:** 04/08/2021. **Published:** 03/01/2022

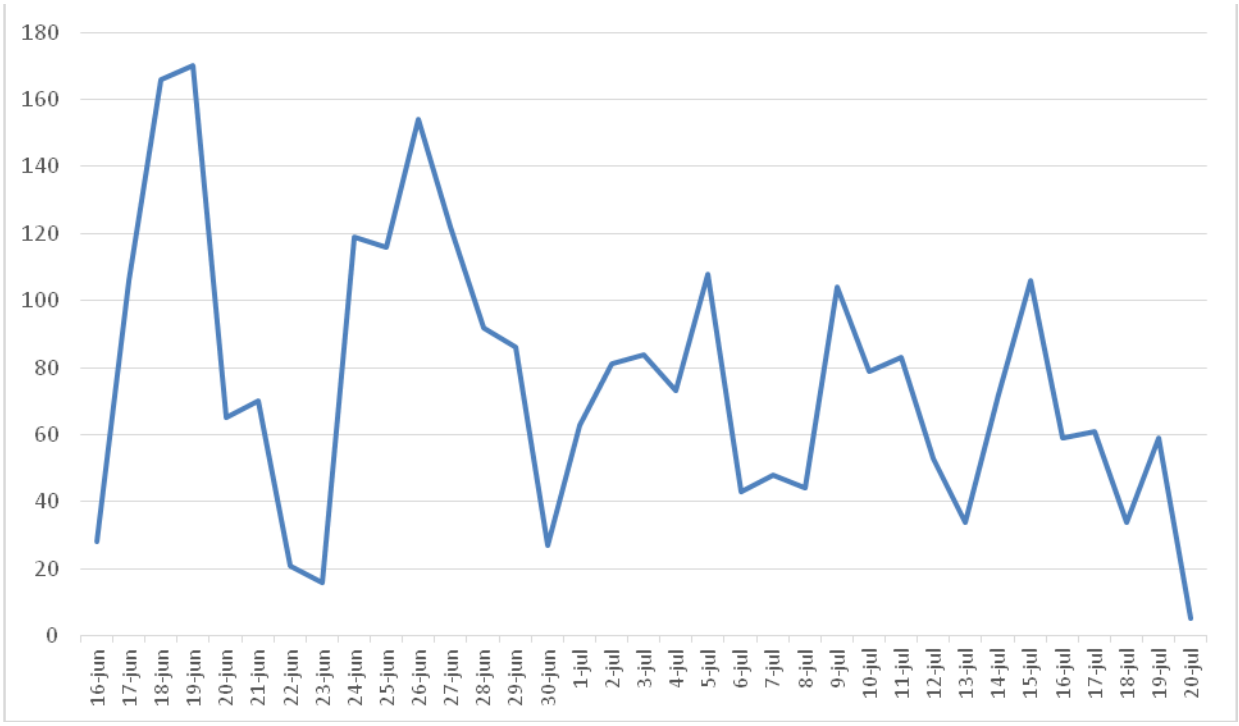

Chart 1. *Online communication on climate change in Spain between 16/06/2019 and 20/07/2019*
Source: self-made

4.2. Typology of information sources on the Internet on climate change

721 different sources have been identified that gave rise to the 2,651 publications. With 61.2% of publications, the online press ranks as the main source of online climate change information in Spain. This category not only includes the digital versions of important conventional reference print newspapers, but also includes digital native newspapers interested in national, regional, or local coverage depending on the geographic area of the audience to which they are targeted (see Chart 2). “Institutions or organizations that are not media outlets” are the next most abundant source of information, publishing 19.3% of online climate change information. With 5.3% of the total publications found, news agencies are the third-largest source of online climate change information, followed by media magazines and television and radio websites. In the penultimate place, we find the sources that we have called "hybrids" as they are media that cannot be classified in just one of the previous categories. Finally, with only 2% we have the NP category that corresponds to those sources whose identity has been impossible to determine.

512 pieces of information have been found, 19.3% of the total, which are disseminated by institutions or organizations that are not media outlets. Chart 3 shows the percentages corresponding to the publications made by the different sources that have been included in this category. We find that the majority, 53%, corresponds to the communication made by associations that represent the strategic interests of different productive sectors. By volume of information, the next organizations (not media outlets) that communicate on the Internet are companies (15%), followed in third place by institutional communication issued by local, regional, or national governments. Research centers (6%), foundations (2%), and unions (2%) register a lower volume of publications. NGO publications only reached 1% of the total in this period.

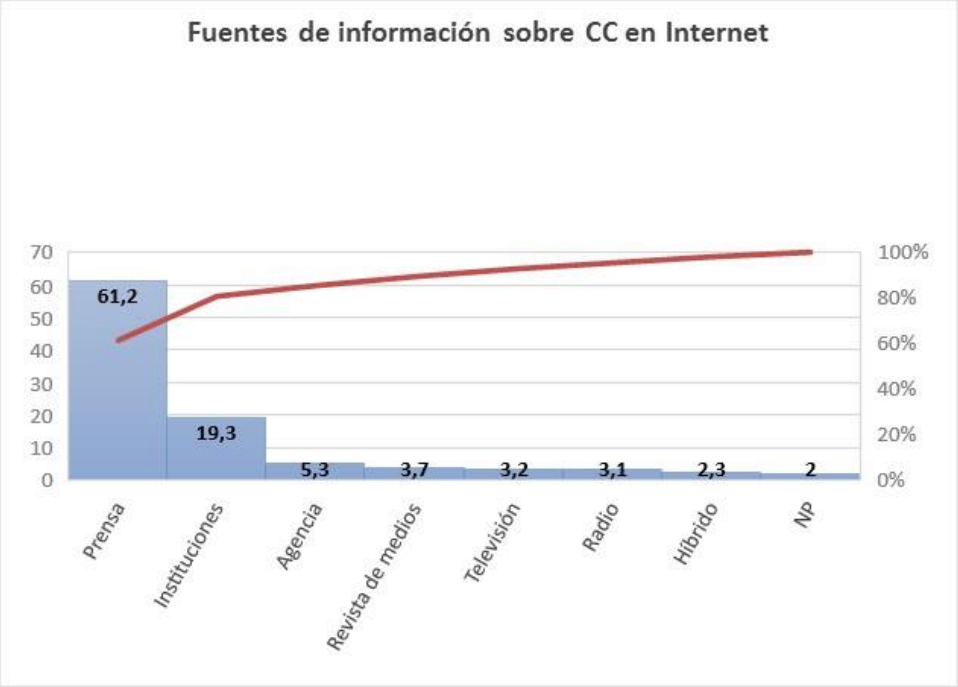

Chart 2. *Percentage of publications on climate change corresponding to each of the different online information sources*
Source: self-made

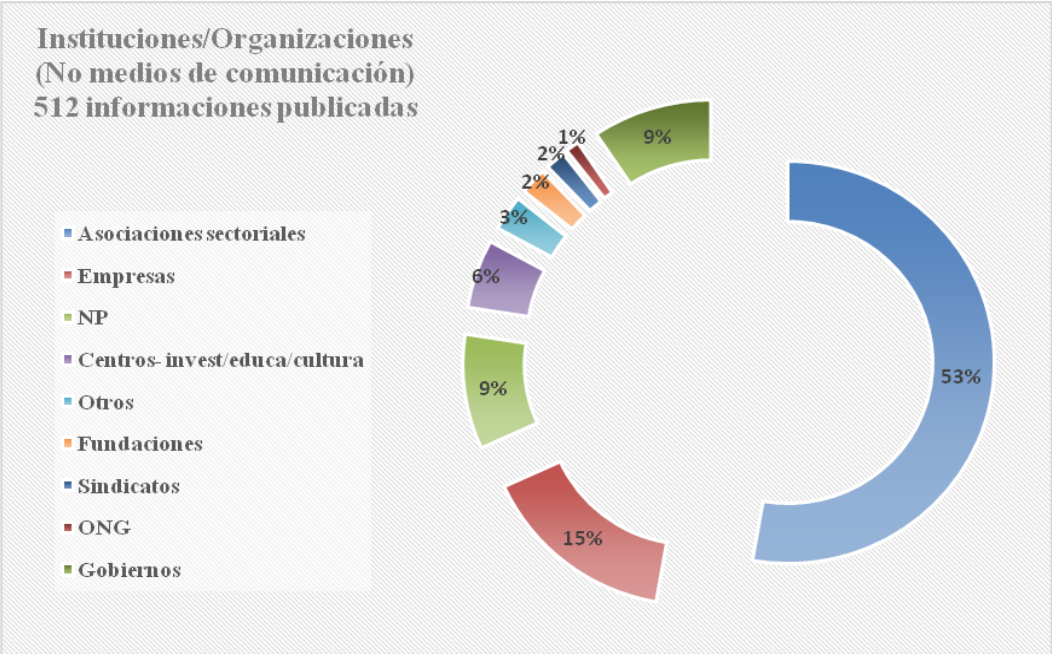

Chart 3. *Percentage of publications corresponding to each of the different sources of online climate change information that are not media outlets*
Source: self-made

4.3. The first 30 sources of information on climate change in online communication in Spain

Chart 4 shows the ranking of online sources that published the most climate change information in Spain in the first probe of 2019. In the first place, we find the Europa Press news agency with 80

publications, 3% of the total, and in last place those sources with 15 publications, 0.6% of the total, as is the case of @ambientum.com, @elpais, and @chainser.com. Europa Press is followed by the digital version of the newspaper *La Vanguardia* in the second position with 53 publications and 2% of the total records found. Next are several online newspapers such as: *Gente Digital, ABC, Eldiario.es, 20 Minutos,* and *Diario Vasco*. *COPE* is the leading radio in this online communication ranking. For their part, *Yahoo es news, Menéame,* and *MSN España* are the main information portals that are part of this list. *El Economista, Expansión, Econoticias, Iagua.es,* and *Ambientum* are the representatives of the specialized press, and *Bolsamanía* together with *@CCMA.CAT* are the institutional representatives that appear in this ranking despite not being media outlets.

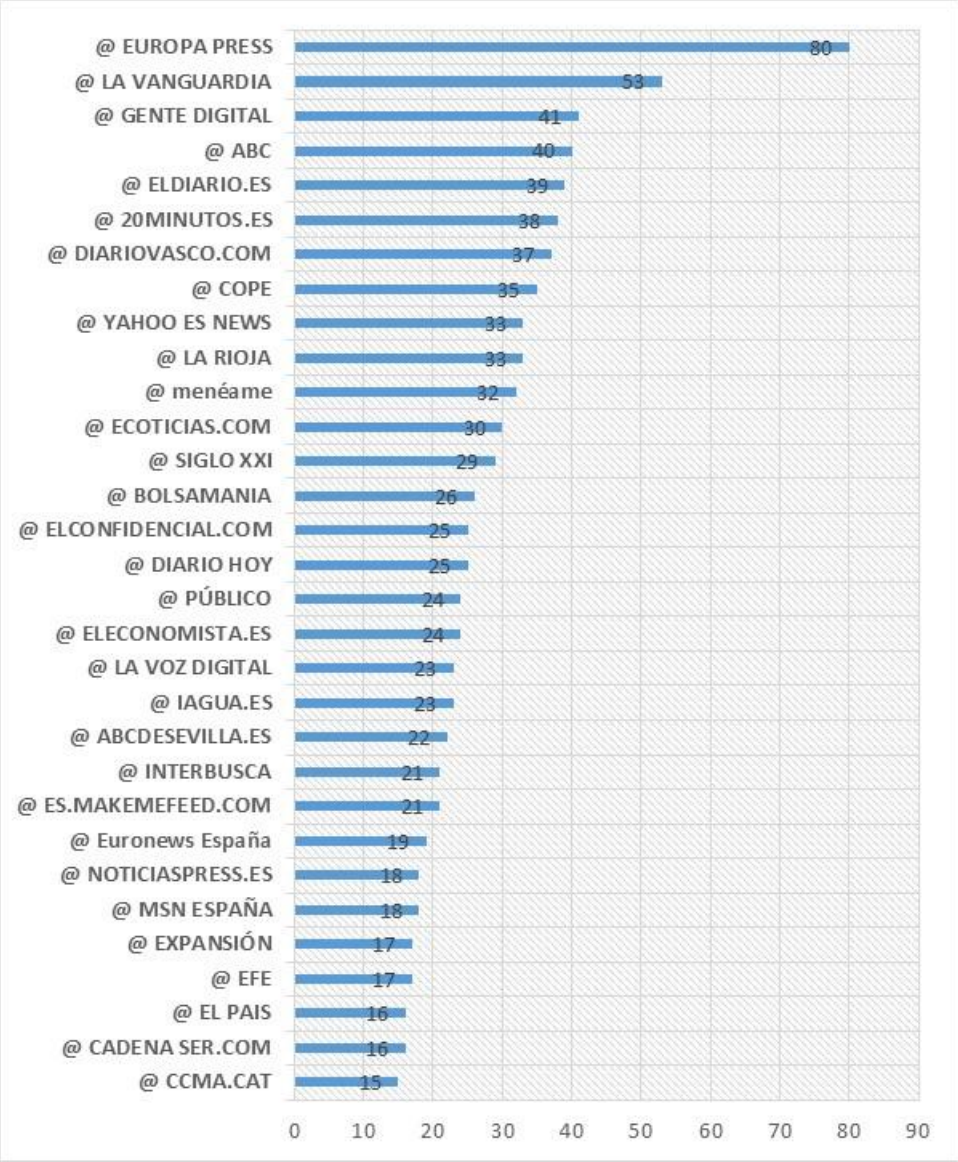

Chart 4. *Ranking of online sources that published the most information on climate change*
Source: self-made

4.4. Territorial coverage of interest

Online communication in Spain offers local, regional, or national information that allows identifying the interest of media outlet or the institution that communicates when directing its information to the audience of a certain territory, although any information published on the Internet is accessible to

any citizen in any territory of the planet. In this sense, the online information published on climate change maintains almost a quantitative symmetry between national coverage (48.8%) and regional-local coverage (41%), while international coverage (8.2%) remains far behind. In Chart 5 it can be observed that the territorial involvement of the media continues to be very present in online climate change communication.

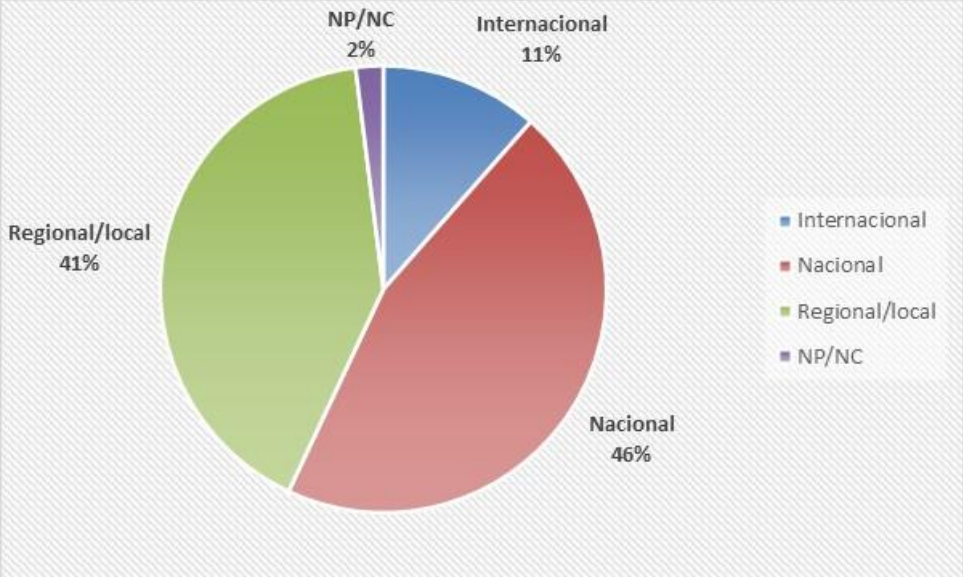

Chart 5. *Percentage of sources that publish local, regional, or national information*
Source: self-made

The abundance of online information sources focused on regional or local content shows that they work to satisfy users who they presume are interested in proximity information and reflect the social and geographical identity of specific territories.

4.5. General vs specialized online information sources and coverage of interest

Of the 2,651 information pieces collected in the 35 days of the analyzed probe, in 52 cases it was not possible to identify the type of source, 1,936 records correspond to information published by generalist sources, and 663 publications were made by sources specialized in specific content, although some sources specialized in audiences of a certain age group (children or those over 65 years of age) have been found.

Based on the above, we can say that three out of four references to climate change in online communication in Spain have been made from general sources and a quarter are made from sources with discourses specialized on certain content. In the case of the press, the most important source of climate change information on the Internet, we find that nine out of ten references are made from generalist media. On the contrary, institutions or organizations that are not the media mostly offer highly specialized information on a certain sector or topic (see Table 2).

Regarding the local, national, or international nature of the information published by the different sources, we find that the sources with interest in national coverage are the general press and institutions or organizations that are not media outlets (mainly sectorial associations and companies) and that are specialized in a specific productive sector or thematic content. The media with an

interest in coverage of regional or local issues mostly publish general information and it is mainly online press. The online sources interested in covering international issues are a minority.

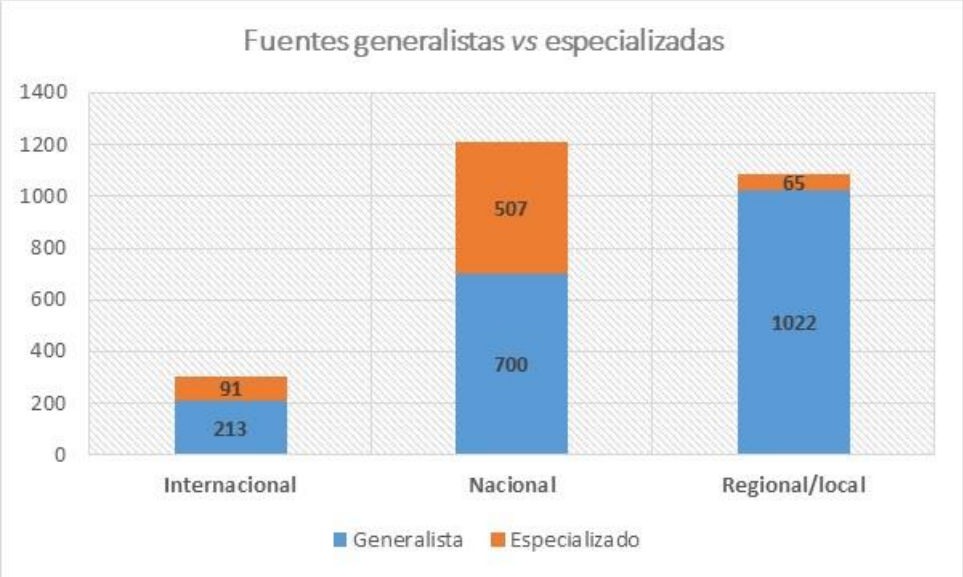

Chart 6. *Publications of a local, national, or international nature made by general versus specialized media*
Source: self-made

4.6. Specialized online information sources and climate change information

The data presented in the previous section indicates that publications about climate change that come from specialized sources constitute 25% of the total. Table 2 offers the data on the specialized content of the online sources that published about climate change in June and July 2019.

The specialized online press that has published the most about climate change has been the one specialized in economics, followed by newspapers focused on water or the environment. In the third position, newspapers specialized in financial markets and cultural information are tied. However, the exact opposite happens with the type of sources that we call institutions or organizations that are not media outlets. In this case, nine out of ten mentions of climate change are made by organizations or institutions dedicated to communicating environmental issues in the first place. In second place are sources specialized in content such as economics and finance, with sources specialized in culture and education in third place as content. Other specialized sources that reported on climate change are aimed at covering topics as diverse as defense, sports, education, energy, computing, fashion and style, politics, religion, CSR, health, security, technology, employment, and tourism.

Table 2. *Online sources of specialized content that published about climate change*

Specialized content	Hybrid Media	Press	Radio	Television	Agency	Media magazine	Institutions (not media outlets)	Total
Environment/Water	0	29	0	0	7	10	118	**164**
Economy	1	63	3	0	0	0	36	**103**
Culture	1	16	0	0	3	4	46	**70**
Primary sector	1	8	1	0	1	0	51	**62**
Financial and Stock Market	0	16	0	0	0	0	46	**62**
Education	0	1	0	0	0	0	41	**42**
Others	0	12	0	0	1	0	25	**38**
Energy	0	4	0	0	0	0	21	**25**
Defense	0	1	0	0	0	0	18	**19**
Technology	0	7	0	0	0	0	7	**14**
Fashion and style	5	5	0	0	0	0	0	**10**
Sports	0	4	0	0	0	0	4	**8**
Responsibility	0	1	0	0	0	0	7	**8**
Religion	0	0	0	0	5	0	1	**6**
Health	0	0	0	0	0	0	6	**6**
Tourism	0	0	0	0	0	0	6	**6**
Famous press	0	5	0	0	0	0	0	**5**
Computing	0	2	0	0	0	0	3	**5**
Security	0	2	0	0	0	0	3	**5**
Politics	0	0	0	0	0	0	3	**3**
Employment	0	0	0	0	0	0	3	**3**
Total	**8**	**176**	**4**	**0**	**17**	**14**	**445**	**664**

Source: self-made

In Chart 7 it can be seen which topics are referred to by the various online sources of specialized information when they communicate climate change in Spain. As can be seen, it is, above all, institutions and organizations specialized in water and the environment that have made the most publications on climate change. However, the specialized press that published the most on climate change was the economic one.

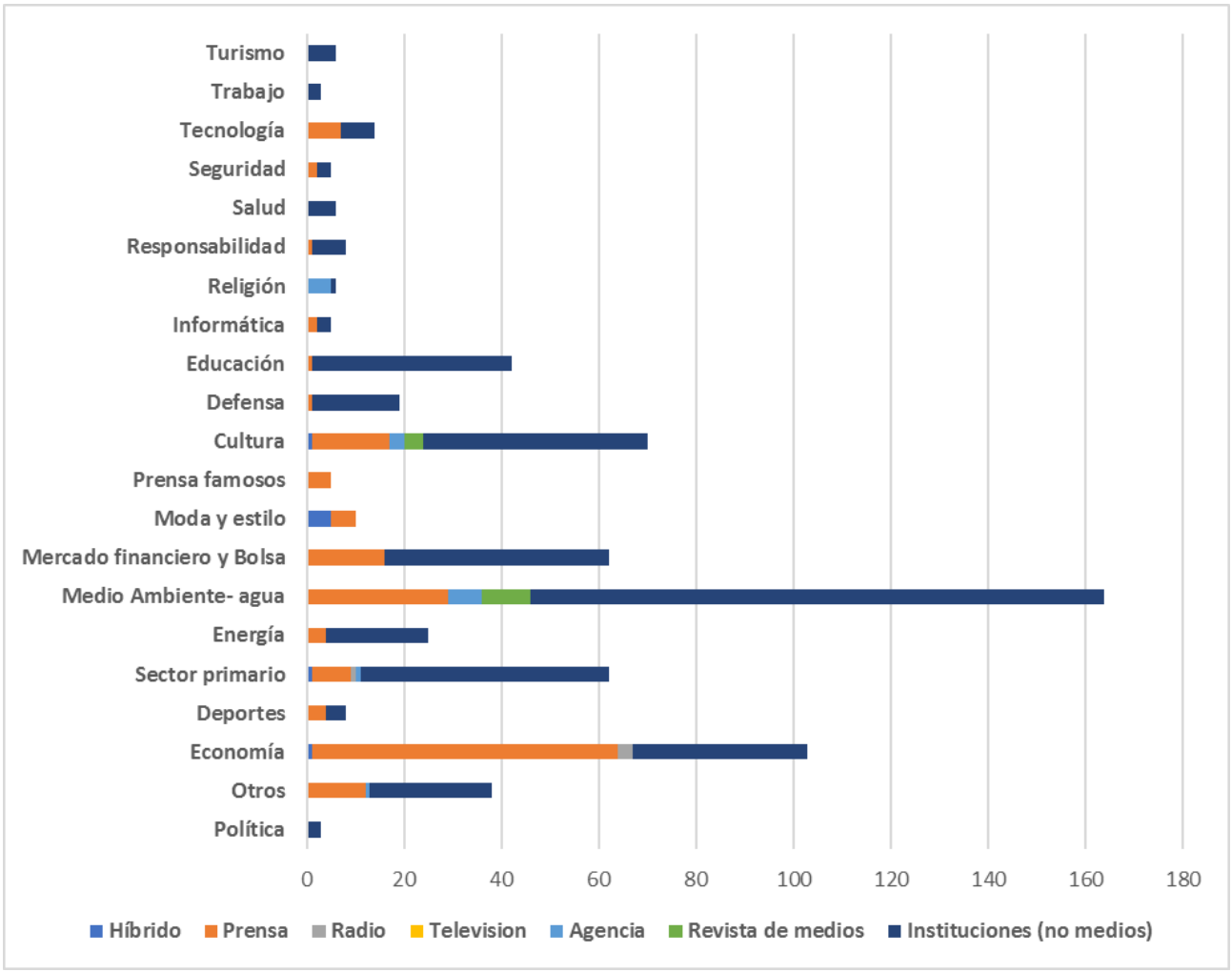

Chart 7. *The volume of online publications on climate change from the different specialized sources found*
Source: self-made

4.7. Answer to research questions

Q.1. Taking into account the volume of emerging online media in the last decade in Spain (Salaverria et al., 2018), we wondered if the media (radio, television, press) were also the main sources of climate change information on the Internet. The results confirm this fact since online media are the main sources of climate change information on the Internet, accumulating 70% of the identified publications on climate change. However, not all media have the same presence on the Internet. The press is the undisputed leader in terms of the volume of publications (61.1%), the frequency of television (3.2%), radio (3.1%), and hybrid media's (2.3%) online climate change communication being much lower. Of these last two, we find the websites of two radio stations that enter the ranking of the 30 main sources of information, but no television website achieves it. This last fact contrasts with the studies that indicate the relevance that the population gives to conventional television as the main source of information on climate change and that highlight the great influence that conventional television maintains on the social perception of climate change (Newman, Fletcher, et al., 2020). News agencies published 5.3% of the online information found.

Q.2. Second, we wondered about which social and institutional agents behave as sources of online climate change information and the characteristics of their communication. 721 different online

sources have been identified that have made a total of 2,561 publications in the analyzed period. We have found that the online press is responsible for 61.2% of the information published about climate change and that 19.1% of this information is issued by associations and institutions that are not media outlets, among which the sectoral associations that defend the interests of specific productive sectors, regional, autonomous, national governments, and research centers stand out. Regarding the idiosyncrasy of the entity that communicates and its interest in the news coverage of contents of a specific territorial context, we have found that the sources interested in issues of national coverage (48.8%) slightly exceed the sources of regional-local coverage (41%), while international coverage is clearly a minority (8.2%).

Q.3. Third, we were interested in discovering in which topics the various online information sources that reported on climate change in the analyzed period are specialized. General content was predominant in the sources that publish the most about climate change on the Internet and that is none other than the online press. However, sectoral associations and companies are the main sources of information with specialized content on topics and issues of a very diverse nature (economy, sports, primary sector, energy, environment, water, finance, etc.).

5. Discussion

Online climate change communication in Spain is poorly studied and is characterized by having a large number and diversity of information sources, although a fifth of all this information is indeed published by institutions that are not media outlets, while most of the total (70%) is published by professional media, the press overwhelmingly standing out. We verify that communicating about climate change is a social practice that increasingly affects both the media and non-media institutions that also participate in these practices. Consequently, news coverage that responds to journalistic routines and canons is not always carried out, since the information that responds to specific sectoral interests that circulate among new audiences in parallel to media audiences is also generated and disseminated.

Among the institutions that are not media outlets, the sectoral associations that defend the interests of specific productive sectors, the regional, autonomous, national governments, and the research centers stand out. Previous research has found that company representatives have been largely absent from media such as television when climate change was addressed as a news reference (Teso, Fernández-Reyes, et al., 2018; Teso, Gaitán, et. al., 2020). This suggests that sectorial associations and companies prefer their own websites to communicate on climate change, rather than intervene to speak in the media. Conversely, we find that NGO publications only reach 1% of the total. These organizations are experts in guiding their communication strategies to capture the attention of the media (Castillo, 2007), which could explain, in a certain sense, this low activity as an online source, taking into consideration that this study does not include publications on social networks, where some NGOs display great communication activity (García, Fernández & Del Olmo, 2018).

Despite the high number of publications analyzed (2,561 units), the authors are aware of the time limitation of this study corresponding to the first probe of 2019. After this exploratory analysis, we intend to continue with the study to proceed with the dissemination of the results of the subsequent probes carried out in 2019, 2020, and 2021. The results of this first exploratory study allow us to propose new working hypotheses.

Taking into account the high volume of publications and sources found, the first hypothesis could point to an increase in general and sectorial interest in climate change that would translate into an increase in the volume of circulating online publications. However, in the first place, it must be

analyzed how the pandemic caused by SarsCov-2 has impacted the online communication of climate change, to confirm if it follows the same tendency as in the conventional media in Spain (Fernández-Reyes & Jiménez, 2020). Secondly, based on the obtained results, we can assume that the online information coverage of climate change will progressively increase in parallel, both by professional media and through the channels used by productive and service sectors whose activity is related to climate change. On the other hand, this increase can translate into the creation of new content and communication proposals aimed at new audiences that provide the value of specialization for specific sectors.

This study has allowed us to verify the weight of the economic sector in specialized information, so it will be of great interest to verify whether phenomena linked to climate change such as extreme meteorological events are of interest to specialized sources in strategic sectors such as energy, water, or finance. Finally, according to the work carried out by Boehnert (2014) and Almirón, Boykoff, et al. (2020), it would be of great interest to specifically analyze the extent to which denial sources have an online presence and to which interest groups they respond.

6. Conclusions

Online media are the main sources of climate change information on the Internet (excluding social networks). The sources that make the most references to climate change are the general press, followed by the specialized press, institutions that are not media outlets (mainly sectorial associations, companies, and official institutions), news agencies, media portals, and radio and television websites. The historic Europa Press news agency ranks first in terms of the volume of information published in the ranking of the 30 main sources of online climate change information. The low volume of online publications from television and NGOs is significant.

While general content predominated in the online press, specialized publications correspond mainly to institutions or organizations that are not media outlets. The specialized sources that published content on climate change constitute a quarter of the total and include both the professional media and other sources. If we add the volume of publications accumulated by specialized sources in economics and finance with those of the primary sector, we find that more than a third of publications about climate change, related this phenomenon to economic activity. The sources dedicated to the publication of educational and cultural content also dealt with climate change. We find a great variety of specialized sectors concerned by the ecological transformation announced in a social context of a climate emergency that was officially declared by the Spanish government in January 2020.

The environment and the economy (including finance) have a great weight in the volume of specialized publications. This constitutes an indicator of the relevance reached by climate change as a matter of public interest in 2019, which appears in information published by specialized sources in sectors and topics as disparate as religion, fashion, defense, or tourism. Besides this sectorial relevance, this fact highlights the transversality of climate change as an environmental, social, and economic problem, as well as the need for comprehensive and sectoral plans to combat its impacts and improve adaptation in the different sectors.

Concerning the characteristics of the sources of online climate change information, we find that cybermedia offer content of a markedly general nature while non-media institutions publish specialized content in a great diversity of topics and sectors to a greater extent. Regarding the interest in disseminating content linked to specific territorial contexts, we find a quantitative balance between the sources that publish national content and those focused on territorial content. We found a high

volume of sources that publish from different Autonomous Communities with their own language, whose contents are focused on the coverage of topics of interest to those territories.

Lastly, it should be noted that certain structural features remain that also condition climate change communication in the conventional media, such as the influence of seasonality and the decrease in the volume of information on weekends, a phenomenon already pointed out by Arcila et al. (2015). As the online press is the main source of online climate change information, this tendency that reproduces the behavior patterns of conventional media in the online context is evident.

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Received: 07/01/2021. **Accepted:** 04/08/2021. **Published:** 03/01/2022