Visual Climate Change Communication in Iran's Social Media: A Discourse Analysis of X

Mehraveh Taghizadeh*, Farzad Gholami

Department of Social Communication Sciences, Faculty of Social Sciences, University of Tehran, Tehran, Iran. (*✉Taghizadeh.mehr@ut.ac.ir, https://orcid.org/0009-0005-6854-3022)

Article Info	Abstract
	Background: The visual turn is one of the most important features of contemporary culture. Therefore, in climate change communication, images can play a crucial role in conveying environmental messages. Environmental advocates use the potential of visuals to deliver part of their messages to their audience. However, only a limited number of studies have focused on the visualization of climate change communication. Given the characteristics of social media, free from the constraints of mainstream media, they can serve as a suitable platform for visualizing climate change messages. **Aims:** Despite Iran's role in greenhouse gas emissions and the engagement of environmental activists, no research has been conducted on the role of images in conveying climate change messages on Iranian social media. Therefore, the main question of this research is: How do Iranian users on social media platform X frame climate change through images, and within what discourses? **Methodology:** To answer the question of the research, a combination of quantitative and qualitative visual discourse analysis was applied to 500 images in 2023. **Findings:** Studies on the visualization of climate change messages have predominantly focused on developed countries. The findings reveal that Iranian users have addressed climate change through four key discourses: scientific, political, ecological, and protest. Furthermore, the results show that visual discourses have been seen globally in Persian X and it has addressed the present tense and the framework of the consequences. **Conclusion:** In general, the public's attention to climate change in Iranian society reflects the dynamism of the environmental movement in Iran and the growth of environmental literacy among Iranian social media users.

1. Introduction

Climate change is significantly impacting the Middle East countries, particularly Iran (Mansouri Daneshvar et al., 2019: 1). It is estimated that temperature will rise around 4.5°C in most parts of Iran by 2100's (Borna et al., 2011; quoted in Mansouri Daneshvar et al., 2019: 3). Conversely, this country, with total greenhouse gas (GHG) emissions amounting to approximately 616,741 million tons of CO_2, stands as the primary contributor to climate change in the Middle East and ranks seventh globally (ibid: 1). However, it is among the eight countries that have not accepted the Paris Agreement. Iran signed this agreement in 2015 but has not yet ratified it (United Nations Convention, 2016, cited in Climate Centre Report on Climate Change in Iran, 2021).

According to Enloe (1975: 21), an event provokes an environmental issue when it (1) stimulates media attention; (2) involves some arm of the government; (3) demands governmental decision; (4) is not written off by the public as a freak, one-time occurrence; and (5) relates to the personal interests of a significant number of citizens (Hannigan, 2023: 62, 63. As a result, people's participation is a piece of the puzzle to make climate change an issue. Conventions and environmental consensus are meaningless without a coordinated collective response, which is especially challenging to organize because climate change "feels" abstract to many people, does not develop linearly, requires international cooperation, and has become highly politicized (Mooseder et al., 2023: 1).

As individuals worldwide turn to hybrid digital spaces for news and information (Chadwick, 2017), social media have become critical pathways for them to engage for social good in their communities and beyond (Hopke & Hestres, 2018). This is especially evident in Iran, where climate change is closely intertwined with politics, especially due to sanctions and limited economic development. In such a context, climate change debates free from government control could bring attention to various climate issues that policymakers may be ignoring and could enhance social pressure on policy-making. Social media such as X has usurped certain traditional sources of authority, such as governmental bodies, and has facilitated the inclusion of diverse stakeholders such as climate change deniers, scientists, researchers, NGOs, policymakers, ordinary people, and industry representatives in the discourse, and deliberation on climate change. As a result, it is important to grasp public perceptions of climate change and how they interpret it.

It is therefore crucial that we better understand how the issue is communicated visually on social media (Mooseder et al., 2023: 9). Images have become central to today's information environment as evidenced by the popularity of visuals on social media, which have become both important sources of news and general information (ibid: 1). One platform where images play a prominent role is X, which

various climate change stakeholders use to influence public understanding (ibid: 2).

Unlike many other environmental problems, however, global climate change is an issue that has 'no ready-made metaphors' (Sheldon, 2000: 305). As Ungar points out, linguistic metaphors such as the 'greenhouse effect' have proven too benign to resonate in the public mind, which suggests that visual imagery potentially has a strong role to play in public understanding of climate change (DiFrancesco & Young, 2010: 518). Therefore, the meanings and types of visual climate change discourses are fluid and various according to each country's cultural and linguistic context. As a result, it is important to identify the power dynamics and ideologies that underlie discourse and how they shape public perceptions of climate change (Orhewere& Olley, 2023: 78). This is the first research that studies the visual discourses of climate change in Iran.

While the majority of social studies have concentrated on the global North (see DiFrancesco & Young, 2010; Wozniak et al., 2017; Dahl, 2017; Hopke & Hestres, 2018; Schafer, 2012), it's essential to acknowledge the significant contributions of other countries to both the manifestation of climate consequences and the formulation of policies aimed at addressing and mitigating climate change. Resolving this global issue necessitates international cooperation and a comprehensive understanding of the unique cultural and contextual considerations of each country, along with the involvement of diverse stakeholders.

In this paper, we analyze images related to climate change among different stakeholders in Iran's X between 2023 and 2024. Applying the social semiotic methodology through Kress and van Leeuwen's multi-modal discourse analysis framework (2021), we aim to answer the following question:

RQ1: How is climate change portrayed on Iran's X among various stakeholders?
RQ2: What is the timeframe that climate discussions encompass?
RQ3: What geographic locations are referenced in visual discourses?
RQ4: Within what framework do stakeholders articulate climate discussions?

2. Literature review
2.1. Climate change on social media
Social media apps and platforms are increasingly hybrid media spaces (see Chadwick, 2017) where individuals encounter news and information on a diverse range of topics and display their own opinions about global issues, including climate issues (Hopke & Hestres, 2018: 11; Cody et al., 2018: 11). In addition, social media can play a decisive role in bringing climate change psychologically closer to people (Anderson, 2017), facilitating public awareness (Mavrodieva et al., 2019), and fostering actions to tackle it (Vraga et al., 2015), cited in (León et al., 2022: 977).

In this way, X allows ordinary users to gather, verify or deny, report, frame, and distribute information from a variety of sources, blending facts, opinions, emotions, and experiences (Moernaut et al., 2020: 3). In this context, the identification of principles for effective visual communication on X becomes crucial to promote citizen engagement in a complex issue like climate change (León et al., 2022: 977).

Both media attention and civil society mobilization around climate change are now also manifested via social media, including the popular microblogging service X (Hopke & Hestres, 2018: 3). As a result, the hybrid nature of X means that its study can potentially provide unprecedented access to people's behavior and the communicative space around an issue including environmental and climate change (Veltri & Atanasova, 2015: 2; Bali, 2023: 372). Research of Bali about the activity of organizations, celebrities, politicians, and ordinary people in X discussions on climate change illustrates that the political frame is dominant compared to others frames because climate change is an international issue and is connected to the political responsibility of countries to handle the issue apart from the national and local benefits and interests in the short term (Bali, 2023: 382).

2.2. The role of images in the social construction of climate change
Best (1989, 250) suggests three primary foci for studying social problems from a social constructionist perspective: the claims themselves; the claims-makers; and the claims-making process (Hannigan, 2023: 54). The study of social problems from a constructionist perspective puts special emphasis on claims-making, particularly the process of generating ideas and narratives and their advancement or promotion into the public sphere (DiFrancesco & Young, 2010: 519). Claim-making does not just refer to journalists' and Experts' texts. Despite this, a variety of stakeholders frame climate change and participate in claims-making on networked spaces of social media like X.

In this process, imagery is part of textual claims-making. Visual content on social media applications is a form of "visual culture" (Rasmussen Pennington, 2017; Rose, 2012), with culture defined as processes of construction meaning" (Hall, 1997: 2) (quoted in Hopke & Hestres, 2018: 4). According to Hannigan (2023: 58, 71), the use of visual imagery is a key task in constructing environmental problems which provides a kind of cognitive shortcut, compressing a complex argument into one that is easily comprehensible and ethically stimulating.

The power of images comes from their ability to blend fact and emotion; to engage viewers as 'witnesses' rather than as detached consumers of information and claims ((DiFrancesco & Young, 2010: 531). Moreover, the analogical quality of images makes them generally perceived to be closer to reality, and they are therefore less questioned

than verbal content (Brantner et al., 2011 quoted in Mooseder et al., 2023: 4).

2.3. Climate change visuals

Many actors— including scientists, journalists, artists, and campaigning organizations— create visualizations of climate change and make the issue meaningful in everyday discourse (O'Neill & Smith, 2014: 73). This imagery, and public engagement with them, helps to shape the cultural politics of climate change in important ways (ibid: 73). The study of León, Negredo, and Erviti (2022: 976) demonstrates that four practical principles are especially relevant to fostering user interaction on X through images: (i) show 'real people' (i.e. non-staged images of people that transmit real emotions), (ii) tell a story, (iii) include a local connection, and (iv) show impacts or actions by people who are directly affected. The association of visuality with daily life makes it more persuasive.

While images are often said to embody complexity (being worth the proverbial thousand words), media theory tells us that they also reduce complexity by providing interpretive frames or narratives that selectively blend fact and emotion (Gamson & Modigliani, 1968). According to Ungar, much of the persuasive power of imagery comes from the ease by which visuals communicate metaphor and analogy (DiFrancesco & Young, 2010: 520). Images have several qualities that aid in information exchange: they can draw viewers in through vivid and emotive portrayals, aid in remembering information, and (providing audiences share cultural references that allow them to decode the image), they can transcend linguistic and geographical barriers (O'Neill & Smith, 2014: 73). This is related to three distinctive characteristics of images: they are a likeness of the real world, they can be interpreted differently by different people, and they are indexical; they are often perceived as a direct representation of reality (León et al., 2022: 977). Images can be associated with past, present, and future temporal contexts, depicting specific geographical locations while also contributing to the establishment of individual and localized perspectives on climate change outcomes.

Yet despite the ubiquitous nature of climate imagery, scholars in sociology, geography, and communication studies have all called attention to the lack of research investigating climate visualization (O'Neill & Smith, 2014: 74; Hopke & Hestres, 2018: 3). Researchers typically focus on the northern hemisphere and use content analysis to identify various visual representations of climate change (Table 1). However, the climate change issue is not just about recognizing the elements in a picture; it's also about understanding how it's framed and its cultural and contextual significance. Moreover, these different visual types in the existing literature often overlap and are not independent of each other. For instance, the "science and technology" category can either contribute to solutions or be part of the problem.

Table 1. Climate change image types in other studies

Method	Image type		Reference
Content analysis	• People • Identifiable people • Solutions • Impacts	• Scientific images • Causes • Other images	Wozniak et al. (2017)
Content analysis	• People • Identifiable people • Solutions • Impacts	• Scientific images • Causes • Other images	León et al. (2022)
Visual frames	• People • Impact • Protest • Causes	• Solutions • Sci & Tech • Weather • other	O'Neill (2013)
Content analysis	• Nation-state contributions—international treaty • Procedural—international treaty • Outcomes—international treaty • Non-treaty international • Clean energy and efficiency • Fossil fuel-based • Nuclear	• Personal behavioral change • Climate justice • Transparency (climate risk and financial) • Climate science/research • No climate solution • Not applicable	Hopke & Hestres (2018)
Content analysis	• Climate consequences • Conferences, workshop • Miscellaneous • Nature and animals	• People • Protest • Technology • Visualization	Mooseder et al. (2023)
Content analysis	• Human: • Political • Citizen • Business/Industry Scientist/Expert Environmentalist • Celebrity • Nature • Urban landscape • Natural landscape	• Ocean/Coast • Polar bear • Another plant/Animal • Snow/Ice • Industry/Technology • Transportation • Oil sands/Refinery • Green technology	DiFrancesco & Young (2010)

3. Methodology

The purpose of this study is to diagnose how climate change is portrayed on Iran's X among different stakeholders. To achieve this, a combination of quantitative and qualitative methodologies was employed. Descriptive statistics were utilized to analyze the distribution of discourses. Furthermore, we applied Kress and van Leeuwen's (2021) multimodal discourse analysis framework (social semiotics model), which includes three key steps (Figure 1). The first step, representational meta-function, will examine the image's subject matter (Gholami, 2010: 92). The second step, interactional meta-function, will delve into the relationship between the image's creator and viewer (Kress and van Leeuwen, 2021: 113). Lastly, the compositional meta-functionality step will concentrate on the arrangement of image elements.

This method emphasizes how semiotics uses in specific historical, cultural, and institutional contexts, and how people talk about them in these contexts (van Leeuwen, 2004: 3). Social semiotics can account both for top-down power and bottom-up polysemy about the uses of semiotic resources (Aiello, 2020: 373). It helps us identify discussions about climate change on X, a social media platform that brings together diverse groups and individuals to address specific issues, such as climate change.
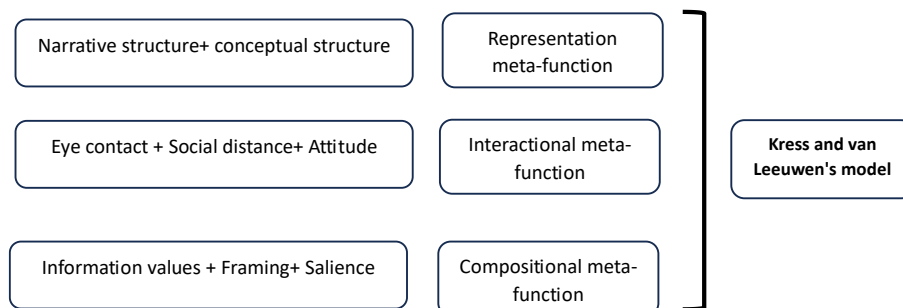
Figure 1. Kress and Van Leeuwen's model; derived from the summarization of (Gholami, 2019)

3.1. Sample selection

For my research, we adopted a hashtag-based approach to gather 500 X images from the year 2023 when COP28 took place. We specifically used the #ClimateChange and #GlobalWarming hashtags in Persian (#تغییر_اقلیم & #گرمایش_جهانی) to collect all original tweets featuring these hashtags and images. Subsequently, I conducted a qualitative visual discourse analysis of climate change-related images in Persian X. This approach is beneficial when there isn't a clearly defined

community of users of interest (Koop-Monteiro et al., 2023: 416). Hashtags serve as focal points for online communities in response to discrete issues (Karsgaard & MacDonald, 2020: 1210). Miscellaneous stakeholders adopted networked platforms like X as a tool to articulate a counter-narrative and to contest selective or dismissive framing (Callison & Hermida, 2015: 697).

4. Findings
This study identifies four visual discourses in the qualitative section which are demonstrated in Table 2.

Table 2. Visual discourses of climate change

Image discourse	Description
Scientific	Sharing research and data-oriented information, scientific observations, specialized terminology, and conversations with experts
Political	Governance and officials' responsibility, and critiques of their performance
Protest	Social and environmental inequalities related to climate change, social movements
Ecological	Local observations of climate change signs, impacts of climate change on the ecosystem

The findings reveal that approximately half of the climate-related tweets were shared by environmental experts, with the remaining half being shared by other stakeholders (Figure 2). News organizations accounted for a fifth of the tweets, the ordinary for 15%, and civic groups for a tenth. Journalists and environmental activists were also among the contributors. Additionally, politicians and the industry sector were absent from posting climate change images on X. The primary stakeholders have been scientists and news agencies. Moreover, the chi-square test showed a statistically significant association between stakeholders and visual discourses $\chi2=59.143$, $P< .001$, df=20.

Also, we wanted to know to what extent climate change stakeholders were shared and made visual discourses. Ecological discourse is the most prevalent among all stakeholders, representing 43.2% of the data. This discourse has been widely utilized for visual representation on Persian X, particularly in the context of addressing the impacts of climate change. Among stakeholders, scientific experts and environmental activists predominantly engage in ecological (20% of tweets) and scientific discourse (15% of tweets). Furthermore, news agencies, journalists, and the public tend to focus on ecological and political discourse. Additionally, civic groups have shown a preference for discussing ecology and protest.
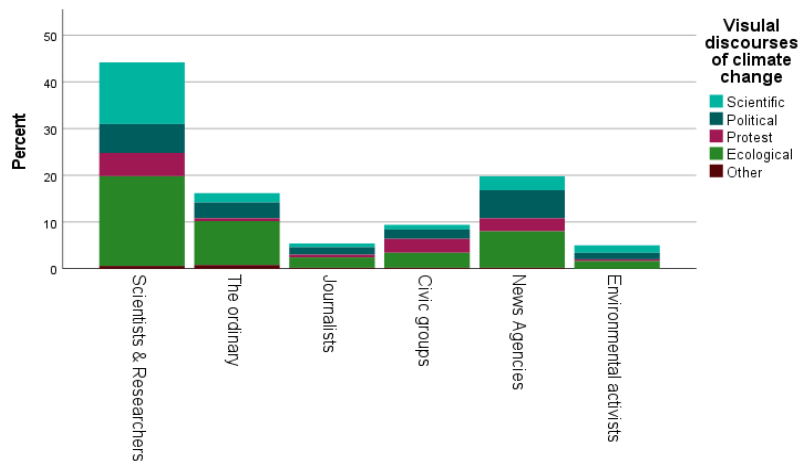
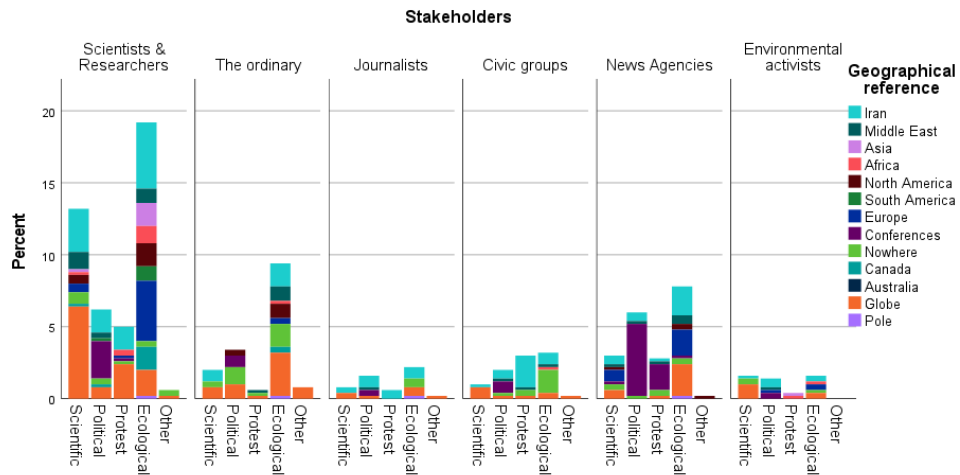**Figure 2.** Percentage of stakeholders by visual discourses

Figure 3. Geographical references

In terms of geographical distribution, the international view has been repeated with 75.8% more than Iran with 24.20% (Figure 3). If we take a close look and consider the countries, after the global view and without referring to a specific country, Iran has been mentioned. But news agencies have given the most references to COP28 with 36.36% of images after the global reference. Scientists have pictured more about the world in scientific discourse with 15% of images and in ecological discourse with 10% of images. The Ordinary have mainly used the ecological discourse with 8% of the data referring to foreign countries. Also, it is noteworthy that in the protest discourse of civil groups, Iran was the first with 22% of tweets related to this stakeholder.

The findings reveal that the present tense prevails, representing 68.4% of tweets across all discourses. Within the present tense, the consequence framework is prominent, constituting 41% of images

(Figure 4). In response to the research's fourth question, the visual discourses of climate change are largely characterized by the consequence framework, accounting for 43.4% of tweets, followed by the scientific framework at 21.6% (Figure 5). However, in the political discourse, "responsibility", consists of the most used framework with one-sixth of the images.
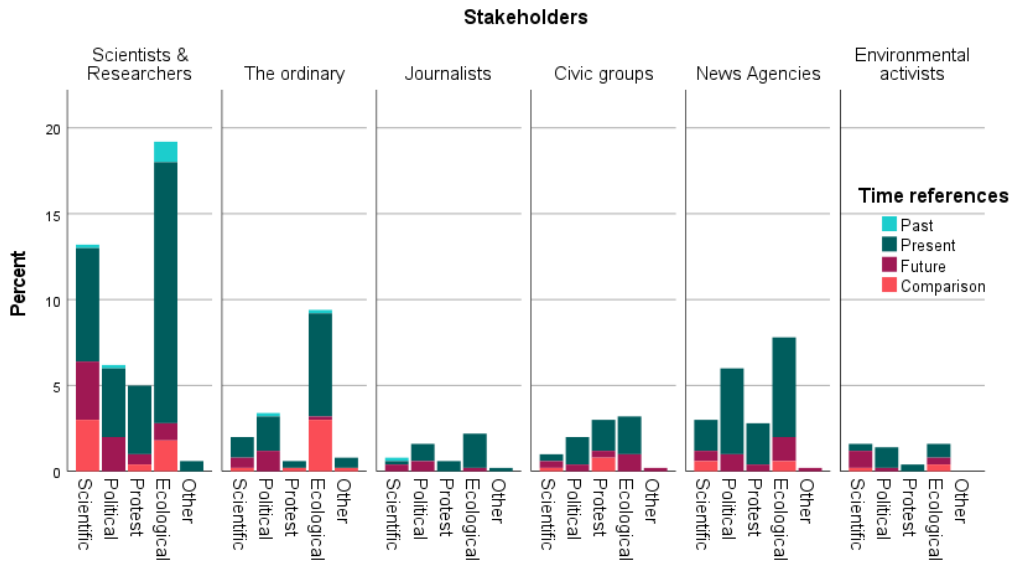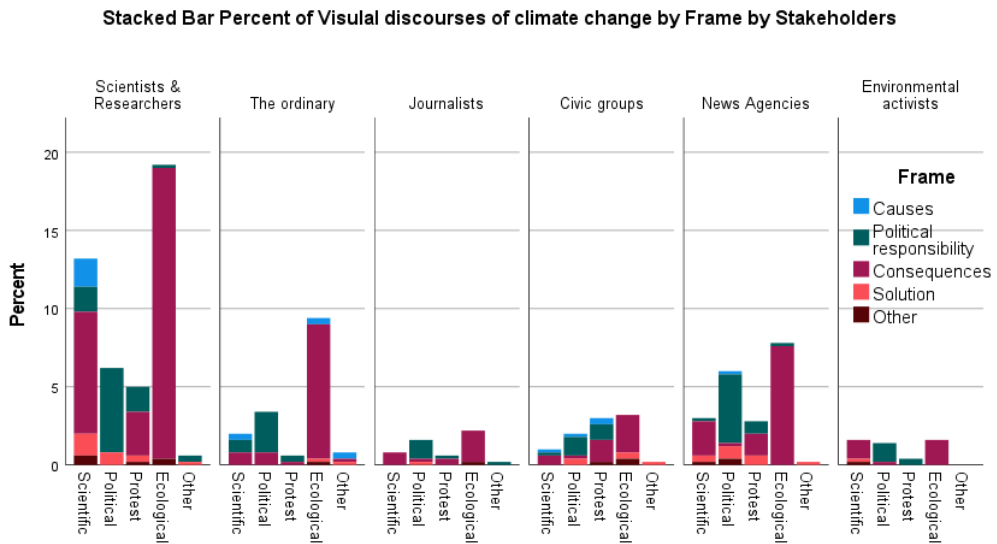

Figure 4. Time references

Figure 5. The framework of visual discourses

4.1. Visual discourses of climate change
This section explains the visual discourses that were identified and studied using a qualitative approach with the discourse analysis method of Kress and van Leeuwen (2021). Qualitative methodology allows us to understand a topic more deeply and to describe it more precisely.

4.1.1. Scientific
In scientific discourse, various tools like simple infographics, informative charts, conversations with environmental experts, and maps and topographies are used to convey information. Maps and topographies are kinds of "conceptual structure" (Kress & van Leeuwen, 2021: 55) which all the meaning is on the map. A carrier exists in climate change maps, which may be the CO_2 emission and some attributes like responsible countries. In addition, in the conversation with experts, there is a vector in which the expert is the carrier of climate messages, and the other side is the TV host and the audience. Findings indicate that civic groups have mostly used general infographics to share global information, but have not focused on visualizing the conditions in Iran. Numbers, maps, and infographics can simplify data, but when information is not personalized and localized, the urgency of climate change is often overlooked in daily life.
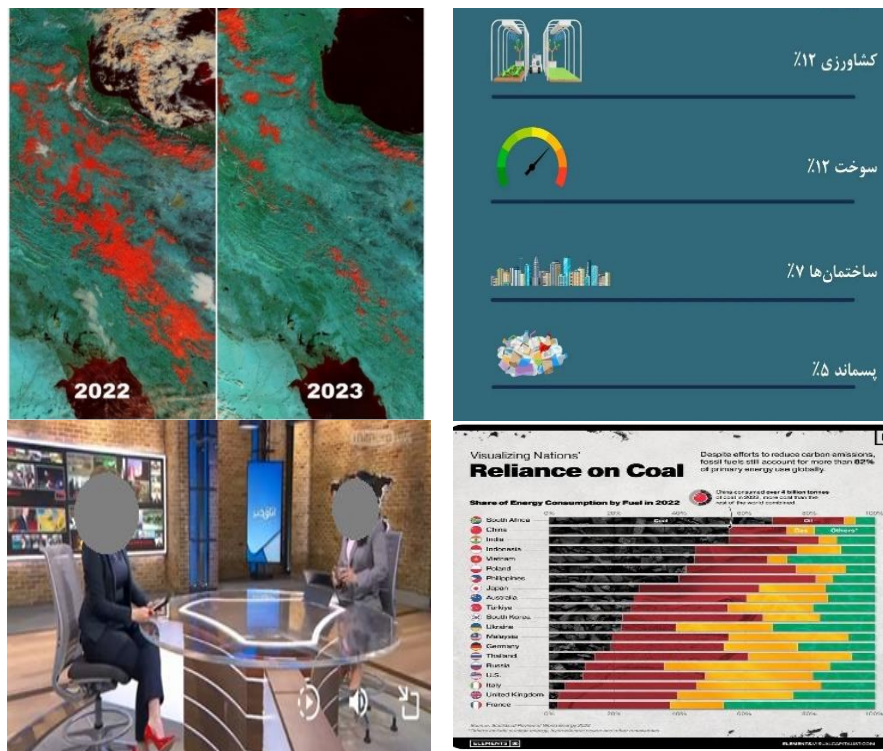

Figure 6. Scientific discourse

4.1.2. Ecological

In ecological discourse, real and tangible signs such as photographs depicting floods in various countries are frequently referenced. The central focus of this discourse is nature, and it examines the current state and the impacts of climate change. In this discourse, climatic signs such as floods and heat carry meaning, and houses and cars caught in water are the attributes. In these images, the objects themselves have appeared in the vector role and the action has been performed on them.

Figure 7. Ecological discourse

In the ecological discourse in Iran, floods and droughts have been repeated the most. In this discourse, images have kept their distance from the audience (visual processes are not reactional). The fact that Iran has a weak presence in the visual discourses of stakeholders and is not detailed like other places separates it from attachment to everyday life.

4.1.3. Political

Mainly, the political discourse is character-oriented. In this discourse, COP28 is mainly paid attention to and includes political figures. In political discourse, all images are active processes, in which the participants play the role of the vector and are the focus of the image. In the group photos of politicians at COP28, we can see a classification where all the portrait elements (politicians) are placed together in a symmetrical composition, known as covert taxonomy. This grouping puts different elements together under one title and creates a sense of teamwork and international collaboration.

Figure 8. Political discourse

4.1.4. Protest

The discourse of protest concentrates on people. In this section, attention has been paid to environmental movements, and social and territorial inequalities in Africa, Iran, and the Middle East. Furthermore, poverty and poor vegetation are represented to demonstrate social and territorial inequalities. This discourse mostly includes children and women. Also, in the field of territorial inequality, the Middle East and Africa are represented and dry lands are considered.

Figure 9. Protest discourse

For instance, in these images, the geographical environment is the carrier and the people are the attributes. A piece of bread and water bottles, are a symbol of inequality in water resources and food security and impose inequalities on children's lives. The clothing worn by the children represents the region of southeastern Iran (Sistan and Baluchistan), and the image of the young girl carrying the bottles on her shoulder signifies gender inequality. The image of the black women

sitting together conveys a sense of inaction. The main focus is on the mother and child, emphasizing their innocence, while also highlighting the imposition of inequalities on women and children.

Environmental movements are also mostly represented with placards of general slogans without reference to specific geography. Although the visual reference to the planet makes its preservation appear important for everyone, this general view deprives the protest discourse of political and cultural geographical contexts and the concreteness of inequalities.

5. Discussion

Social media apps and platforms are increasingly hybrid media spaces where individuals are encountering news and information on a diverse range of topics, including climate issues (Hopke & Hestres, 2018: 11). Climate science portrayed through images draws boundaries around what is normal and thus helps to define what is seen as politically, socially, and economically acceptable. This study revealed that the political discourse focuses on the COP28 conference, while the protest discourse highlights social inequalities and social movements. The visual discourses on climate change mainly concentrate on the international perspective, depicting Iran as less affected by climate change compared to other parts of the world.

O'Neill and Smith (2014: 83) demonstrate that the topic of climate change is suffused with the concept of time; Even the term 'climate change' directly references time: what was climate before; how has it changed; what is climate like at present; and what does it mean for the future? In this article, the temporal framing of climate discourses was studied and the results showed that the stakeholders mostly considered the present time and represented the consequences of climate change.

Past research has shown that effective climate action necessitates the attention of a range of stakeholders, from nation-states, multinational organizations, and civil society to News agencies and industry (Hopke & Hestres, 2018). Findings have shown that politicians and the industry sector are not present in the visual discourse of climate change, and climate change scientists have assumed multiple roles of researchers, journalists, and environmental activists. This issue is due to the low participation of other stakeholders and the presence of more scientists outside of Iran, which has led to a shift in roles to these scientists.

The distribution of climate change stakeholders on Persian X reveals that economic instability, inflation, daily life tension, and political strain have contributed to climate change being less prominent within Iran, as stated by Qaneie Rad (2015: 132):

> "In Iran, environmental awareness has been linked with basic concerns for living; That is, more than environmental awareness, it reflects the social issue or the problem of poverty."

As a result of addressing the issue of water, the consequences of which have become more apparent in people's daily lives, it has attracted more attention and climate change has received less attention.

Unlike many other environmental problems, however, global climate change is an issue that has 'no ready-made metaphors' (Sheldon, 2000: 305). Accordingly, the meanings and types of visual climate change messages can vary depending on each country's cultural and linguistic context. Our research provides a comprehensive understanding of how Iranians use metaphors to convey climate change through visual tweets. The findings show that the images related to climate change on Persian X have evolved to represent national symbols of climate change, integrating pre-existing symbols of Iran as representations of the impacts of climate change.

Scholarly research on climate visuals has predominantly centered on the northern hemisphere using quantitative methods. However, this specific study delves into Iran, employing a blend of quantitative and qualitative research approaches to explore the visual representation of climate change within the intricate context of cultural, political, and economic dimensions. Furthermore, this study is the first research to have examined the visual discourse of climate change in terms of temporal and geographical references and their framing.

6. Conclusion

In general, visual discourses have been seen globally in Persian X and it has addressed the present tense and the framework of the consequences. In visual discourses, a vision of the future is not presented, and the solutions are not visual either. Moreover, stakeholders describe the situation but fail to address climate change in the context of solving the problem. Regarding why the primary focus of images on platform X is on the consequences, it can be argued that this is a relatively new topic for the social media landscape in Iran. The limited climate literacy and even visual literacy among social media users in Iran have further contributed to this trend. Additionally, it can be said that since the consequences of climate change are visibly affecting the daily lives of a large portion of Iran's population— in other words, climate change is directly impacting their quality of life— this reality has been reflected in the visual representations of climate change.

The critique of environmental governance in Iran is notably lacking on Persian X. Moreover, Iranian politicians have not been vocal about climate change, both on social media and in real-world discussions. One of the reasons for this is that, within the context of Iranian society, policymakers are detached from the realities of societal changes, and unless a problem escalates into a crisis or a social issue, policymakers will not pay much attention to it. However, it should be noted that the public's attention to climate change in Iranian society reflects the

dynamism of the environmental movement in Iran and the growth of environmental literacy among Iranian social media users.

Although climate researchers have been actively engaging in Persian X conversations, the most active accounts and news agencies discussing climate change were based outside Iran. This distribution suggests that economic instability, inflation, and political tensions have led to a lower prominence of climate change discussions within Iran. The inaction of the stakeholders regarding the future, distance from daily life due to general and distanced photos from the audience, and the presence of the majority of stakeholders outside of Iran have distanced the discourses from Iranians and Iran as if they have changed. The climate moves in the visual discourse with a distance from Iran in Persian X.

Conflict of interest
The authors declared no conflicts of interest.

Ethical considerations
The authors have completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. This article was not authored by artificial intelligence.

Data availability
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References
Aiello, G. (2020). "Visual semiotics: Key concepts and new directions". In L. Pauwels, & D. Mannay, *The Sage Handbook of Visual Research Methods* (pp. 367-380). London: Sage.
Bali, A.O. (2023). "Raising Climate Change Awareness Across X". *The Journal of Environment & Development*. 32(4): 370-391. https://doi.org/10.1177/10704965231205020.
Callison, C. & Hermida, A. (2015). "Dissent and Resonance: #IdleNoMore as an Emergent middle ground". *Canadian Journal of Communication*. 695-716. http://dx.doi.org/10.22230/cjc.2015v40n4a2958.
Chadwick, A. (2017). "Climate Change Communication". *Oxford Research Encyclopedias*. 1-29. https://doi.org/10.1093/acrefore/9780190228613.013.22.
Climate Centre Report on Climate Change in Iran. (2021). https://www.climatecentre.org/wp-content/uploads/RCCC-ICRC-Country-profiles-Iran.pdf.
Cody, E.; Reagan, A.; Mitchell, L.; Dodds, P.S. & Danforth, C.M. (2015). "Climate change sentiment on X: An unsolicited public opinion poll". *PLoS ONE*. 10(8): 1-18. https://doi.org/10.1371/journal.pone.0136092.
Dahl, T. (2017). "Verbal and Visual Framing activity in climate change discourse". In

K. Fløttum, *The Role of Language in the Climate Change Debate* (pp. 13-30). Oxon: Routledge.

DiFrancesco, D.A. & Young, N. (2010). "Seeing climate change: the visual construction of global warming in Canadian national print media". *Cultural Geographies.* 18(4): 517-536. https://doi.org/10.1177/1474474010382072.

Gamson , W. & Modigliani, A. (1968). "Media discourse and public opinion on nuclear power: A constructionist approach". *American Journal of Sociology.* 95(1): 1-37. https://www.jstor.org/stable/2780405.

Gholami, F. (2019). *Environmental Communication: A Study of the Construction of Iran's Water Issue in Social Media*. Ph.D. Thesis. Tehran: University of Tehran.

Hannigan, J. (2023). *Social Construction of Environmental Issues and Problems*. Oxon: Routledge.

Hopke, J. & Hestres, L. (2018). "Visualizing the Paris Climate Talks on X: Media and Climate Stakeholder Visual social media During COP21". *Social Media + Society.* 4(3): 1-15. https://doi.org/10.1177/2056305118782687.

Karsgaard, C. & MacDonald, M. (2020). "Picturing the pipeline: Mapping settler colonialism on Instagram". *New Media & Society.* 22(7): 1206-1226. http://dx.doi.org/10.1177/1461444820912541.

Koop-Monteiro, Y.; Stoddart, M. & Tindall, D. (2023). "Animals and climate change: A visual and discourse network analysis of Instagram posts". *Environmental Sociology.* 409-426. https://doi.org/10.1080/23251042.2023.2216371.

Kress, G. & van Leeuwen, T. (2021). *Reading Images: The grammar of Visual Design.* Oxon: Routledge.

León, B.; Negredo, S. & Erviti, M. (2022). "Social engagement with climate change: principles for effective visual representation on social media". *Climate Policy.* 976=992. https://doi.org/10.1080/14693062.2022.2077292.

Mansouri Daneshvar, M.; Ebrahimi, M. & Nejadsoleymani, H. (2019). "An overview of climate change in Iran: facts and statistics". *Environmental Systems Research.* 1-10. https://doi.org/10.1186/s40068-019-0135-3.

Moernaut, R.; Mast, J.; Temmerman, M. & Broersma, M. (2020). "Hot weather, hot topic. Polarization and skeptical framing in the climate debate on X". *Information, Communication & Society.* 25(3): 1-20. http://dx.doi.org/10.1080/1369118X.2020.1834600.

Mooseder, A.; Brantner, C.; Zamith, R. & Pfeffer, J. (2023). "(Social) Media Logics and Visualizing Climate Change: 10 Years of #climatechange Images on X". *Social Media + Society.* 9(1): 1-14. https://doi.org/10.1177/20563051231164310.

O'Neill, S. (2013). "Image matters: Climate change imagery in US, UK and Australian newspapers". *Geoforum.* 49: 10-19. https://doi.org/10.1016/j.geoforum.2013.04.030.

O'Neill, S. & Smith, N. (2014). "Climate change and visual imagery". *WIREs Climate Change.* 73-87. http://dx.doi.org/10.1002/wcc.249.

Orhewere, J.A. & Olley, W.O. (2023). "The Construction of Climate Change Discourse in Online News Comment Sections: A Critical Discourse Analysis". *African Journal of Social Sciences and Humanities Research.* 75-84. https://doi.org/10.52589/AJSSHR-5CMY6RVA.

Qaneie Rad, M. (2015). "Environmental awareness or economic requirements". Tehran: *Shagh Newspaper*. [in Persian]

Schafer, M. (2012). "Online communication on climate change and climate politics: a literature review". *WIREs Climate Change.* 1-17. http://dx.doi.org/10.1002/wcc.191.

Sheldon, U. (2000). "Knowledge, ignorance and the popular culture: Climate change versus the ozone hole". *Public Understanding of Science.* 297-312. http://dx.doi.org/10.1088/0963-6625/9/3/306.

van Leeuwen, T. (2004). *Introducing Social Semiotics.* Oxon: Routledge.

Veltri, G. & Atanasova, D. (2015). "Climate change on X: Content, media ecology and information sharing behaviour". *Public Understanding of Science.* 26(6): 1-17. http://dx.doi.org/10.1177/0963662515613702.

Wozniak, A.; Wessler, H. & Lück, J. (2017). "Who prevails in the visual framing

contest about the United Nations Climate Change Conferences?". *Journalism Studies.* 1433-1452. https://doi.org/10.1080/1461670X.2015.1131129.