

**Dr. Isidro JIMÉNEZ-GÓMEZ**

Universidad Complutense de Madrid. Spain. isidrojimenez@ucm.es

**Dr. Samuel MARTIN-SOSA-RODRÍGUEZ**

Universidad de Salamanca. Spain. samuelmartinsosarodriguez@gmail.com

## **European Press Coverage of Cities' Adaptation to Heatwaves and Climate Change**

### **Cobertura en la prensa europea de la adaptación de las ciudades a las olas de calor y al cambio climático**

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#### **Abstract**

In recent years, European cities have suffered from intense heatwaves which have been exacerbated by climate change. The city is not only one of the major contributors to greenhouse gas emissions but also an important agent for climate change adaptation and mitigation. This study analyses how European cities are represented in 393 news items about the heatwaves suffered in the months of June 2017 and 2019. We analyse the coverage of 19 newspapers in France, the United Kingdom, Italy, Portugal and Spain. The results show the country to be the most decisive variable in the rigour and depth of journalistic coverage, followed by ideological orientation, media section and authorship. News items about heatwaves in European cities that deal with technical aspects such as the Urban Heat Island effect are those that best address structural adaptation and mitigation measures.

#### **Keywords**

Heatwaves; climate change; cities; press; Europe.

#### **Resumen**

*Las ciudades europeas están sufriendo en los últimos años intensas olas de calor, favorecidas por el cambio climático. La ciudad es a la vez uno de los grandes contribuyentes a las emisiones de gases de efecto invernadero, pero también un espacio clave para la adaptación y mitigación del cambio climático. Este estudio aborda de qué forma las ciudades europeas son representadas en 393 noticias periodísticas sobre las olas de calor sufridas durante los meses de junio de 2017 y 2019. Para ello se analiza la cobertura de 19 periódicos de Francia, Reino Unido, Italia, Portugal y España. Los resultados señalan que el país es la variable más determinante en la rigurosidad y profundidad del tratamiento periodístico, seguido por la orientación ideológica, la sección del medio y la autoría. Las noticias sobre las olas de calor en las ciudades europeas que tratan aspectos técnicos como el efecto Isla de Calor Urbana son las que mejor abordan las medidas estructurales de adaptación y mitigación.*

#### **Palabras clave**

*Olas de calor; cambio climático; ciudades; prensa; Europa.*

## 1. Introduction

The recent increase of heatwaves in European countries (Vautard et al., 2020; Tomczyk and Bednorz, 2019; Kew et al., 2019) has led to public discussions regarding the role of climate change on the increase of this type of extreme events (Schiermeier, 2018; Guo et al., 2018; Mitchell et al. 2016; Stocker et al., 2013). The city is increasingly located at the forefront of this debate (Zhao et al., 2018; Ramamurthy and Bou-Zeid, 2017; Ward et al., 2016) because it is both a major contributor to CO<sub>2</sub> emissions (Rosenzweig, 2018; Hunt and Watkiss, 2011; Betsill and Bulkeley, 2003) and a space that suffers particularly from the high temperatures typical of heatwaves (Rizwan, Dennis and Chunho, 2008; Arnfield, 2003; Shimoda, 2003).

The aim of this paper is to analyse to what extent and in what ways European cities are framed as leading actors in the newspapers' coverage of the heatwaves that took place during the months of June 2017 and 2019. We are particularly interested in exploring whether cities are represented by the European press as proactive institutions that are getting prepared and adapting to the increasingly more frequent effects of climate change.

### 1.1. European cities facing heatwaves and climate change

In recent years, surprisingly intense and premature heatwaves have been taking place in Europe (Vautard et al., 2020; Tomczyk and Bednorz, 2019; Kew et al. 2019), with some European countries reaching temperature records in June (NASA, 2017; NOAA, 2019). According to Oke et al. (2017), the term "heatwave" refers to a period of sustained heat that affects a relatively wide region, considered noteworthy when compared to historical temperatures. The term is often adopted to refer to cases where relatively high temperatures cause heat stress and discomfort in the population, leading in some cases to hyperthermia and death (UNFCCC, 2018:1).

According to the World Health Organization, between 1998 and 2017, more than 166,000 people died due to heatwaves, including more than 70,000 who died during the 2003 heatwave in Europe (WHO, 2020). France recorded more than 14,000 deaths on that occasion (Wallemacq and House, 2018). Meanwhile, the 2010 heatwaves in Eastern Europe and Russia claimed 55,000 lives. In addition to the human losses, the economic damage caused by these phenomena is estimated at billions of dollars (Faust and Strobl, 2018).

Children and older adults are at increased risk of mortality during heatwaves (Dalip et al., 2015; Knowlton, 2009; Gabriel and Endlicher, 2011; Tong et al., 2014). The fact that some recent heatwaves have taken place before the end of the school year has sometimes led to schools closing or exams getting postponed. In addition, heatwaves are particularly relevant for Europe, where the population is increasingly aged (Długosz, 2011), as older people are more sensitive to heat due to physiological changes, chronic diseases, certain medications or sedentary lifestyles (Åström, Forsberg & Rocklöv, 2011).

In a review of articles published between 1980 and 2014, Mora et al. (2017) found 783 cases of excess human mortality associated with heat in 164 cities across 36 countries. They also identified a global threshold beyond which average daily surface air temperature and relative humidity become fatal, and concluded that about 30% of the world's population is currently exposed to climate conditions that exceed this threshold for at least 20 days a year (Mora et al., 2017). The study projects that by 2100 this percentage may increase to 48% in a scenario with drastic reductions in greenhouse gas emissions, and to 74% in a scenario where these measures are not implemented (*Business-as-usual* scenario).

In fact, climate change is expected to worsen the frequency, intensity and impact of certain extreme events such as heatwaves, droughts, heavy rainfall or sea storms (Keellings and Ayala, 2019; Schiermeier, 2018; Guo et al., 2018; Mitchell et al. 2016; Stocker et al., 2013; Luber and McGeehin, 2008; Easterling, 2000). In a study of 571 cities worldwide, Guerreiro et al. (2018) predict that the number of heatwave days will increase, especially in southern Europe, with significant temperature raises taking place in central European cities as well.

According to attribution data, the temperatures reached during the 2019 heatwave in France and the Netherlands would have been unlikely to occur without human influence on the climate (Van Oldenborgh et al., 2019). A heatwave as intense as the one known as "Lucifer", which took place in June 2017 in Europe (Kew et al., 2019) is today 12% more likely to happen than in the absence of climate change. In a world 2°C warmer than the pre-industrial temperature, such an intense heatwave is 42% more likely to occur (Van Oldenborgh et al., 2019).

In recent years, the impact of extreme events triggered by climate change on large cities has been analysed by several authors (Keellings and Ayala, 2019; Phillip, 2018; Sparrow, 2018; Zhao et al., 2018;

Ramamurthy and Bou-Zeid, 2017; Ward et al., 2016; Partain et al., 2016). The specific effect of heatwaves on cities is due to the Urban Heat Island (UHI) effect, which has been widely discussed since the 1960s (Rizwan, Dennis and Chunho, 2008; Arnfield, 2003; Shimoda, 2003; Oke, 1967). It is difficult for cities to dissipate accumulated heat at night due to the abundance of steel, concrete or asphalt, while rural environments can do so more easily. The size of large cities enhances this effect (Rizwan, Dennis and Chunho, 2008), which is also related to the lack of green spaces and the overabundance of buildings and various heat-generating activities. Thus, the greater the transformation of the natural surface, the greater the increase in temperatures, with differences of up to 6°C (Román López, Gómez Muñoz and De Luxán García, 2017) or even 10°C (Phelan, 2015). Socio-economic differences also play an important role: in cities such as Madrid, the temperature variation between districts goes up to 8°C, with some of the poorest districts being the most affected by the heat, which is precisely due to the UHI effect (Sánchez et al., 2017). In this sense, heatwaves have an impact on pre-existing forms of social vulnerability. A report published by the European Environment Agency (EEA, 2018) stresses that specific measures must be taken to better protect Europe's most vulnerable populations from these extreme events worsened by climate change, including the poor, the elderly and children.

Against this background, the role of cities has become increasingly important. On the one hand, they are key contributors to greenhouse gas emissions (Rosenzweig, 2018; Hunt and Watkiss, 2011; Betsill and Bulkeley, 2003); on the other, they have become priority areas for the adaptation to the effects of climate change (Kim and Lim, 2016; Araos et al., 2016; Carter et al., 2015; Bulkeley et al., 2009; Gill et al., 2007). According to the United Nations (2018), by 2030 urban areas will be home to 60% of the world's population, and one in three people will live in cities with at least half a million inhabitants.

### **1.3. Coverage of heatwaves and climate change in the European press**

The media wield considerable power over the public and political agenda (Nisbet and Lewenstein, 2002). Thus, as key actors in the climate debate, the media influence both the dissemination and understanding of climate change and the political measures that are being taken, as pointed out by Boykoff and Lueddecke (2016). According to Anderson (2009), the debate on climate change is positioned somewhere between the scientific, the political and the public spheres.

In recent years, different works have analysed the press coverage of climate change and its relationship with the public sphere. For example, Sampei and Aoyagi-Usui (2009) relate an increase in the number of news in Japanese newspapers between 1998 and 2007 with a significant increase in citizen concern about the issue. Other studies, such as Brulle et al. (2012), come to similar conclusions with the US press. In Europe, Painter and Gavin (2015), Gavin and Marshall (2011), Smith and Joffe (2009), Boykoff (2007) or Carvalho and Burgess (2005) analyse the coverage of climate change in British newspapers. Dessai and Sims (2010) explore, for example, public perceptions of drought and climate change following the water shortage experienced in several areas of the south of the UK between 2004 and 2006.

Weingart et al. (2000) study the coverage of climate change in German newspapers; Gkiouzevas and Botetzagias (2017) focus on the Greek media; while Hemono et al. (2016) review articles regarding climate change and health published in two French-speaking newspapers. Fernández-Reyes et al. (2015) analyse the coverage of climate change in the Spanish press, and Águila Coghlan (2016) focuses on Spanish TV news. On their part, Baranquero and Marín (2014) reviewed the Spanish academic literature on environmental communication and journalism, concentrating on topics such as the representation of climate change, environmental catastrophes and the risks they pose. In addition, an increasing number of authors, such as Fernández-Reyes and Rodrigo-Cano (2019) analyse the media coverage of climate change mitigation and adaptation.

Other studies compare media coverage in different countries. For example, Schmidt, Ivanova and Schäfer conducted a comparative analysis of the treatment of climate change in 27 countries between 1996 and 2010 (Schmidt et al., 2013). While their analysis indicates that the coverage of climate change has increased in all countries, media attention is particularly high in carbon dependent countries. Painter and Ashe (2012) compare the presence of climate scepticism in the print media in six countries. Grundmann and Krishnamurthy (2010) found that in the French and German press moral framings were much more evident compared to the American or British press. Four years later, Grundmann and Scott (2014) showed that the sceptical approach is more visible in the US and French media than in the German and UK media.

Nevertheless, perhaps the most relevant study is the one coordinated by the Media and Climate Change Observatory (MeCCO) of the University of Colorado Boulder, which is due to its size and longevity. They monitor monthly the climate change news published in 120 media outlets in 54 countries around the world (Boykoff et al., 2020).

As the adverse effects of heatwaves and climate change have been gaining greater social attention, the media have become relevant disseminators of climate change diagnosis, as well as key spaces for the debate on potential measures to be adopted. Cities, which are major communication agents, are also beginning to receive special attention because of their role in dealing with these phenomena (Zhao et al., 2018; Ramamurthy and Bou-Zeid, 2017; Ward et al., 2016). Analysing the media coverage of these kinds of extreme phenomena within large European cities can help us understand the social imaginary they generate (Jiménez-Gómez and Martín-Sosa, 2018), as well as gain a deeper understanding of the measures cities are adopting in order to face these events.

## 2. Methodology

To carry out this study, a sample of 393 news pieces regarding heatwaves and published during the months of June 2017 and 2019 was compiled. These appeared in the online edition of 19 European newspapers: 20 Minutes, CNEWS, Le Monde and Le Parisien (France, with 79 news items); The Sun, The Guardian, Daily Mail and The Telegraph (United Kingdom, with 98 news items); Jornal de Notícias, Expresso and Correio da Manhã (Portugal, with 53 news items); La Stampa, La Repubblica, Il Messaggero, Corriere della Sera and Metro (Italy, with 88 news items); 20 Minutos, El Mundo and El País (Spain, with 75 news items). The selection criteria for the media was:

- a) Dissemination. The selected media are among the most widely read printed newspapers in each country, and their websites have been freely accessible during the sampling period. All of them offer a print and a digital version, which increases the readership of the news.
- b) Diversity. The selected media represent a diversity of journalistic approaches, including elite media (Boykoff and Luedecke, 2016), tabloids and free newspapers. Furthermore, the selection aims to incorporate media with diverse political orientations (Boykoff and Luedecke, 2016).

The choice of the months of June 2017 and 2019 is based on the intensity and extent of the heatwaves on both dates in almost all of Europe (Vautard et al., 2020; Tomczyk and Bednorz, 2019; Kew et al. 2019). The countries selected for the study, apart from having experienced said heatwaves are also culturally close, which helps to avoid problems of "functional equivalence" derived from comparing situations in very different contexts (Schmidt, Ivanova and Schäfer, 2013: 1240).

The sampling was carried out during the months of July 2017 and 2019 using Google's search engine on each media's main server. Depending on the language of each newspaper, the following search terms (along with their plural forms) were used: heatwave (UK); Onda de calor, (Portugal); Ola de calor (Spain); Vague de chaleur, Canicule (France); Ondata di caldo, Ondata di calore (Italy).

The news in each media were tailored according to the following criteria:

- a) The most relevant news, placed as the top results in the search engine.
- b) News published in diverse newspaper sections (Environment, International, National, Health, Opinion, Meteorology, Science).
- c) Search results that included the keywords "climate change" or "global warming" in the language of each media outlet.

For each of the articles in the sample, generic categories were manually assigned for each newspaper. Specific categories were also assigned for the news pieces themselves, such as the section where they were published or whether they were signed by journalists or agencies. In addition, the grid includes several categories that analyse the news content and reflect the number of references to cities, as well as mentions to the Urban Heat Island effect and to the different possible responses to heatwaves. The complete sample grid is as follows (table 1):

**Table 1. Sample grid with the categories used in the sampling and their possible values**

|         |  |
|---------|--|
| Country | Spain / United Kingdom / France / Portugal / Italy   |
| Journal | 20 Minutes / CNEWS / Le Monde / Le Parisien / The Sun / The Guardian / Daily Mail / The Telegraph / Jornal de Notícias / Expresso / Correio da Manhã / La Stampa / La Repubblica / Il Messaggero / Corriere della Sera / Metro / 20 Minutos / El Mundo / El País |
| Section | Environment / Health / International / National / Opinion / Science / Weather  |

|  |  |
|--|--|
| Type of media  | Elite / Non-elite                              |
| Authorship (signature of the news)                       | Journalist / News agency / Non-declared author |
| Publishing line  | Progressive / Conservative                     |
| CITY   | YES / NO                                       |
| IUH (Urban Heat Island)                                  | YES / NO                                       |
| CC (Climate Change)                                      | YES / NO                                       |
| TR (Temperature Record and Climate Change not mentioned) | YES / NO                                       |
| <b>RESP (Response measures)</b>                          |  |
| REC (Advice and Recommendations)                         | YES / NO                                       |
| PROT (Protection and Reinforcement of Public Systems)    | YES / NO                                       |
| REFR (Refreshment Facilities)                            | YES / NO                                       |
| UP (Urban Planning and City Model)                       | YES / NO                                       |
| AP (anti-pollution measures)                             | YES / NO                                       |

Source: Own elaboration

The category "CITY" identifies those news items where the city plays a relevant role, either because specific cities affected by heatwaves are mentioned, or because the urban space is central to the news story. The category "UHI" signals those news items that explicitly mention or explain the Urban Heat Island effect (Oke, 1967; Arnfield, 2003; Rizwan, Dennis and Chunho, 2008). Meanwhile, the "CC" category indicates which news items specifically mention climate change, while the "RT" category identifies those that talk about temperature records or make comparisons with historical cycles without explicitly mentioning climate change. This last distinction is intended to further our understanding of the reasons it is only in some cases that the media discuss climate change.

In addition, cities' response measures to heatwaves (RESP) were divided in the following categories:

*Advice and Recommendations (REC):* Advice and recommendations issued by the authorities against heat strokes, sometimes directed at vulnerable demographic groups, which include advice on clothing, physical effort, hydration, food or sun exposure. This is a low proactive response that is easily implemented by cities.

*Protection and Reinforcement of Public Systems (PROT):* This includes plans developed by national or local governments (that usually pay special attention to vulnerable groups), implementing specific measures to care for those affected during the days of the heatwave. These policies have a more structural approach than the previous ones, but are equally short-term.

*Refreshment facilities (REFR):* These are measures taken by cities to make urban space suitable for daily activity during the heatwave. They include actions on streets, fountains and parks, indicating an intent to adapt to these exceptional situations, although they remain short-term measures.

*Urban Planning and City Model (UP):* They include medium to long-term measures for urban intervention, aimed at reducing the impacts of heatwaves, such as actions in green areas, streets and buildings. They aim at generating structures to leverage water use and provide solar protection.

*Anti-pollution measures (AP):* These are measures against pollution by ozone, a secondary pollutant that is enhanced by sun radiation, and against primary pollutants such as NO<sub>2</sub>, generated in cities by motor vehicles (Dulac et al., 2016). They include measures that seek to reduce vehicle traffic during the heatwave or even permanently.

Python programming language has been used for the statistical analysis of frequencies. In addition to the content quantitative analysis, we conducted in-depth readings on those news items that mention the Urban Heat Island effect and on half of those that mention the city in some way. Although the images illustrating the pieces were not quantified in this study, we undertook an exploratory analysis of the images usually featured in those news items that mention the UHI effect or detail the adapting measures adopted by the cities.

### 3. Results

#### 3.1. Heatwaves and the Urban Heat Island effect

65% of the news items analysed make reference to the city, either because cities affected by heatwaves are directly mentioned or because urban space is presented as a key concept. The rest of the news stories (35%) focus on the effects of heatwaves in the rural environment or in larger geographical areas, such as regions or countries as a whole. However, as table 2 indicates, the number of articles explicitly dealing with the Urban Heat Island (UHI) effect is very low, reaching 5% of the total, 8.49% if we consider only those news items where the city occupies a prominent space.

**Table 2. Frequency and percentage of news about heatwaves that make reference to the city and to the Urban Heat Island effect**

| CITY   | UHI   | UHI/CITY | Total |
|--------|-------|----------|-------|
| 259    | 22    |          | 393   |
| 65,90% | 5,60% | 8,49%    | 100%  |

Source: own elaboration

As shown in Table 3, between 2017 and 2019 we see an increase in heatwave news coverage referring to cities and also in those referring to the UHI effect, which increased from 3.91% to 7.01% of the total sample (n=393). In 2019, 10.87% of the analysed news referring to cities (n=249) also mention the UHI effect.

**Table 3. Frequency and percentage of heatwave news that make reference to the city and the UHI by year of publication**

| CITY 2017 | UHI 2017 | UHI/CITY 2017 | Total 2017 |
|-----------|----------|---------------|------------|
| 111       | 7        |               | 179        |
| 62,01%    | 3,91%    | 6,31%         | 100%       |
| CITY 2019 | UHI 2019 | UHI/CITY 2019 | Total 2019 |
| 138       | 15       |               | 214        |
| 64,49%    | 7,01%    | 10,87%        | 100%       |

Source: own elaboration

In relation to the authorship of the pieces, there does not seem to be any major difference amongst those signed by journalists and those attributed to agencies. As table 4 shows, news items signed by agencies that mention the UHI effect reach the highest percentage (7.14%), followed by those signed by individual journalists (6%), although these are not significant differences either.

**Table 4. Frequency and percentage of news about heatwaves that make reference to the city and the UHI effect by authorship**

| AUTHORSHIP          | CITY | %      | UHI | %     | Total |
|---------------------|------|--------|-----|-------|-------|
| Journalist          | 129  | 64,50% | 12  | 6,00% | 200   |
| News agency         | 36   | 64,29% | 4   | 7,14% | 56    |
| Non-declared author | 94   | 68,61% | 6   | 4,38% | 137   |
| Total               | 259  | 65,90% | 22  | 5,60% | 393   |

Source: own elaboration

However, there is more diversity regarding the section where news stories about heatwaves are published. Thus, as table 5 shows, 78.95% of the news published in the International section of the newspapers studied refer to the city, while they only reach 29.41% when they are part of the Health section.

**Table 5. Percentage of heatwave news that make reference to the city and the UHI effect by newspaper section**

| SECTION       | CITY   | UHI    | UHI/CITY | Total |
|---------------|--------|--------|----------|-------|
| Environment   | 64,00% | 28,00% | 43,75%   | 25    |
| Health        | 29,41% | 5,88%  | 20,00%   | 17    |
| International | 78,95% | 4,21%  | 5,33%    | 95    |
| National      | 65,41% | 2,26%  | 3,45%    | 133   |
| Opinion       | 60,00% | 20,00% | 33,33%   | 10    |
| Science       | 66,67% | 16,67% | 25,00%   | 6     |
| Weather       | 52,34% | 3,74%  | 7,14%    | 107   |
| Total         |        |        |          | 393   |

Source: own elaboration

A more detailed analysis of the news in the International section shows that a large part of the media in all countries cover heatwaves in other countries when the temperatures are record-breaking. Thus, those countries with fewer heatwave days in June 2017 or 2019 provide the sample with a higher number of news in the International section than in the National section.

However, out of the heatwave news pieces referring to the city, almost half (43.75%) of those published in the Environment section refer to the UHI effect, followed by Opinion (33.33%), Science (25.00%) and Health (20.00%). Although the Urban Heat Island effect is well described in the scientific field, there are less heatwave news items published under the Science section than, for example, in the Opinion section.

### 3.2. The city' response to heatwaves

In the sample analysed (n=393), more than half (59.04%) of the heatwave news referring to the city (n=249) propose some kind of measure to be taken. However, this type of content decreases in 2019 (53.62%) when compared to 2017 (65.77%).

As table 6 indicates, amongst the total of news items proposing some type of measure (RESP) (n=147), 59.86% include recommendations (REC); 63.95%, general protection measures (PROT); 24.49% refer to proactive city refreshment measures (REFR); and only 14.29% mention medium or long term measures aimed at changing the city's structure and function model (UP). Meanwhile, news mentioning measures against other pollution problems derived from heat (PA) do not reach 20% of the total.

**Table 6. Frequency and percentage of news about heatwaves proposing response measures according to the type of measure proposed**

| REC    | PROT   | REFR   | UP     | AP     | Total RESP |
|--------|--------|--------|--------|--------|------------|
| 88     | 94     | 36     | 21     | 27     | 147        |
| 59,86% | 63,95% | 24,49% | 14,29% | 18,37% |            |

Source: own elaboration

A more detailed reading of these articles suggests that protective measures (PROT) are usually addressed to citizen groups, especially children and older adults. However, some specific factors influencing this are a consequence of the choice of the sampling dates. Thus, several news items focus on protective measures for the school population (such as closing schools, relocating the school population to other rooms, distributing water and fans in classrooms or delaying university entrance exams), given that in June most students still have to attend classes. It is worth noting the sensitivity of some cities to the suffering of animals in the face of the heatwave, including specific preventive measures in their protection plans (PROT), such as a ban on horse-drawn carts (Seville, for example) or measures to protect animals in zoos (Paris).

On many occasions, news about heatwaves in cities are illustrated by specific references to water structures present in the city, such as fountains or rivers, which are used by citizens in search of refreshment (REFR). Some of the images are recurrent and become media icons of heatwaves, such as the Madrid Río Fountains (Spain) or the Gardens of the Trocadero, next to the Eiffel Tower, in Paris (France). Other news items, however, reflect measures implemented to change dress codes for school uniforms or for workers in the justice and the public transport sector. These groups have even taken part in protests -by going to work in skirts, given the impossibility of doing so in shorts- which resulted in the relaxation of these codes by the competent authorities.

Comparing the news published in 2017 and 2019, table 7 shows an increase in the frequency most of the proposed measures were mentioned.

**Table 7. Frequency and percentage of heatwave news proposing measures by year of publication**

| REC    | PROT   | REFR   | UP     | AP     | Total | RESP |
|--------|--------|--------|--------|--------|-------|------|
| 2017   | 2017   | 2017   | 2017   | 2017   | 2017  |      |
| 37     | 48     | 6      | 9      | 5      | 73    |      |
| 50,68% | 65,75% | 8,22%  | 12,33% | 6,85%  |       |      |
| REC    | PROT   | REFR   | UP     | AP     | Total | RESP |
| 2019   | 2019   | 2019   | 2019   | 2019   | 2019  |      |
| 51     | 46     | 30     | 12     | 22     | 74    |      |
| 68,92% | 62,16% | 40,54% | 16,22% | 29,73% |       |      |

Source: own elaboration

Particularly noteworthy is the increase, among the news items containing response proposals (RESP, n=147), of the measures relating to the establishment of refreshment infrastructures in the city (REFR), which rose from 8.22% to 40.54%. There is also an increase in the more far-reaching measures relating to the city model (UP), which involve a more comprehensive perspective of the environmental problems linked to heatwaves.

As table 8 shows, the most mentioned type of response proposal (RESP, n=147) varies depending on the country where the news piece was published. Thus, news items in the Spanish media stand out for their generic recommendations (REC), compared to the rest of the countries, where heatwave protection plans (PROT) are more recurrent.

**Table 8. Percentage of news items on heatwaves that propose measures by country of publication**

| COUNTRY        | REC    | PROT   | REFR   | UP     | AP     |
|----------------|--------|--------|--------|--------|--------|
| Spain          | 72,00% | 40,00% | 16,00% | 12,00% | 12,00% |
| Italy          | 45,83% | 70,83% | 8,33%  | 8,33%  | 8,33%  |
| France         | 52,94% | 67,65% | 29,41% | 17,65% | 32,35% |
| United Kingdom | 67,31% | 69,23% | 30,77% | 17,31% | 19,23% |
| Portugal       | 50,00% | 66,67% | 33,33% | 8,33%  | 8,33%  |

Source: own elaboration

Regarding the percentage of mentions to measures dealing with refreshment infrastructures (REFR), the news pieces published in Portugal, France and the United Kingdom stand out, reaching around 30% of the total. However, it is the French and the British media that mention the most proactive and far-reaching measures in the face of heatwaves, with 17% of the news items referring to urban planning measures (UP). Furthermore, 32.35% of the news published by the French media talk about limitations to private mobility in order to decrease ozone pollution during heatwaves (PA). For this type of measure, the number of references in the Portuguese and Italian media is lower than average.

As can be seen in table 9, 44% of the news items in the sample that are signed by a journalist provide measures to deal with heatwaves (RESP), a proportion that falls to 32.14% in the case of those signed by a news agency. However, news pieces including medium and long term measurements (UP) are much more frequent in articles signed by agencies. In any case, those news that lack an explicit signature (non-declared authorship) mention four of the six types of measures with significantly less frequency.

**Table 9. Percentage of heatwave news pieces proposing response measures, according to the authorship of the news**

| AUTHORSHIP          | RESP   | RESP/CITY | REC/RESP | PROT/RESP | REFR/RESP | UP/RESP | AP/RESP |
|---------------------|--------|-----------|----------|-----------|-----------|---------|---------|
| Journalist          | 44,00% | 68,22%    | 62,50%   | 59,09%    | 23,86%    | 18,18%  | 15,91%  |
| Non-declared author | 30,40% | 47,50%    | 47,37%   | 71,05%    | 23,68%    | 10,53%  | 10,53%  |
| Agency              | 32,14% | 50,00%    | 72,22%   | 72,22%    | 22,22%    | 0%      | 44,44%  |

Source: own elaboration



In relation to the newspaper section, those published in the Weather or Meteorology section include the least references to possible measures (RESP) for heatwaves (table 10). An in-depth analysis of this type of news pieces indicates that they largely consist of articles that only focus on providing data on the temperature and geographical location of the heatwave. Portugal and Italy particularly stand out among the countries studied for having a higher proportion of this type of news stories.

**Table 10. Percentage of heatwave news items proposing response measures according to the section of the newspaper where they were published**

| SECTION       | RESP   | RESP/CITY | REC/RESP | PROT/RESP | REFR/RESP | UP/RESP | AP/RESP |
|---------------|--------|-----------|----------|-----------|-----------|---------|---------|
| Environment   | 44,00% | 68,75%    | 54,55%   | 36,36%    | 9,09%     | 54,55%  | 18,18%  |
| Health        | 23,53% | 80,00%    | 75,00%   | 25,00%    | 25,00%    | 0%      | 25,00%  |
| International | 53,68% | 68,00%    | 64,71%   | 76,47%    | 41,18%    | 11,76%  | 23,53%  |
| National      | 42,11% | 64,37%    | 53,57%   | 73,21%    | 10,71%    | 10,71%  | 14,29%  |
| Opinion       | 40,00% | 66,67%    | 0%       | 50,00%    | 25,00%    | 50,00%  | 0%      |
| Science       | 33,33% | 50,00%    | 100,00%  | 0%        | 0%        | 0%      | 0%      |
| Weather       | 17,76% | 33,93%    | 73,68%   | 36,84%    | 31,58%    | 5,26%   | 21,05%  |

Source: own elaboration

However, the International section, which contains the highest number of articles mentioning response measures (RESP) also stands out in relation to the significant percentage (76.47%) of news that detail protection measures (PROT). As expected, those items published under the Health section include a significant number of references to Anti-Pollution Measures (AP) and Recommendations (REC), as they often aim to advise its readers on better ways to withstand the heat. Meanwhile, the news pieces published in the Environment section stand out for making reference to urban planning and city model (UP), an informative approach that requires a more structural approach. On the other hand, measures relating to cooling infrastructure (REFR) are more common in the International section, which is due to the significant amount of articles referencing measures implemented in large European cities, especially in France.

### 3.3. The adaptation of cities to climate change

16.09% of the news items analysed explicitly mention climate change (CC) and connect it to heatwaves in some way. As seen in table 11, it is the British and the French media that do so to a higher extent, with percentages of 27.55% and 36.71% respectively, quite far from Portugal (15.09%) or Italy (9.09%).

**Table 11. Percentage of heatwave news items that mention climate change, the UHI effect or UP measures**

| COUNTRY        | CC | %      | UHI | %      | UP | %     | Total |
|----------------|----|--------|-----|--------|----|-------|-------|
| Spain          | 15 | 20%    | 0   | 0%     | 3  | 4%    | 75    |
| Italy          | 8  | 9,09%  | 2   | 2,27%  | 2  | 2,27% | 88    |
| France         | 29 | 36,71% | 14  | 17,72% | 6  | 7,59% | 79    |
| United Kingdom | 27 | 27,55% | 4   | 4,08%  | 9  | 9,18% | 98    |
| Portugal       | 8  | 15,09% | 2   | 3,77%  | 1  | 1,89% | 53    |
| Total          | 87 | 16,09% | 22  | 4,77%  | 21 | 5,34% | 393   |

Source: own elaboration

Given that references to climate change in heatwave news are normally associated with an analysis of its possible causes, integrating a more systematic and comprehensive view of the issue, table 11 also quantifies two other key indicators: references to the UHI effect and to urban planning measures (UP). Thus, we can see that news pieces published in those countries that reference climate change (CC) with more frequency are precisely those that include the highest number of mentions to urban planning measures (UP) and the UHI effect.

However, Table 12 shows that 32.32% of the news items on heatwaves talk about record temperatures, and even analyse a series of historical records to demonstrate this, but without going so far as to explicitly mention climate change. This phenomenon, which is more frequent in Italy (37.50%) and Spain (36%), represents a journalistic perspective in which the causes of heatwaves in European cities are not considered.

**Table 12. Percentage of heatwave news items that mention record temperature figures without referring to climate change (RT)**

| COUNTRY        | RT  | %       | Total |
|----------------|-----|---------|-------|
| Spain          | 27  | 36,00 % | 75    |
| Italy          | 33  | 37,50 % | 88    |
| France         | 19  | 24,05 % | 79    |
| United Kingdom | 31  | 31,63 % | 98    |
| Portugal       | 17  | 32,08 % | 53    |
| Total          | 127 | 32,32 % | 393   |

Source: own elaboration

### 3.4. Newspaper's political orientation by country regarding the press coverage of heatwaves

In relation to the country of publication, the French and British newspapers stand out with 78.48% and 69.39% of their heatwave news referring to cities, while the percentage of Portuguese news that mention the city is only 47.17% (table 13).

**Table 13: Frequency and percentage of heatwave news making reference to the city and the Urban Heat Island effect by country of publication**

| COUNTRY        | CITY | %       | UHI | %       | Total |
|----------------|------|---------|-----|---------|-------|
| Spain          | 48   | 64,00 % | 0   | 0,00 %  | 75    |
| Italy          | 56   | 63,64 % | 2   | 2,27 %  | 88    |
| France         | 62   | 78,48 % | 14  | 17,72 % | 79    |
| United Kingdom | 68   | 69,39 % | 4   | 4,08 %  | 98    |
| Portugal       | 25   | 47,17 % | 2   | 3,77 %  | 53    |
| Total          | 259  | 65,90 % | 22  | 5,60 %  | 393   |

Source: own elaboration

The content analysis per country also reveals that British and French news items show more depth in the informative treatment, offering more detailed and technical information on the role of cities in relation to heatwaves. In fact, France stands out in references to the UHI effect (17.72%), which are scarce in Portugal (3.77%) and Italy (2.27%). None of the news from Italy published in 2019 refers to this effect (in 2017 there were only 2, 5.56%), while the news published by the French media with references to the UHI effect goes from 10.53% in 2017 to almost a quarter (24.39%) in 2019.

Regarding specific newspapers, it is Metro, Le Monde and Daily Mail that stand out for the high number of news items referring to cities they published. As table 14 shows, among those newspapers that refer to the UHI effect more often are the French (Le Monde and Matin Direct) and the British media (The Guardian or Daily Mail).

**Table 14: Frequency and percentage of heatwave news that make reference to the city and the Urban Heat Island effect by newspaper**

| JOURNAL       | UHI | %       | CITY | %       | Total |
|---------------|-----|---------|------|---------|-------|
| Le Monde      | 7   | 36,84 % | 17   | 89,47 % | 19    |
| Matin Direct  | 3   | 20,00 % | 7    | 46,67 % | 15    |
| Le Parisien   | 3   | 10,71 % | 19   | 67,86 % | 28    |
| The Guardian  | 2   | 6,25 %  | 23   | 71,88 % | 32    |
| Daily Mail    | 2   | 11,76 % | 15   | 88,24 % | 17    |
| La Repubblica | 1   | 4,00 %  | 15   | 60,00 % | 25    |
| La Stampa     | 1   | 4,76 %  | 11   | 52,38 % | 21    |
| 20 Minutes    | 1   | 5,88 %  | 9    | 52,94 % | 17    |
| J De Noticias | 1   | 5,56 %  | 8    | 44,44 % | 18    |
| Expresso      | 1   | 7,69 %  | 8    | 61,54 % | 13    |

Source: own elaboration

A closer reading of the news suggests that in the UK there are media outlets such as The Guardian that are widely known for their in-depth reporting on heatwaves. Thus, some of the news with a more comprehensive approach to the effects that heatwaves have on cities that also make reference to possible measures to be adopted can be found in the International section of this British newspaper. However, we could contend that this depth in the analysis is less intense but more generalised in the French media.

A comparative analysis based on the category "Type of media" (elite/non-elite) does not offer significant differences. As table 15 shows, news items published in elite newspapers refer to cities, the UHI effect or to response measures only slightly more often than those disseminated by non-elite media. In fact, one of the most important measures -urban planning (UP)- has a higher percentage of mentions in the non-elite media (68.89%) than in the elite media (61.76%).

**Table 15. Percentage of heatwave news by type of media (elite / non-elite)**

| TYPE OF MEDIA | CITY   | UHI   | RESP   | REC   | PROT   | REFR   | UP     | AP     | Total |
|---------------|--------|-------|--------|-------|--------|--------|--------|--------|-------|
| Elite         | 64,04% | 5,99% | 38,20% | 9,36% | 59,65% | 61,76% | 61,76% | 20,59% | 267   |
| Non-elite     | 61,90% | 4,76% | 35,71% | 7,69% | 57,69% | 55,56% | 68,89% | 33,33% | 126   |
|               |        |       |        |       |        |        |        |        | 393   |

Source: own elaboration

In relation to the political orientation of the newspaper, those media with a progressive editorial line generally integrate a more comprehensive approach to heatwaves than newspapers with a conservative tendency. Thus, as shown in table 16, progressive media consider the role of cities in the heatwave phenomena and make reference to potential response measures to a greater extent than conservative journals. In addition, the most important/far-reaching responses are also found more often in progressive media.

**Table 16. Percentage of heatwave news by editorial line (progressive / conservative)**

| POLITICAL ORIENTATION OF THE EDITORIAL LINE | CITY   | UHI   | RESP   | REC/RESP | PROT/RESP | REFR/RESP | UP/RESP | AP/RESP | Total |
|---|--------|-------|--------|----------|-----------|-----------|---------|---------|-------|
| Progressive                                 | 73,98% | 8,13% | 40,65% | 64,00%   | 64,00%    | 18,00%    | 24,00%  | 24,00%  | 123   |
| Conservative                                | 51,32% | 5,29% | 32,28% | 59,02%   | 65,57%    | 29,51%    | 19,67%  | 22,95%  | 189   |

Source: own elaboration

Among those countries whose heatwave media coverage integrates a more mature, in-depth climate perspective, such approach is present in all the national newspapers analysed, regardless of the type of media and its editorial line. For example, the fact that France is a more rigorous country in the treatment of news about heatwave in cities is reflected in the fact that CNEWS, a non-elite and conservative media also presents high percentages of mentions to climate change in news items on heatwaves, which also integrate a comprehensive view of these phenomena.

## 4. Discussion and conclusions

### 4.1. The role of the press in the face of heatwaves in European cities

This study has analysed the media coverage of European cities during the heatwaves of June 2017 and 2019 in 19 European newspapers. The results obtained indicate that European cities have a prominent presence in heatwave news stories. However, the frequency in which these pieces appear depends on factors such as the newspaper's section, the editorial line of the media, the authorship and, above all, the country where the articles are being published.

Thus, French and British newspapers mention cities the most; moreover, they also offer a more technical and detailed treatment of their role in heatwaves, describing and reflecting on the Urban Heat Island (UHI) effect. In France, the country with the most in-depth treatment of this issue, a comprehensive approach of heatwaves and cities is present in almost all media, regardless of type and editorial line. In other words, even those newspapers that generally show the worst results (such as non-elite or conservative media) also provide a comprehensive treatment of the role of cities in the face of heatwaves and their links to climate change.

This may be due to the greater maturity of the French press regarding the coverage of environmental issues -an idea we did not detect in the pre-existing academic literature of the topic- but also to the role of the different actors in the country, as the in-depth reading of the news reveals. Thus, both the French authorities and institutions, as well as the French meteorological agency publicly link heatwaves to climate change and describe the role of cities in the face of these phenomena, promising specific measures for the adaptation of large cities and even calling for lifestyle changes. In addition, these actors incorporate more technical elements and resources in their explanations, such as the Urban Heat Island effect, also mentioning a wide range of specific adaptation and mitigation proposals for big cities. In the analyzed

news, it is possible to observe the weight that the memory of the thousands of deaths that occurred in the 2003 heatwave (due to the lack of means to counteract it) has had in French politics, (Wallemacq and House, 2018). Thus, the footprint left by that significant episode may be another factor influencing the French media's prominent attention to this phenomenon.

Le Monde in France and The Guardian in the United Kingdom are the two media outlets that stand out for their treatment of the role of cities in heatwaves, adopting a strategic view of cities that may be key to tackling climate change. The news published by these newspapers show greater rigour and depth, not only in the search for the causes of these adverse phenomena, but also in analysing possible solutions to be adopted in cities both medium and long term. The French and the British media also make reference to the most proactive and far-reaching measures taken by European cities in the face of heatwaves, such as urban and mobility planning measures. In fact, a considerable number of news items published by the French media talk about limitations to private mobility in order to cope with ozone pollution during heatwaves. In some of these stories, the measures are reported as part of an inevitable process of redesigning the city to give priority to pedestrians and to minimize combustion engine vehicle's traffic.

The 2017 heatwave was very intense in the United Kingdom, where historical temperature records were reached in cities like London and Manchester (NASA, 2017). This has led to greater attention being paid to heatwaves in the British media. However, further analysis reveals that news items published by the British media in 2019 also mention heatwaves in other parts of Europe, particularly in France. News stories in the UK media that include medium or long-term measures significantly increased in 2019, partly driven by the rise in the number of articles about London, but also by the increase in news stories focusing on the measures adopted in Paris. This city and the measures it is undertaking in the face of heatwaves are generating quite a lot of attention, not only in French newspapers, but also in those of other neighbouring countries. In this sense, the symbolic city (Kapferer, 2011) that implements measures to deal with heatwaves and climate change is gaining strength, especially in the context of the network of large European cities (Carter et al., 2015; La Porte, 2013) or even large-scale transnational projects such as the *EU Covenant of Mayors for Climate & Energy*[1] or *Cities for Climate Protection* (Andonova, 2009:61).

On the opposite side regarding the treatment of heatwave news we have Italy and Portugal. A large amount of the news published in the Portuguese media are written under the International section, therefore making reference to heatwaves in countries other than Portugal. One reason that partially explains this is that, while in 2017 Portugal suffered severely from the heatwave (which produced forest fires of tragic dimensions), with many news items pointing at the situation suffered in the country itself (where cities, as we have pointed out, are not protagonists), in 2019, Portugal largely escaped the heat. In addition, the number of news items that report some kind of response to the heat (RESP) is particularly low in Portugal. This may also be due to the fact that Portugal has smaller cities and the effects of heatwaves are more focused on the problems of drought and forest fires in rural areas.

#### **4.2. Journalistic shortcomings regarding technical and structural perspectives**

In general, there is a significant absence of references to technical aspects such as the Urban Heat Island (UHI) effect in the news items analysed, despite it being a frequently mentioned concept with widespread acceptance in heatwave studies (Oke, 1967; Arnfield, 2003; Rizwan, Dennis and Chunho, 2008). Its absence could indicate a still limited comprehensive view of the topic, but it is also plausible that newspapers mirror the local authorities and institutions' lack of knowledge regarding these technical aspects.

The consideration of more specific technical aspects such as the UHI effect requires that journalists have some knowledge of the mechanisms that play a fundamental role in heatwaves, something that is only common amongst environmental journalists. Thus, almost half of the news items published in the Environment section refer to the UHI effect, which could indicate that the authorship of the news and its location in the media section is a decisive factor. News pieces signed by journalists specialised in environmental issues are linked to a more rigorous and technical type of information (Boykoff and Lueddecke, 2016). These journalists have wide experience in reporting on climate change (Teso-Alonso et al., 2018), so that their more comprehensive perspective may allow them to tackle the problem of heatwaves and climate change in cities in a more rigorous and systematic manner. Thus, they can delve deeper into the possible causes of these phenomena and make more informed references to the necessary adoption of adaptation and mitigation measures (Fernández-Reyes and Rodrigo-Cano, 2019).

However, the generalised increase in mentions of the UHI effect that occurred in 2019 could be understood as a sign of progress in the way the problem of heatwaves in cities is framed, or at least in the way it is perceived. We can assert that, if there is a further increase in the public debate regarding this issue, the scope of the responses to heatwaves in the urban environment will become wider and more ambitious.

However, as opposed to an informative perspective focusing on the record figures left by heatwaves and its subsequent associated images, a journalistic approach that delves into their causes (Teso-Alonso et al., 2018) could be key in designing alternatives that allow the cities of the future to face such complex challenges (Fernández-Reyes and Jiménez-Gómez, 2019). Therefore, including the Urban Heat Island effect in the diagnosis of the situation seems to be key to making decisions about fighting heatwaves in an efficient but also equitable and fair manner, given that the effects of this phenomenon are more adverse in some population groups than in others (Taylor et al., 2018). Thus, the age of individuals should be taken into account (Dalip et al., 2015; Tong et al., 2014) in the design of medium and long-term measures, as well as pre-existing forms of social vulnerability, as pointed out by the European Environment Agency (EEA, 2018).

News pieces about heatwaves that link them to climate change also present a more comprehensive and rigorous analysis of the phenomenon (Anderson, 2009). In fact, in this study we have been able to see that a greater mention of climate change corresponds to a better technical treatment of the news, with mentions of the UHI effect and to the most important response measures to be adopted in cities. The rigorous media treatment of these measures therefore acts as an indicator of the maturity of the European press when it comes to analysing and disseminating the cities' adaptation to the future challenges they face.

### **4.3. Adapting European cities to future scenarios**

More than half of the heatwave news stories that refer to the city propose some kind of response measure, although the slight decrease in mentions in the 2019 coverage compared to the news pieces published in 2017 could be cause of concern. The most commonly mentioned measures are those that include recommendations and general protective measures. Next in importance are the city's proactive refreshing measures and, finally, the medium or long term measures related to the change in the city's planning, which have a broader significance and require more in-depth technical analysis.

Due to their lasting impact on the size and shape of the city, spatial planning and urban transport policies seem to be determining factors in the adaptation of cities to climate change (Lemonsu et al., 2015). While structural decisions focused on mitigation necessarily require decisions at a higher governance level (on a national scale in the energy sector, for example), policies structured around adaptation processes tend to be locally differentiated, involve a wider range of sectors and actors that operate on various time scales (McEvoy, Lindley and Handley, 2006). The city therefore has some local tools that will also be needed to address environmental problems that, while transnational in nature (Carter et al., 2015; La Porte, 2013) also affect the city's own preservation.

In this sense, the considerable increase in 2019's news stories mentioning anti-pollution measures such as restrictions on city traffic and the pedestrianisation of streets could indicate that this type of structural measures may be gaining prominence as a strategy to cope with heatwaves and climate change. In 2019 there is also a significant increase in news' references to measures relating to the establishment of cooling infrastructure in the city, which could imply progress in the adoption of a more proactive role for cities. In general, the measures that have been adopted for the cooling of the population are short-term, although they at least attempt to temporarily meet this need. In this sense, in addition to mentioning public fountains, for example, several of the news items speak of important changes in green spaces to give them more prominence in the city. In other words, they could be interpreted as an intermediate or provisional step towards more systemic or structural decisions on the city model.

Some cities -especially Paris and London- have become the leading players in terms of adopting innovative and far-reaching measures, as observed in the analysis of the sample. The communicative projection of these measures is then linked to the city branding, generating an image of a modern city capable of adapting to upcoming adversities (Kapferer, 2011). Given the weight of large European cities as a mirror of EU institutional policies (La Porte, 2013), the measures they adopt will be key in the European Union's climate change mitigation and adaptation policy: European cities contribute to spreading "a positive, innovative and unified image of the EU" and "offer innovative solutions to global problems. And at the same time they show the open and positive attitude of the EU institutions, which, in line with European values and principles, stimulate the actions of cities within the legal framework of the European multilevel system" (La Porte, 2013:86).

In this sense, the media coverage of transnational governance networks such as the Cities for Climate Protection (CCP) is noteworthy. It integrates over 600 local governments from 30 countries and has the capacity to transcend "the limits of official intergovernmental diplomacy, and participate in an authoritative direction to try to address greenhouse gas emissions" (Andonova, 2009:61). The dissemination

of this type of networks in European newspapers is important because it would translate the role of cities to confront climate change into key sections of the newspaper such as Society or Politics. This was one of the reasons that explained the media's success in making climate change notorious in 2007, with Al Gore as a prominent player (Fernandez-Reyes et al., 2015).

Large European cities are major communicative agents, with the media acting as important intermediaries of their imaginary since they constitute essential channels for spreading citizen information about the challenges cities face. Networks such as *Cities for Climate Protection (CCP)* or the *EU Covenant of Mayors for Climate & Energy*[1] not only provide frameworks for advancing the European climate agenda, but also have communication value when addressed by the media. The actions undertaken by cities to deal with heatwaves and other climate impacts is reflected both in *ad hoc* plans for short-term interventions to mitigate the effects of heat, and in medium- and long-term adaptation strategies. This study concludes that a large part of the European press has difficulty in differentiating the scope of the various types of adaptation and mitigation response measures.

The climate challenges European cities face require the dissemination of the issue as well as the generation of spaces for debate, a job that has been traditionally carried out by the media (Fernández-Reyes and Rodrigo-Cano, 2019). However, the press in countries such as Spain, Portugal or Italy seems to be lagging behind when it comes to dealing rigorously with technical aspects such as the Urban Heat Island effect, or when explaining climate change as one of heatwaves' main causes. The results obtained in this study indicate that the adaptation of European cities to these challenges will therefore have to go hand in hand with a process of adaptation of the European media, which will require a more in-depth analysis of these phenomena and more specific mentions of technical factors.

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## Notes

1. <https://www.pactodelosalcaldes.eu>



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