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Visual Communication of the 2025 European Heatwave: A Content Analysis of Accessibility, Credibility-related Features, and Urgency

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ABSTRACT

Aim of the Study: The 2025 European heatwave generated extensive use of maps, satellite images, charts, and infographics to present heat-related information. This study examines the visible features of these visuals in relation to accessibility, credibility-related features, and urgency.

Methodology: A descriptive visual content analysis was conducted on 32 purposively selected visuals published during June-August 2025. Each visual was treated as the unit of analysis and coded using 12 indicators across the three dimensions. Frequencies and percentages were used to summarize the results.

Findings: Maps were the most common visual type, followed by satellite images, charts, and infographics. Credibility-related features, particularly source identification and clear legends, were more frequently present than accessibility and urgency features. Accessibility features such as alt-text and simple captions were less common, while urgency was more often shown through graded risk color scales than through lead-time information or warning levels.

Conclusion: Overall, the findings show that the selected visuals placed greater emphasis on source and data presentation than on accessibility and practical risk information. The study focuses on the features present in the visuals and does not measure audience trust, understanding, or behavioral response.

Keywords: European Heatwave 2025; Climate Communication; Visual Communication; Visual Content Analysis; Credibility-related Features; Urgency; Heatwave Visuals.

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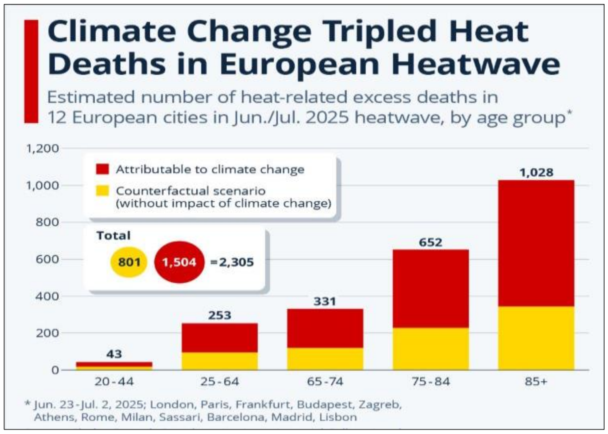
1. INTRODUCTION

During the 2025 heatwave, Western, Eastern, and Southern Europe suffered due to changing patterns of climate. Spain, Italy, Greece, Romania, Bulgaria, Germany, and France faced the highest number of deaths after a scorching summer in these regions (Wu et al., 2025).

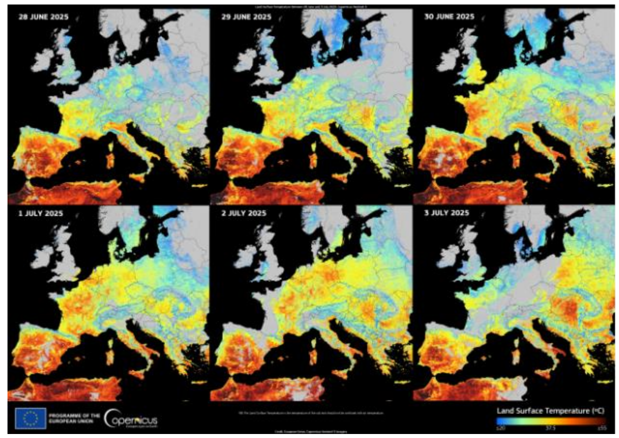
Italy, Spain, and Germany were among the top three countries that faced the highest death toll in Europe, reflecting the earlier cautions regarding the Mediterranean region by climate experts. Data confirm that climate change is an extreme threat to human lives and a health risk across Europe (Borenstein, 2025).

Figure 1: *Estimated excess deaths during the European heatwave during June-July 2025*



Note. From "Climate Change Tripled Heat Deaths in European Heatwave," by F. Richter, 2025, *Statista*. https://www.statista.com/chart/34783/estimated-excess-deaths-in-european-heatwave/ (Richter, 2025)

Figure 2: *Evolution of the heatwave across Europe 2025*



Note. From *Evolution of the heatwave across Europe*, July 4, 2025, by European Union, Copernicus Sentinel-3 imagery. https://eu-space.europa.eu/components/earth-observation-copernicus/image-of-day/evolution-heatwave-across-europe (European Union, 2025)

Figure 1 shows that more than 2,320 people died from Jun 23 to Jul 02 across 12 major European cities due to the heatwave, while the collective death toll was much higher; more than 16500 people died during the summer due to blazing heat (Niranjan, 2025; Withers & Abnett, 2025). Human-induced climate change has increased the heat by 2-4 °C, which tripled the death toll in the region (Borenstein, 2025). These consequences show the immense human cost of extreme temperatures in Europe.

European heatwave in 2025 was a communication stress test. Due to climate change, temperatures rose throughout the Northern Hemisphere, followed by fires, droughts, and health risks. According to climate science agencies, July 2025 was the third hottest month in recorded human history. This hot weather continued till August 2025. These conditions created a continuous need for timely and clear visuals in the media. News agencies and newsrooms responded with charts, satellite images, maps, and infographics to address the issue. Each format of visuals contained a variety of information for public information (ECMWF, 2025; Liu et al., 2025).

Figure 2 clearly showcases the massive heatwave in Southern and Western Europe during July 2025. Maps have an important role in illustrating climate threats. Heat maps and risk-level indicators translate complex data into a single picture.

Visuals are particularly important in communicating complex climate and weather information. Maps can show the geographic spread of heat, charts can present changes over time, satellite images can show patterns across large areas, and infographics can combine different types of information in a single visual. However, the value of a visual depends not only on the information it contains but also on how that information is presented. Design choices such as color, labels, legends, captions, and the presentation of uncertainty can affect how climate information is communicated (Crameri et al., 2020; Harold et al., 2016).

Satellite images provide visual evidence of climate irregularities, including smoke clouds, land-surface heat, and water vapor patterns.

National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) share real-time images of blocked pressure systems, warm Earth, and burned marks. The same pattern is visible in Figure 3, which depicts the Earth's surface temperature from space. Satellite images provide a broad visual view of heat and other environmental conditions, but their meaning can depend on how the image is presented and explained (Doermann, 2025; NESDIS, 2025).

Accessibility is one important part of visual communication. People may differ in their ability to read colors, understand technical information, or interpret complex graphics. The use of clear captions, suitable color schemes, alternative text, and additional cues such as labels and icons can make visual information more accessible. Research on climate data visualization has highlighted the need to consider these design issues when presenting scientific information to wider audiences (Crameri et al., 2020; Terrado et al., 2022).

Credibility is another important feature of climate visuals. Source identification, data references, clear legends, and information about uncertainty can provide useful information about the basis of a visual. Previous studies have shown that the design and presentation of climate data can influence judgments about the information being presented (Courtney & McNeal, 2023; Liu et al., 2025). In this study, however, credibility is examined through these visible features rather than through audience perceptions of trust.

Urgency is also relevant to heatwave communication. Visuals can show the intensity and geographical spread of heat through color scales, warning levels, timing information, and action-related language. Research on extreme heat communication has also raised concerns about how visual representations can understate or reshape the risks associated with heatwaves (Hopke, 2020; O'Neill et al., 2023). Examining these features can therefore help identify how heat risk was presented during the 2025 European heatwave.

1.1 Research Gap

Existing research on climate and heatwave communication has examined visual design, audience responses, and the way extreme heat is represented in news media. Studies have also examined issues such as color use, visual credibility, and the presentation of heatwave risk (Courtney & McNeal, 2023; Crameri et al., 2020; Harold et al., 2016; O'Neill et al., 2023). However, much of this work has focused on audience perception, individual design features, or photographic representations rather than the systematic analysis of data-based visuals used during a specific heatwave event.

There is therefore a need for more focused analysis of how different types of data visuals are presented during an actual heatwave. Maps, satellite images, charts, and infographics have rarely been examined together through a common coding framework that considers accessibility, credibility-related features, and urgency (Terrado et al., 2022; Tetzlaff et al., 2024). This is especially relevant because these features concern different aspects of visual communication and cannot be understood from visual format alone.

1.2 Research Questions

1. What types of visuals were used in the selected coverage of the 2025 European heatwave during June-August 2025?
2. How were maps, satellite images, charts, and infographics distributed across the selected sources?
3. What accessibility, credibility-related, and urgency features were present in the selected visuals?

2. LITERATURE REVIEW

Visuals are widely used to illustrate environmental and climate information as they can translate complex scientific data into an easy-to-read, understandable format. At the same time, visuals also provide sequential and geographic context (Elgammal et al., 2026; Griffin, 2020; Nicholson-Cole, 2005). Maps illustrate where a climatic event is happening, and charts indicate change, comparisons, and emerging trends. Similarly, infographics can merge different forms of information in one image, whereas satellite imagery describes the spatial (four-dimensional) context of climate hazards (Cairo, 2019; Sheppard, 2012).

The layout and construct of these visuals is also significant. Previous studies show that design, color selection, symbols, and other design choices can also influence how people understand and interpret information (Harold et al., 2016; Liu et al., 2025). Poor color selection can create problems for people with color vision deficiencies. Suitable color schemes and clear labels can make scientific images easy to understand. Researchers stress the significance of color selection and accessible visualization practices in climate communication (Crameri & Hason, 2024; Terrado et al., 2022).

Credibility is another key concern while using climate visuals. Clear legends, accurate labels, source detection, data reference, and the way information is disseminated can affect how visuals are judged (Courtney & McNeal, 2023; Liu et al., 2025). Attribution is particularly important when visuals contain scientific or model-based information. However, credibility in the present study is not treated as audience trust. It is examined through visible features such as source identification, data citation, clear legends, and uncertainty information.

Visuals can also present the urgency of a climate hazard. Color scales, warning levels, timing information, and action-related language can signal the seriousness of an event (Clive et al., 2023). Previous research on heatwave coverage has also shown that media visuals do not always present heat as a serious risk. O'Neill et al. (2023) found that some European heatwave coverage used images of leisure and outdoor activities, which could reduce the hazard's visibility. Tetzlaff et al. (2024) reported a similar pattern in Canadian coverage of extreme heat and wildfire.

Most existing studies have examined either particular visual formats, audience responses, or photographic representations of climate and heat events. Less attention has been given to the actual data-rich visuals used during a single heatwave event.

2.1 Theoretical Framework

This study is based on Framing Theory, Risk Communication Theory, and the Source Credibility Model. Collectively, these theories offer a foundation for investigating how heatwave visuals show risk and other related information.

Moreover, "Accessibility" in this study is not treated as a separate theory; it is an analytical/ design dimension based on established visual design principles supported by visualization research.

Framing theory refers to how media select and show specific aspects of any event (Entman, 1993). In the current study, it helps investigate how colors, labels, warning levels, and other visual elements depict the 2025 European heatwave and its risk level.

Risk Communication Theory is focused on timely and clear hazard communication (Covello, 1992). This theory is appropriate to the study because urgency was measured through visible features such as action language, lead-time information, graded risk scale, and warning levels.

Source Credibility Model is about examining how information is shown and attributed (Hovland et al., 1953). In the current study, it informs the coding of source identification, clear legends, data citations, and uncertainty. Credibility is therefore assessed through visible features, not through audience perceptions of trust.

Accessibility as an analytical dimension was investigated through design features, such as simple captions, color-blind-safe palettes, redundant cues, and alt-text or equivalent features. This approach is supported by research on accessible scientific visualization (Crameri et al., 2020; Terrado et al., 2022).

This framework supports the three dimensions (accessibility, credibility-related features, and urgency) and indicators used in the coding scheme.

Figure 3: *Conceptual Model of the Study*

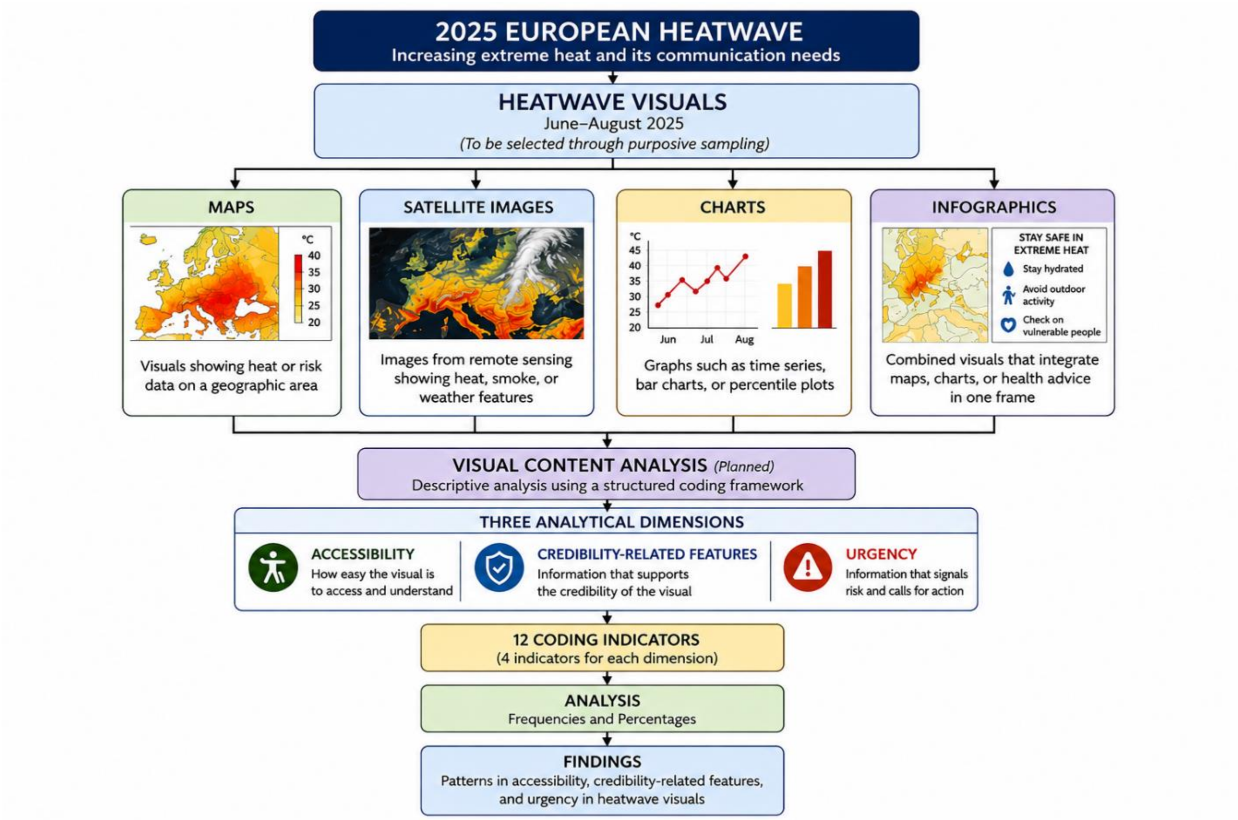


Figure 3 shows the overall flow of the study. It starts with the 2025 European heatwave and the heatwave visuals available during June-August 2025. These visuals are grouped into four types: maps, satellite images, charts, and infographics. The study then examines them through three dimensions: accessibility, credibility-related features, and urgency. These dimensions are examined through 12 coding indicators, followed by frequency and percentage analysis to identify the main patterns in the selected visuals.

3. METHODOLOGY

This study used descriptive visual content analysis to examine visuals related to the 2025 European heatwave (Krippendorff, 2019). Each visual was treated as the unit of analysis. The analysis focused on three dimensions: accessibility, credibility-related features, and urgency. The study describes the visible featur000es of the visuals and does not measure audience responses, trust, understanding, or behavior.

3.1 Data Sources

The study examined visuals published between June and August 2025 regarding the 2025 European heatwave. The study used visuals from Copernicus/ESA and European Centre for Medium-Range Weather Forecasts (ECMWF) bulletins. The visuals included maps, satellite images, charts, and infographics.

3.2 Sampling Strategy

The study used purposive sampling to select 32 visual materials related to the 2025 European heatwave. The sampling period covered June to August 2025, when major heatwave conditions were reported across different parts of Europe. In the current study, the sample included four types of visuals: maps, satellite images, charts, and infographics. Visuals were selected from the identified official agencies and weather-related sources used in the study.

To avoid duplication, the same visual appearing repeatedly across sources was counted only once. The final sample consisted of 32 unique visuals. Purposive sampling was used to select information-rich visuals suitable for examining the study's three dimensions: accessibility, credibility-related features, and urgency.

3.3 Inclusion Criteria

A visual was included in the study when it met the following criteria:

1. It was directly related to the 2025 European heatwave.
2. It presented data, temperature information, heat anomalies, warnings, forecasts, or other heatwave-related information.
3. It was presented in the form of a map, satellite image, chart, or infographic.
4. It was produced or published by an identified official agency, meteorological service, or news-related source included in the study.
5. The visual was available during the June-August 2025 study period.

3.4 Exclusion Criteria

The following visuals were excluded from the study:

1. Stock photographs, generic images, or decorative visuals that did not present heatwave-related data or information.
2. Visuals that were not directly related to the 2025 European heatwave.
3. Visuals that did not contain relevant data, warnings, forecasts, temperature information, or heatwave-related information.
4. Social media posts produced by individuals or commercial weather applications.
5. Duplicate visuals that had already been included in the sample.
6. Visual materials outside the June-August 2025 study period.

3.5 Operational Definition Visual Categories

Map: A visual showing heat or risk data on a geographic area.

Chart: A graph such as a time series, bar chart, or percentile plot.

Satellite image: An image from remote sensing that shows heat, smoke, or weather features.

Infographic: A combined visual that brings maps, charts, or health advice into one frame.

3.6 Coding Framework

The coding framework is based on three main dimensions, i.e., accessibility, credibility-related features, and urgency. These dimensions come from the Source Credibility Model and Risk Communication Theory. Each visual is coded according to clear indicators.

Table 1: *Coding Framework*

Dimension	Indicators	Coding
Accessibility	Color-blind-safe palette	Yes / No
	Simple captions or annotations	Yes / No
	Alt-text / equivalent accessibility feature	Yes / No
	Redundant cues such as labels, shapes, icons	Yes / No

Credibility-related Features	Source identified (agency, service, outlet)	Yes / No
	Data citation or model name shown	Yes / No
	Legend present and clear	Yes / No
	Uncertainty or confidence intervals shown	Yes / No
Urgency	Color scale shows graded risk (green-red tiers)	Yes / No
	Action language used ("take protection today")	Yes / No
	Lead time indicated ("next 3 days")	Yes / No
	Warning level marked (low/medium/high/extreme)	Yes / No

Table 1 provides clear coding criteria for assessing accessibility, credibility-related features, and urgency in each visual

Figure 4: *Coding Framework Model*

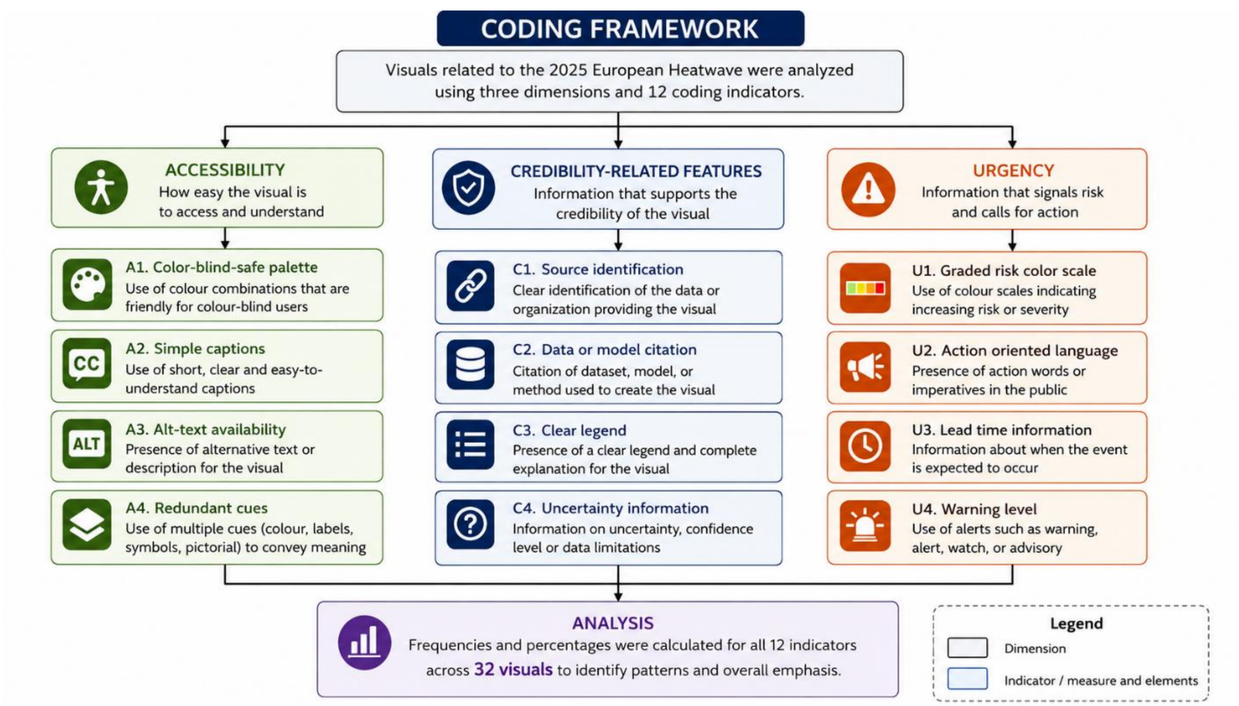


Figure 4 explains the coding framework, which groups the 12 indicators into three dimensions: accessibility, credibility-related features, and urgency. Each visual was coded against these indicators using the operational definitions provided below.

3.7 Operational Definitions of Coding Categories

3.7.1 Accessibility

Color-blind-safe palette:

Coded **Yes** when the colors could be clearly distinguished by people with color-vision difficulties; otherwise, coded **No**.

Simple captions or annotations:

Coded **Yes** when the visual used short and clear captions or annotations written in plain language; otherwise, coded **No**.

Alt-text or equivalent accessibility feature:

Coded **Yes** when the visual had alt-text or another text-based description of the visual; otherwise, coded **No**.

Redundant cues:

Coded **Yes** when the visual used labels, icons, shapes, or symbols along with color to show information; otherwise, coded **No**.

3.7.2 Credibility-related Features

Source identified:

The visual was coded **Yes** when the organization, agency, service, or other source responsible for the visual or underlying information was clearly identified; otherwise, coded **No**.

Data citation or model identified:

The visual was coded **Yes** when it identified the data source, dataset, model, satellite, or other relevant scientific basis used to produce the visual; otherwise, coded **No**.

Clear legend present:

The visual was coded **Yes** when it provided a legend and clearly explained the colors, symbols, categories, or measurements used in the visual; otherwise, coded **No**.

Uncertainty or confidence information shown:

The visual was coded **Yes** when it presented uncertainty, confidence intervals, probability ranges, forecast ranges, or other information indicating the level of certainty associated with the data or prediction; otherwise, coded **No**.

3.7.3 Urgency

Graded color scale:

Coded **Yes** when the visual used a graduated color scheme to indicate different levels of heat intensity, risk, or severity. It was coded **No** when the visual did not use a graduated color scale.

Action language used:

Coded **Yes** when the visual included language that advised, encouraged, or directed people to take a specific precaution or action in response to heat risk. It was coded **No** when no such action-oriented language was present.

Lead time indicated:

Coded **Yes** when the visual indicated when the heat risk was expected to occur or how much time was available before the expected event, such as a specific date, period, or number of days. It was coded **No** when no such time-related indication was provided.

Warning level marked:

Coded **Yes** when the visual explicitly identified a heat risk level or warning, such as low, moderate, high, or extreme. It was coded **No** when no specific warning level was marked.

3.8 Data Collection Procedure

Visuals related to the 2025 European heatwave were collected from Copernicus/ESA and ECMWF websites and bulletins during June-August 2025. The selected visuals included maps, satellite images, charts, and infographics. Each visual was downloaded and saved with its source, date, headline, and visual type. The visuals were organized by category, and repeated visuals were checked and counted only once. A total of 32 unique visuals were selected for analysis.

3.9 Data Analysis

The 32 visuals were coded using the 12 indicators under accessibility, credibility-related features, and urgency. Each indicator was coded as Yes or No according to the operational definitions. Frequencies and percentages were calculated for each indicator. The results were presented in tables and figures to show the presence of accessibility, credibility-related features, and urgency features across the visuals.

3.10 Visual Counts by Source and Type

The following tables show details of visuals analyzed during the study

Table 2: *Visual Counts by Source and Type (June–August 2025)*

Source	Maps	Satellite Images	Charts	Infographics	Total
Copernicus / ESA	10	8	4	2	24
ECMWF / Bulletins	3	1	2	2	8
Total	13	9	6	4	32

A total of 32 visuals were analyzed. Maps were the most common type (13), followed by satellite images (9), charts (6), and infographics (4). Copernicus/ESA provided 24 visuals, while ECMWF bulletins provided 8.

4. RESULTS

4.1 Accessibility Outcomes

Accessibility components were a weaker dimension than the other two, i.e., credibility-related features and urgency. Accessibility related features were less common than the other two dimensions.

Table 3: *Accessibility Results for All Visuals*

Accessibility Feature	Yes	No
Color-blind safe palette	14	18
Simple captions	11	21
Alt-text available	8	24
Redundant cues (labels/icons)	17	15

Accessibility features were limited across the 32 visuals. A color-blind-safe palette was found in 14 visuals, while 11 used simple captions or annotations. Alt-text or an equivalent accessibility feature was available in 8 visuals. Redundant cues, such as labels and icons, were more common and appeared in 17 visuals. Overall, the results show that accessibility features were not consistently included across the visuals.

4.2 Credibility-related features

Table 4 elaborates that credibility-related features were more common than accessibility features. The source was identified in 29 of the 32 visuals, while 25 included a data citation or model reference. A clear legend was present in 27 visuals. However, uncertainty or confidence information was shown in only 9 visuals. Overall, source identification, data citation, and clear legends were common, while uncertainty information was less frequently included.

Table 4: *Credibility-related features Results for All Visuals*

Credibility Feature	Yes	No
Source identified	29	3
Data citation shown	25	7
Legend present	27	5
Uncertainty shown	9	23

4.3 Urgency Signals

Table 5 describes urgency-related features that were present at different levels across the 32 visuals. A graded risk color scale was found in 20 visuals, making it the most common urgency feature. Action language was highlighted in 16 visuals, while 12 visuals marked a specific warning level. Lead time was indicated in 11 visuals.

The findings can be related to the theoretical framework and all three theoretical perspectives utilized in this study. From the Framing Theory perspective, the repeated use of maps, satellite images, charts, and graded color scales highlights how visuals show the intensity and spatial spread of heatwaves in different parts of Europe in 2025. Risk Communication Theory could be linked to features such as warning levels, action language, and real-time information, although these features were not equally distributed among the sample. Lastly, the Source Credibility Model is reflected in the common use of source detection, clear legends, and data citation.

Table 5: *Urgency Results across Visuals*

Urgency Feature	Yes	No
Graded color scale	20	12
Action language	16	16
Lead time indicated	11	21
Warning level marked	12	20

Figure 5: *Comparison of Coded Features across the Three Dimensions*

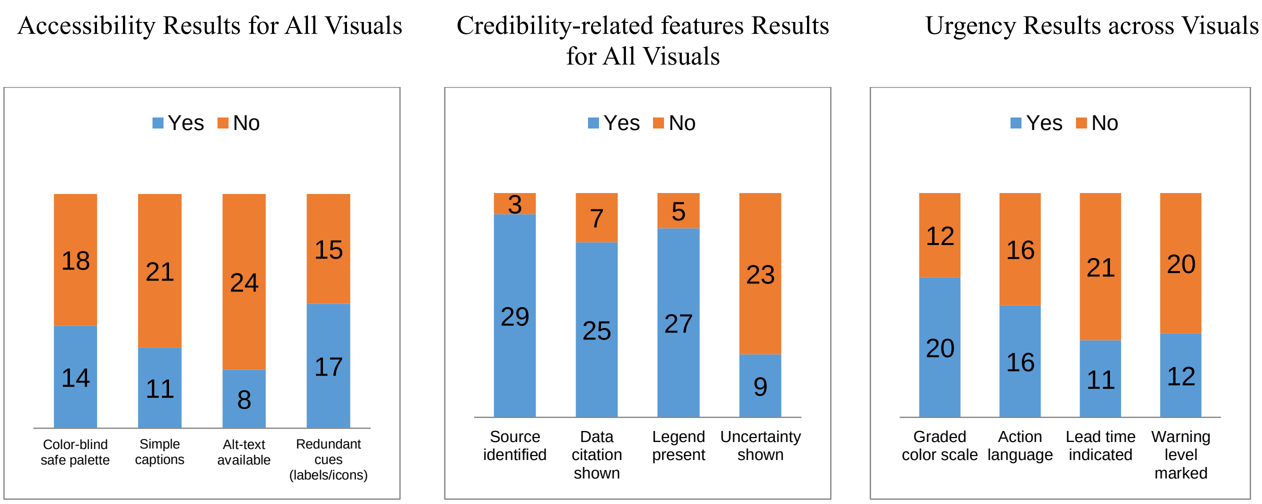


Figure 5 presents the distribution of the coded features across the three dimensions: accessibility, credibility-related features, and urgency. The accessibility results show that redundant cues were the most common feature, while alt-text and simple captions were less frequent. For credibility-related features, source identification and clear legends were the most common features, while uncertainty information was less frequently shown. For urgency, graded risk color scales were the most common feature, followed by action language, warning levels, and lead-time information.

Figure 6: *Overall Percentage of Coded Features by Dimension*

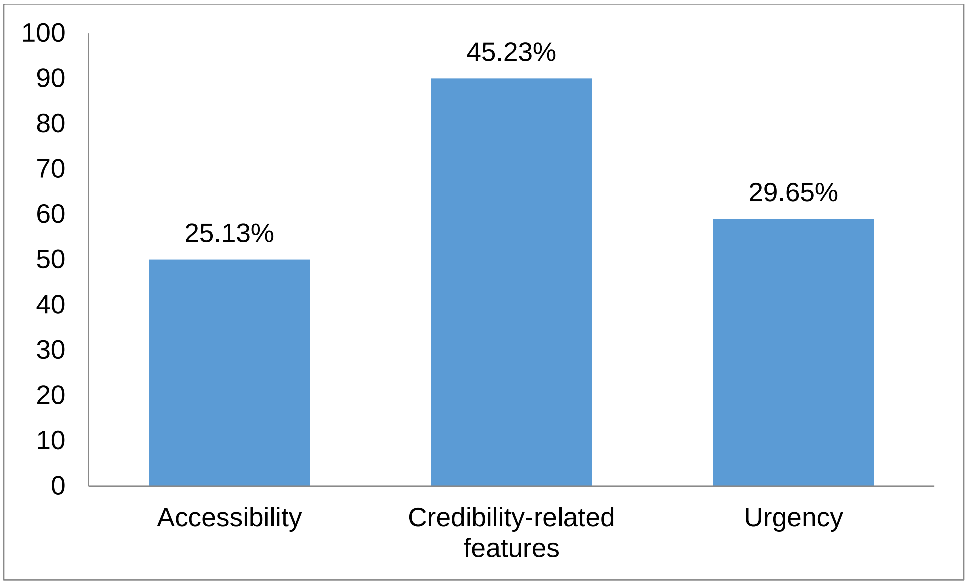


Figure 6 shows the overall percentage of coded features across the three dimensions. Credibility-related features had the highest percentage at approximately 45.23%, followed by urgency at 29.65%. Accessibility had the lowest percentage at approximately 25.13%. The results show that source identification, data citation, legends, and other credibility-related features were more frequently present than the coded accessibility and urgency features.

5. FINDINGS

The analysis of 32 visuals shows different patterns in the use of accessibility, credibility-related features, and urgency. The visuals were mainly produced by Copernicus/ESA and ECMWF, with maps and satellite images being the most common formats. Overall, credibility-related features appeared more frequently than accessibility and urgency features. However, the presence of these features varied across the three dimensions.

5.1 Accessibility Insights

Accessibility features did not appear commonly in all visuals. Repetitive signs such as icons and labels were the most consistent accessibility features, whereas simple captions and alt-text were less often present. Thus, some visuals provided multiple visual elements, while others relied primarily on visual designs and colors.

5.2 Credibility Insights

Data shows that credibility-related features were more numerous than accessibility features. The majority of visuals revealed their sources and included legends clearly, while many other visuals provided model or data information also. Conversely, information about uncertainty appeared in a few visuals. This indicates that visuals often provide information about their data and source bias, but less often indicate uncertainty.

5.3 Urgency Insights

The visuals used several features to communicate heat intensity and risk. Graded color scales were the most common, followed by action language and marked warning levels. Lead-time information was less frequent, meaning that fewer visuals indicated how soon the heat risk was expected. The findings therefore show greater use of visual indicators of severity than information about timing and response.

6. DISCUSSION

Regarding RQ1, the findings show that maps, satellite images, charts, and infographics were used to communicate information about the 2025 European heatwave, with maps being the most frequently used visual type. The findings suggest that the sampled heatwave visuals placed greater emphasis on showing the source and basis of the information than on making the visuals fully accessible or providing clear preparation-related information. It is significant, as climatological visuals usually need to show complex scientific data in an understandable format for the public without specialized knowledge.

Harold et al. (2016) argued that visual design selection can also influence how non-experts understand, persuade, and interpret climate graphics. Terrado et al. (2022) stressed the importance of considering accessibility and the needs of wider and diverse audiences in climate visualization.

The findings also support the application of framing theory to visual communication in the European heatwave of 2025. The repeated use of satellite images, graded color scales, maps, and infographics indicates that the chosen visuals underscored the specific angles of the heatwave, particularly its geographical spread and intensity. The findings recommend that, in presenting the European heatwave 2025, visual framing worked along with risk communication features and credibility-related features,

Regarding RQ2, the findings indicate the chosen visuals were dispersed across the European Centre for Medium-Range Weather Forecasts (ECMWF) and Copernicus/ESA, while ESA contributed a larger portion of visuals.

On the other hand, as far as RQ3 is concerned, findings show chosen visuals consist of different amounts and levels of accessibility, credibility-related, and urgency features. Credibility-related features were found to be more frequent than others (accessibility and urgency).

The powerful appearance of clear legends and source identification was a positive element of selected visuals. Locating the source and describing the visual scale can be helpful for the public to understand and interpret climate information. However, at the same time, information about uncertainty also requires attention. Scientific climate data is usually based on forecasts, estimates, or models, so uncertainty is an important factor for explaining such weather and climate information.

Daron et al. (2015) indicates that different techniques used to present climate data are important because these influence interpretation and confidence. Thus, the limited appearance of uncertainty features in selected visuals proposes an area where climate and scientific communication needs improvement.

Accessibility presents a different concern. The relatively low presence of color-blind-safe palettes, simple captions, and alt-text shows that scientific accuracy was not always accompanied by accessible presentations. Previous research has also noted that climate visuals can be difficult for non-expert audiences and that accessibility requires attention to design, language, and the needs of different users (Harold et al., 2016; Terrado et al., 2022). This does not mean that the visuals were necessarily difficult for all audiences, since audience understanding was not measured in this study. It only shows that several commonly recommended accessibility features were not consistently present.

The findings on urgency also point to a gap between showing heat intensity and providing information for response. Graded color scales were common, but fewer visuals included lead-time information or specific warning levels. Previous research on heatwave communication has shown that visual presentation can shape how heat risk is represented in the media. O'Neill et al. (2023), for example, found that news visuals can sometimes present heatwaves in ways that do not adequately reflect their risks. In the present study, the use of risk-related color scales provided a clear visual indication of heat intensity, but the less frequent use of action language and timing information suggests that these visuals were more focused on showing the heat event than explaining what should be done and when.

Theoretically, the current study contributes by framing theory, risk communication theory, and the source credibility model together to investigate visual communication of an extreme heatwave event in Europe in 2025. Rather than exploring these perspectives unconnectedly, the current research relates them to a common set of visual features, including risk information, scientific data, source authentication, and heat intensity.

This cohesive approach offers a framework for investigating how scientific visuals communicate dissimilar angles of climate risks. This research also treats accessibility as an analytical design dimension, extending the framework beyond the focus on framing, risk, and credibility.

7. CONCLUSION

The study shows that visual communication played an important role in presenting the 2025 European heatwave, but the sampled visuals did not give equal attention to all aspects of communication. The main strength was the clear presentation of sources and supporting information, while accessibility and practical risk information received less consistent attention.

The study highlights the importance of considering accessibility, credibility-related features, and risk communication together when developing visuals for climate-related hazards. A balanced approach can help ensure scientific information is not only accurate but also understandable and useful to diverse audiences. This is particularly important during extreme heat events, when timely communication can support public awareness and risk preparedness.

The study therefore highlights the need for a more balanced approach to heatwave visual communication. Better attention to accessibility, clarity, and action-oriented information could make future climate and heatwave visuals more useful as public information tools. Since this study focused on the visual content, further research could examine how audiences interpret them.

7.1 Study Limitations

This study has some limitations. First, the analysis was based on a purposive sample of 32 visuals, which limits the generalizability of the findings to all heatwave visuals published during the study period. Second, the study focused on visuals from Copernicus/ESA and ECMWF, so visuals from other news organizations, government agencies, and digital platforms were not included. Third, the analysis examined only the visible features of the visuals and did not measure audience trust, understanding, risk perception, or behavioral responses. Finally, the study used descriptive frequencies and percentages, so it identifies patterns in the selected visuals rather than establishing causal relationships.

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Authors Contribution

Dr. Ghulam Safdar was responsible for study design, Dr. Syed Muhammad Hasnain Raza was responsible for data collection and Dr. Aatif Iftikhar was responsible for drafted the manuscript and revised it. All authors read and approved the final manuscript.

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