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RESEARCH ARTICLE

Climate Activist Groups' Discourses on Science and Knowledge: Merging Rhetorical Strategies with Political Visions

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ABSTRACT
Climate activist groups such as Fridays for Future and Extinction Rebellion have recurrently demanded for science to be taken seriously in political decision-making. Scholars point out that science has been "consecrated" as a source of guidance for a climate-dependent future, with a focus on techno-scientific reasoning. This can potentially suppress values of inclusivity and pluralism, and power dynamics inherent to climate politics from public discourse. This study examines the discursive uses of science by three Portuguese youth-led climate groups—School Strike for Climate Portugal, Climáximo, and LIDERA. We found that they have invoked science in three distinctive communicative moves: constructing science into a strategic ally; turning climate science into a political and ethical referee; and debating and pluralizing science. We argue that while climate groups can bolster mainstream science, some also foster critical perspectives and try to push science away from the dominant symbolic territory of "universalism" and "neutrality".

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Introduction

The emergence and expansion of new climate activist groups, such as Fridays for Future (FFF) and Extinction Rebellion (XR), have demonstrably impacted public debates on climate change (Rödder & Pavenstädt, 2023; Thackeray et al., 2020). With their capacity for public mobilization, protest organizing, and, arguably, their influence on decision-making at both individual and political levels, these groups have become significant social actors in the (broadly understood) politics of climate change, warranting ongoing research attention. "Listen to the science" has been a key motto of FFF's public communication since its inception, while XR often employs the slogan "Tell the Truth". These student and young adult activists have recurrently demanded that science be taken seriously in political decisions. Moreover, since the rise of both groups, members of the scientific community have become partners in the youth movement (e.g. Scientists for Future and Scientists for Extinction Rebellion).

Environmental movements have long relied on scientific evidence to support their arguments and exert socio-political pressure (Yearley, 1991). However, it is important to highlight the distinctive features of the "new" (2018–onwards) climate groups (de Moor et al., 2021), considering their unique characteristics. This recent youth-led movement places a strong emphasis on the climate crisis, contrasting with earlier environmental movements that primarily focused on issues such

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as habitat conservation and natural resource management (Jamison, 2010; Yearley, 1991). Climate change presents a multi-scale and intersectional challenge, marked by a level of complexity and urgency that far surpasses prior environmental issues. Unlike earlier environmental issues—such as the ozone hole—where techno-scientific solutions addressed specific local or national problems, the stakes in the climate crisis are global and systemic. This shift raises profound political questions about the social distribution of risks and benefits associated with technologies and policies. What "science" and "knowledge" inform these debates, and how do social sciences (in their different strands) are mobilized to understanding and addressing these challenges?

Groups such as FFF stand out through their focus on intergenerational justice, younger participant demographics, informal and horizontal practices, and a preference for direct, do-it-yourself activism (de Moor et al., 2021). These young activists also act as global and digital mediators of scientific knowledge, leveraging interconnected networks (Wahlström et al., 2019). However, they face challenges stemming from the proliferation of misinformation, a rhetoric of denialism, and the discrediting of scientific knowledge for big-P politics interests (Forti et al., 2023; Painter et al., 2023). This makes their reliance on science to legitimize their calls for change especially critical. However, detailed analyses of the ways these groups discursively (re)construct science remain sparse (Pavenstädt & Rödder, 2024; Rödder & Pavenstädt, 2023).

Previous studies have examined the movement's use of sources of scientific knowledge (Eide & Kunelius, 2021; Evensen, 2019; Matthews, 2020), explored discourse opportunities (Kern & Opitz, 2021) and means of communication in science communication (Rohden, 2021; Rödder, 2020). Some scholars have concluded that the movement has placed intense emphasis on science in their calls for action on climate change, implicitly "consecrating" science as the primary source of guidance for a climate-dependent future (Eide & Kunelius, 2021; Evensen, 2019). This approach carries risks for democracy in the politics of climate change as it may suppress the values and power matters inherent to climate politics, excluding them from public discourse (Hulme, 2010; Pavenstädt & Rödder, 2024; Stirling, 2015). In recent years, however, issues of justice and ethical considerations have gained prominence in climate discourses (Reyes & Carderón, 2021; Thierry, 2023).

Despite the relevance of the findings of earlier studies, it is not clear whether they are valid for the new climate groups as a whole, as there is significant diversity among them. For instance, while FFF and XR have become transnational movements, they have acquired distinct flavors in different territorial contexts (e.g. Herfort et al., 2023; Tomnyuk et al., 2023). Most of the research conducted so far has focused on (Western) countries or cities that possess significant political and economic power (Buzogány & Scherhaufer, 2022; Marquardt, 2020; Svensson & Wahlström, 2021; Tomnyuk et al., 2023). In contrast, much less is known about climate activism in more peripheral regions. This article aims to analyze how climate groups in Portugal integrate science in their discourses and how this is interconnected with the social changes they advocate. We offer a critical discourse analysis on three young led-climate groups and shed light on the plurality of political views and the diversity of knowledge sources within the Portuguese context, enabling comparisons not only between national groups but also with those in broader geographical contexts.

Science, justice, and politics in the communication of new climate groups

The relationship between the climate groups that emerged after 2018 and science is best understood by tracing the history of the environmental and climate movement. Environmental groups have long relied on the accumulation of scientific evidence and the natural sciences to shape their discussions about the environment (Yearley, 1991). Over time, this reliance was further solidified as groups sought to legitimize their claims and distinguish themselves from climate change deniers. For instance, the Climate Action Network, established in 1989, "decided that all its political demands should be based on peer-reviewed science (…) and the conclusions of the IPCC to frame the climate change problem as a scientific issue that required an international policy solution." (Hadden, 2015, p. 24). The increasing involvement of the Global Justice Movement in climate politics contributed to a significant shift at the 2009 COP15 summit, regarded by some as a "turning point for transnational climate mobilizing" (de Moor et al., 2021, p. 620). COP15 saw a division between activists advocating the "scientific urgency frame" and those presenting climate change through a "climate justice frame" (Cassegård & Thörn, 2017; Svensson & Wahlström, 2021).

After years of slow progress in international negotiations, the announcement of the 2015 Paris Agreement was met with pessimism by parts of the climate movement. Hence, the post-COP21 period saw extensive opposition to the fossil fuel industry and gave rise to a series of civil disobedience mobilizations. Movements like Germany's Ende Gelände emphasized grassroots efforts to "act for ourselves" (Scherhaufer et al., 2021). In 2018, the Intergovernmental Panel on Climate Change (henceforth IPCC) published the Special Report on Global Warming of 1.5°C, which underscored the urgency of climate action. This pivotal year saw the emergence of new climate protests and the formation of two notable movements. FFF, inspired by Greta Thunberg's school strikes, emphasized the importance of the Paris Agreement and the goal of limiting global warming to 1.5°C. XR, by contrast, adopted a more radical and emotionally driven approach, advocating for moral responsibility, civil disobedience, and direct action to pressure political leaders.

Both groups have frequently invoked science to emphasize the severity of climate change impacts and the urgency of action with critics maintaining that they prioritize scientific facts, albeit in a somewhat abstract manner, over concrete solutions. This marks a shift from earlier environmental campaigns that often rallied around specific demands for action (de Moor et al., 2021, p. 623; Evensen, 2019). A study across nine countries examining the FFF movement found that the majority of young participants were convinced that science can be relied on to solve environmental problems; an even larger fraction supported the idea that politicians should follow the advice of climate scientists, even against popular opposition (Wahlström et al., 2019, p. 17). For Svensson and Wahlström (2021), this is "reminiscent of the scientific urgency frame used by the early climate movement" (p. 4).

Drawing on Resource Mobilization Theory, Soßdorf and Burgi (2022) argue that FFF relies on scientific knowledge on climate change as a moral resource to legitimize their claims. Similarly, XR has employed science as a somewhat ambiguous moral resource to mobilize support (a stance that evolved over time, as noted by Thierry, 2023). XR has frequently integrated the authority of science and experts into mechanisms like citizens' assemblies, promoting consensus-building for climate action (see Pavenstädt & Rödder, 2024, p. 9). In analyzing XR, Karnik Hinks and Rödder (2023) have maintained that the movement's narrative gives primacy to scientific knowledge rather than to politics, thus privileging a technocratic pathway to address climate change, and limiting the possibility to imagine alternative futures with an emphasis on apocalyptic imagery and deadlineism.

Frauke Rohden (2021) characterizes these groups as "amplifiers of existing science communication practices" (p. 12), while Thelma Krug (2022) credits them with "raising awareness of the IPCC's work" (p. 22). Similarly, Eide and Kunelius (2021) describe the groups as "unapologetic ambassadors of the key message of science and its call for urgent climate action" (p. 15). However, in the words of Hanusch and Meisch (2022), the mantra "Listen to science" establishes "clear limits to policy agendas and policy outcomes because science is elevated to an absolute truth, to an absolute good." (p. 895).

There are compelling reasons for climate groups to invoke science in their discourses: science's epistemic and social authority can help the rhetorical force of their appeals and bolster their credibility. However, there are also reasons for these groups to distance themselves from science. Climate science is closely associated with the IPCC, an intergovernmental body that has faced criticism for producing government-approved reports, deemed "conservative," that are presented as "non-policy prescriptive" (IPCC, 2023a). Over-reliance on science can also position environmental movements in alignment with the very (techno-scientific and political) systems that they often critique (Kenis, 2021). Scientific expertise heavily influences decision-making, particularly shaping climate technologies and structures within the framework of the (unproven) "green economy" (Kenis & Lievens, 2015). Furthermore, techno-science has arguably been discursively co-opted by governments to pursue agendas that diverge from those of climate movements, and numerous scholars and climate groups have suggested that such policies are based on and reinforce dominant neoliberal paradigms (Blue, 2018, p. 552). These tensions underscore the complexities of using science as both a tool for advocacy and a potential source of critique.

When dictates of science become naturalized as "the only way", climate change is depoliticized (Karnik Hinks & Rödder, 2023; Pepermans & Maeseele, 2016), i.e. the diverse possible pathways to addressing it are concealed and so are the social, ethical and power-related matters ingrained in decision-making. Opportunities for democratic politics in this defining, climate-marked moment may be constrained if science is socially constructed as "supreme authority", as noted in the context of XR (Karnik Hinks & Rödder, 2023, p. 11). The studies reviewed here suggest that the communication strategies of prominent new climate groups are often associated with "scientism", which Blue (2018) defines as "a phenomenon whereby authority is implicitly granted to scientific and technical experts to define the meaning, scope and by extension solution for public policy concerns." (p. 545). As techno-scientific knowledge is prioritized in thinking about responses to climate change so are the producers and holders of such knowledge – the "experts" – at the cost of other voices and views. Against this background, it is crucial to explore how diverse climate groups negotiate the relationship between climate science, existing policies, and their aspirations for future policies. Understanding how they balance the interplay of science and values is essential for evaluating their contributions to a more inclusive and democratic climate discourse.

The Portuguese (young) climate groups

Since 2014, Portugal's environmental and climate movement has significantly expanded, gaining prominence through various protests that have drawn public attention. Notable developments and achievements include the successful cancelation of oil and gas drilling contracts, opposition to lithium extraction, and criticism of how workers were handled during the closure of an oil refinery. In recent years, those movements and other young activists have also mobilized around (global) issues like feminism, anti-racism, and the housing crisis, adopting anti-system narratives that challenge political institutions and corporate practices (Carvalho et al., 2022; Fernandes-Jesus 2022; Soares et al., 2022).

This article focuses on three prominent climate groups in Portugal: the Portuguese School Strike for Climate (SSC-PT), Climáximo, and LIDERA a Década do Clima (LEAD the Climate Decade, referred to as LIDERA). While numerous climate groups operate in the country, these three are arguably the most influential, despite differing profiles and action repertoires. In recent years (2023–2024), SSC-PT and Climáximo have led several high-profile protest actions. Members of these groups, along with those from LIDERA, have also contributed articles on climate change to Portugal's leading newspaper, *Público*.

Climáximo, based in Lisbon, includes young and young-adult members and describes itself as an "open, horizontal, and anti-capitalist collective" (Climáximo, 2021). Founded in 2015 ahead of the Paris COP21, the group participated in the creation of the international network Climate Justice Action, and has since joined Gastivists, Stay Grounded, and Subvertisers International. These international networks focus on global climate justice, opposing new gas infrastructures, resisting aviation expansion, and challenging large-scale commercial advertising (Climáximo, 2023).

Climáximo has spearheaded significant national climate campaigns and developed a network linking labor, environmental movements, and unions. A key initiative is the "Climate Jobs Campaign," which promotes sustainable job creation while reducing greenhouse gas emissions. They underscore values like justice, recognition, and inclusion, supporting a deliberative democracy that aligns social, political, and economic priorities with climate action. The group has often engaged in direct action and civil disobedience, including street actions, occupations, and blockades, which they argue are necessary given the government's failure to address the climate emergency or represent public interests. They also organize public talks and social media campaigns, and have developed extensive training materials on climate activism and climate change.

SSC-PT was launched in 2019 as part of the first Global Strike for Climate on March 15th, aligning with the international FFF movement. It quickly spurred the creation of regional groups across mainland Portugal and its islands, though many have since dissolved, leaving SSC-PT Lisbon as the most active. Initially, the group's activities mirrored those of the global FFF movement, including protests outside political institutions, school actions, public visual displays, and social media campaigns. Over time, SSC-PT shifted focus, joining the international End Fossil: Occupy! movement. Beginning in late 2022, it actively participated in school and university occupations. Additionally, SSC-PT Lisbon formed strong ties with Climáximo, collaborating on various joint actions.

From the outset, Climáximo has promoted a transformative political imaginary, explicitly opposing the neoliberal capitalist system and proposing concrete steps for climate policy change (Ferreira da Silva et al., 2024). SSC-PT, particularly its Lisbon chapter, adopted this vision soon after its creation. Both groups identify fossil fuel companies as key culprits in worsening climate change and hold the Portuguese government accountable for inaction. Both support sociopolitical and socioeconomic arrangements rooted in ecosocialism and degrowth principles, emphasizing the importance of a just energy transition in Portugal. Their discussions also reflect an intersectional perspective, highlighting the disproportionate impacts of climate change on marginalized groups.

LIDERA, founded in 2020 during Portugal's COVID-19 lockdown, is a group of young students and entrepreneurs from diverse fields. Initially, they advocated for a just and sustainable socio-economic recovery, viewing the pandemic as an opportunity for change. Since then, their focus has shifted to supporting a just energy transition. One of their first actions was organizing a Bootcamp and delivering an open letter, *"The Future We Want: A Letter from Portuguese Youth to the Country"* (LIDERA, 2020), to the national Environment Minister. Compared to other groups, LIDERA adopts a more moderate approach, aligning with conventional strategies rooted in individual ethics, sustainable development, and ecological modernization, such as green entrepreneurship (Ferreira da Silva et al., 2024). Their political vision emphasizes working within existing systems, advocating for reforms to climate policies and promoting national and international agreements like the Paris Agreement (ibid.). The group prioritizes raising public environmental literacy through certified knowledge, aiming to help citizens make more informed voting decisions. Their actions focus on organizing training sessions and awareness-raising events that bring together activists, policymakers, and researchers for public discussions. While LIDERA acknowledges the global impact of climate change, they show limited engagement with issues of climate justice. Instead, they emphasize the feasibility of solutions and support institutionalized strategies already in place.

Materials and methods

This study critically analyses how different climate groups integrate science in their discourses. More specifically, it examines what functions science plays in the groups' discourses, and how their discursive (re)constructions of science relate to their positions on prevailing and desirable socio-political and socio-economics pathways to address climate change. By critically analyzing texts, we can understand how social life is reproduced, but also how it can be shaken and remade (Fairclough, 2001). Texts of climate activist groups have an important potential to construct and amplify alternative political positions on climate change and illustrate how dominant representations can be re-signified. Besides depicting – or representing – the world (either in the present or the future), discourse is also essential in social relations, which involves addressing others, evaluating them, and constituting them (and self) into particular "subject positions".

Drawing on Critical Discourse Analysis (CDA) (Fairclough, 2003; Wodak & Meyer, 2001) and on other analytical traditions for the study of texts, we have examined representational and interactional dimensions of texts, as well as rhetorical aspects (e.g. Molek-Kozakowska, 2021). We have looked at how science was depicted, i.e. how its characteristics and attributes were discursively

Table 1. Mapping of the corpus by group (number of texts/percentage)

	Overall corpus	% of texts from each group	Corpus with mentions to science	% of science corpus relative to overall corpus
	n.		n.	
SSC-PT	79	27%	32	41%
Climáximo	211	72%	38	18%
LIDERA[a]	4	1%	4	100%
Total	294	100%	74	25%

[a]LIDERA, established in 2020, primarily operates through social media platforms, with a less active presence on its website.

represented, as well as to (political) claims and how they were grounded on science. We paid heed to the social subjects that were discursively constituted in connection with science; looked at elements related to persuasion, namely the apparent persuasive purpose of a given text/segment and how it was textually enacted, for instance via stylistic resources. Overall, we looked at aspects such as lexical choices, grammar (e.g. modal constructions with truth modality – is/can – and obligation modality – ought/should – being especially relevant), and intertextuality (references to other texts, which were done in multiple manners). Moreover, in the tradition of CDA, we were interested in understanding ideological functions of discourse and zoomed in on each group's social and political visions and how they were weaved in their discourses on science.

Data were collected from the websites of the selected groups within a period that starts in the beginning of 2018 and ends in June 2022. Websites are crucial as platforms for activists' social critique (e.g. Ravazzani & Maier, 2022) and as repositories of relevant materials for mapping self-representation (Molek-Kozakowska, 2021). We collected all the texts published by the three groups in the selected period, which included a variety of types and genres, such as calls to action, manifestos, press releases, position statements /commentaries, among others, amounting to 294 texts.[1] For the analysis presented in this article, we worked with a subset of 74 texts containing words that share the same root as "science"[2] (Table 1).

Analysis

Table 1 shows that 25% of the 294 texts in the corpus reference science, primarily within position statements/commentaries, followed by calls to action, by the three groups. This is done in distinct ways that can be categorized into three communicative moves: constructing science into a strategic ally; turning climate science into a political and ethical referee; and debating and pluralizing science. By "communicative move" we refer to specific discursive acts or semantic maneuvers in the construction of meaning around climate-related science (and its relation to climate politics).

Constructing science into a strategic ally

Analysis of the compiled texts shows that, frequently, science is discursively constructed as a supporting entity regarding the claims and demands of climate groups. It serves as an epistemic foundation for climate groups' socio-political agendas and a source of legitimacy for the groups themselves. For instance, in a Climáximo presentation video, the group expresses its commitment to "being at the forefront of collective action with a foundation in scientific knowledge for a fairer and more inclusive society" (Climáximo 02/2021).[3] Climate groups often refer to science as a source of unquestionable knowledge about climate change. The following excerpts illustrate how science is presented as consensual and unambiguous: "Faced with the inexorable observation of science (…)" (SSC-PT 02/11/2021); "We have heard the science. And the science is clear about the consequences of global warming exceeding 2° C (…)" (SSC-PT 24/01/2021); "Climáximo (…) emphasises that this is an unprecedented moment to build a new economic model that protects the rights of today's and future workers, respecting the planetary limits demarcated by climate science." (Climáximo 01/07/2020);

"Following the scientific consensus widely communicated in alerts from national and international organizations (…)" (LIDERA, 2020). When speaking about science, climate groups employ the adjective "clear" numerous times. In doing so, they emphasize both the ability to demonstrate scientific claims unequivocally and the ease of comprehension of those claims. From a communication pragmatics standpoint, the repetitive use of the term "clear" holds significant implications. It enhances the credibility of both the scientific field and the climate groups themselves, and promotes the resonance of scientific findings with a broader audience (Kern & Opitz, 2021).

The value of science in groups' discourses often appear as self-evident and indisputable. By allying their views and agendas with science, climate groups enhance their perceived competence and authority:

> "(…) climate science (…) tells us that existing fossil fuel infrastructures are more than enough to push us into the climate abyss (…). This means that in order to remain on a habitable planet, we need to close down fossil fuel infrastructures instead of considering opening new ones." (Climáximo 20/01/2019)

The quote above is a clear example of a strategic use of science: first, via the validation offered by science, climate groups aim for legitimization of their claims and, indirectly, the groups themselves; second, by contrasting "climate science" with "climate abyss" they contribute to the persuasion of groups' audiences and, potentially, foster mobilization to address climate change.

The rhetorical effects of invocations of science in groups' discourses operate at the levels of diagnosis and prognosis of climate change impacts, as well as at the level of prescription of "solutions", as detailed below. Science has traditionally been seen as a provider of information about the state of things. Considering the nature of anthropogenic climate change, the scientific role of prognosis and projection (e.g. emissions trajectories, pathways of technological and socio-economic change) is critical and is also frequently invoked in climate groups' discourses. In analyzing discourses of climate groups, we found that, in multiple instances, they awarded a prescriptive nature to scientific knowledge: "Cutting 50% of greenhouse gas emissions globally by 2030 will be the biggest transformation humanity has ever undertaken, and it is exactly what Science tells us has to happen." (Climáximo 13/09/2019). There are multiple mentions of a timeline or targets set by science, made in very assertive language (e.g. "will", "50%"): "(…) the transition will take place within the time limits determined by science" (SSC-PT 02/05/2021). On this matter, several scholars have pointed to the risks of deadline-ism: limiting climate action in time can have negative impacts on the effectiveness of climate action itself. It may lead to actions being viewed as mere reactions to model equations, leaving issues of justice and sustainability closed to debate. If targets are not achieved, some may argue that climate action is no longer necessary, potentially damaging the credibility of the scientific community (Asayama, 2021; Asayama et al., 2019; Hulme, 2016).

In the discourses of various activist groups, science is portrayed as an ally through its roles in establishing not only specific time and temperature thresholds but also prescribing methods for mitigating climate change. As observed by Rödder and Pavenstädt (2023), Yearley (2023) and Pavenstädt and Rödder (2024) scientific knowledge is frequently depicted as monolithic, a single body or unified entity with a univocal will. This may suggest an uncritical adherence to science-led proposals. However, a more nuanced picture emerges upon further analysis of the groups' discourse, as presented in the following sections.

Turning climate science into a political and ethical referee

Several climate groups in Portugal have put forth intense criticism of both politicians' and large corporations' responsibility for GHG emissions by referring to science. Indeed, climate groups discursively use science as a referee to assess other social actors' character and performance. While those agents claim to respect climate science, climate groups denounce their lack of honesty and present alternative readings of what scientific knowledge implies. The spread of discursive practices and styles employed in doing so include irony and sarcasm, as illustrated by a speech where a

Climáximo activist posed as Environment Minister and declared the following about GALP, a large fossil fuel company in Portugal: "Just like GALP, I deny climate science and deny basic arithmetic. If GALP hasn't understood the climate crisis, then it must have tried really hard to ignore it. Therefore, we imagine that GALP will resist education and science." (Climáximo 19/06/2018). Within the framework of classical Aristotelian rhetoric, this discursive event is notably rich. The tone of satire and the emphasis on the absurdity in GALP's position on climate science contributes to emotional appeal (pathos). Simultaneously, the credibility (ethos) of GALP is challenged while the activist group's commitment to exposing the truth is enhanced [opposing GALP with "basic arithmetic", "science" and "education" (cf. XR discourses in Thierry, 2023)]. This excerpt also serves as an example of strategic uses of science. Birte Faehnrich (2018) argues that activists primarily deploy science as a "quiet resource" when their positions and opinions are actively disputed by others. Our material suggests that activists resort to science to secure an expert status in critiques of political decision-makers.

Contestation and claims-making by climate groups often do not stop at technical aspects (e.g. reduction of CO_2 emissions) but open the debate to ethics and to justice frames. That was the case of reactions to the closure of a coal-fired power station in Sines in 2021 (then the largest source of GHG gas emissions in Portugal) by EDP (the largest electricity and gas company in the country). Although positive, this was seen by some groups as a rushed affair that did not thoroughly consider workers' rights and futures. Both Climáximo and SSC-PT referred to climate science to problematize both process and agency (i.e. who carried it out):

> What constitutes a just energy transition? (…) Phased closure of polluting infrastructures, ensuring support for workers through their training and professional requalification, taking into account the geographical mobility and age of the workers, that can contribute to the conversion of the infrastructure to genuine solutions. (…) Democratization of the energy sector – a transition compatible with climate science can only be led by civil society, populations, and workers. (Climáximo 07/05/2022)

Climáximo has consistently put social justice at the center of their positions on energy and climate change. Work and employment rights have been one of their main banners, as illustrated by the "Climate Jobs Campaign", and which has involved alliances with unions and other social actors. In a press release concerning the announced conversion of a coal-fired power station in central Portugal into renewables and liquid hydrogen production, they strongly argued for job maintenance and the provision of training to current workers for the new purposes of the unit, in line with "climate science":

> The units at the Pego thermoelectric plant that have not been shut down continue to produce electricity from fossil gas. The government insists on keeping fossil gas until 2040, a policy that guarantees climate chaos. A just transition compatible with climate science implies closing these units during this decade, which means that Endesa and Trust Energy companies must be obligated to provide and facilitate professional training in renewable energy for all fossil gas workers. (Climáximo 08/02/2022)

The segment above suggests that there is a scientific basis for closing "these" units, and in doing so it transposes abstract scientific claims to concrete industrial operations and to their owners. This is open to (scientific) dispute, but has an important rhetorical effect, since one of the main problems in moving away from the causes of climate change has been the fuzziness of their discursive representation (namely the lack of concrete attribution and localization) and the constant diffusion (and deferral) of responsibility (Tosun, 2018). Climáximo then says that a just transition compatible with climate science "means that" the two corporations "must be obligated" to offer professional training for workers made redundant. This imperative language referring to a "just transition" gains rhetorical force by drawing on the social authority of science ("compatible with climate science"). Rather than being portrayed as abstract knowledge, science is not only made to coexist with social considerations but appropriated as part of the rhetorical arsenal for a just transition.

Science is very explicitly at the basis of SSC-PT's calls for socio-political transformations: "science is clear, and Greta, the movement activists, and all supporters are determined in their strong demand for a clear rupture and change in the social, political, and ecological paradigm." (SSC-PT 02/08/2020). Invoking climate science often comes hand in hand with demanding social justice as illustrated below:

> The Government-Vinci[4] partnership must be halted. The interests of a multinational corporation are being placed above the interests of the local population, working people, and are in complete disagreement with scientists who warn us about the dangers of further increasing emissions. (SSC-PT 20/04/2021)

In contrast with the other groups, LIDERA tends to be cautious in its political critique. This group, which appears to seek to work closely with traditional power institutions and prefers conventional forms of civic participation (e.g. the vote), invoked science to say that it had "predicted" the climate crisis: "A crisis [the climate crisis] that also reaches all borders and social classes, further exacerbates existing inequalities, and that was predicted by scientists and international organizations, downplayed by governments and companies, and whose resolution requires coordinated global responses." (LIDERA, 2020). Although considering that it had been "downplayed" by governments and business, the group failed to point to specific culprits, staying within (and thus reinforcing) the dominant, "official" parameters of "global responsibility" and "global politics".

In this section, we have shown that science is construed as a referee regarding the economic and political players, sometimes raising a red card to concrete moves in the game. Climate groups draw on science and scientific knowledge in their discourses to promote quite different claims. Rather than treating climate science as "policy neutral", two of the groups – Climáximo and SSC-PT – invoke it as support for advocating pathways that are transformative not only of physical sources of GHG emissions but also of social and political (power) relations (e.g. the integration of workers from the "fossil industry" into the "renewables industry" through company training and state support). LIDERA stays closer to the dominant climate discourse.

The examples discussed here show how some groups try to associate science to policy-prescriptive discourses not in a deterministic way but as a measure of acceptable political performance and as support for advocacy of justice-based action. However, attempts to bridge "universal" scientific truths with specific political struggles (Thierry, 2023) are not without challenges. Likewise, justice and other ethical/normative issues, although examined in academic circles (e.g. Sovacool et al., 2016), do not easily correspond to what is predominantly viewed as "science".

Debating and pluralizing science

Whereas for strategic purposes science is referred to, by all groups, as a monolithic, united, and nonpartisan entity that should be heard, in other discursive contexts we find plural, nuanced and critical representations of science by SSC-PT and Climáximo. In their websites, both groups debate several aspects of science production and circulation and science's roles in society (cf. XR discourses on science in Thierry, 2023). One particularly rich case is an SSC-PT essay titled "Scientific development: problem or solution?" (SSC-PT 17/06/2020). It discusses how science acquired a position of social and cultural prominence. Looking back in history, it argues that "[r]eligious faith was replaced by a blind faith is science" (ibid.). The piece then argues that,

> Scientific and technological progress has extended the average human life expectancy, which has given humanity greater power and, with it, the longer subjugation of nature. (…) [s]cientific and technological advancements, which were supposed to bring well-being and longevity to humanity, have become the root cause of various problems that threaten human survival itself. (ibid.)

Hence, appeals towards adherence to science do not impede climate groups from weighing the impacts of techno-scientific applications and accounting for the negative ones. In another excerpt, SSC-PT members take up the role of sociologists of science in reflecting about the dynamics of the IPCC – "(…) the [sixth IPCC] report has a very high level of trust within the scientific community. It is produced and reviewed by hundreds of scientists from all over the world, and also prefers conservatism over alarmism in its statements. If the report points to disaster, we should prepare for widespread calamity." (SSC-PT 27/08/2021). By suggesting, in a rather assertive lexic, how to interpret the IPCC report, groups are constituting themselves into critical knowledge brokers towards their publics (cf. Gluckman et al., 2021).

In contrast to texts where science is placed in a pedestal, in the following excerpts SSC-PT writes about a horizontal relationship with multiple sectors of society. In this discursive formulation, science is a dialogical partner rather than an oracle: "The resolution of the climate crisis is extremely complex and will be impossible to solve without frank conversation and contribution between the scientific community, government institutions, large corporations, and civil society, with the collaboration of the media." (SSC-PT 27/08/2021). Next, they position the climate movement (i.e. themselves) as agents of democratization of the climate debate and construct different social actors in the climate struggle as equals: "(…) the climate debate must be brought to the circles of discussion at all levels. It is the responsibility of the climate movement to democratize and reflect this message." (ibid.).

In some texts of Climáximo, social movements are similarly put side by side with science:

> Fortunately, not only do we have decades of science to support our cause, but we also have decades of experience from climate justice movements to distinguish false solutions from true ones. As early as 2014, more than 300 organizations with 200 million members worldwide launched the manifesto "Mobilization and organization to stop and prevent the fever of the planet" that analyzed in detail the various false solutions of the so-called "green capitalism", which only serve to worsen the climate crisis (…). (Climáximo 31/05/2019)

The first sentence not only creates a value equivalence between science and climate justice movements but also assigns the latter with a critical form of "epistemic agency": the ability and the experience to "distinguish false solutions from true ones", which is then illustrated with the mention of a source (i.e. the manifesto).

The epistemic interventions of Climáximo go further as the group conducts collaborative studies on specific cases of climate-related decisions. One example concerns the social and economic impact of the closure of the coal-fired power station in Sines. In a case study piece titled "*Towards a Just Transition in Sines*" (Paulo et al., 2022) they refer to a report by the International Energy Agency and to a study by ISCTE (a reputed Lisbon university), which they say was incomplete, and discuss data regarding the process whereby workers were forced to leave the company (EDP). Rather than relying on "globalized knowledge" (Hulme, 2010) that tends to homogenize social realities, Climáximo also offers a type of knowledge that is sensitive to local factors and contexts.

In addition to analyzing invocations of science, we have examined the sources mentioned by the various groups in the 74 texts, which helps comprehend how the nature of different forms of knowledge informs calls for socio-political transformations. Sources were divided into (1) documentary sources (including direct and indirect citations, URLs, and hyperlinks) and (2) entities (people/organizations) which are identified without a documentary source. The two types of sources were then organized into five categories (Table 2). Table 3 presents the mapping of sources by category and by group.

The website of SSC-PT offers an image of knowledge that is diverse and sophisticated. More than 60% of the sources are derived from research-based sources, with authors recognized (or perceived) as activists holding a predominant position; institutional and political sources contribute to 22% of

Table 2. Categories of the sources

Research	Research-based sources (e.g. academic, activist, or journalistic research presented in books or papers)
Activism	Activist communication sources (e.g. commentaries, reports, videos, etc.)
Institutional/ political	Institutional sources (e.g. intergovernmental reports)
Journalistic	Articles produced by media outlets
Business	Business sources (e.g. CEOs, financial websites)

Table 3. Mapping of sources by category, by group (number/percentage)

	SSC-PT				Climáximo				LIDERA			
	n. Ds	n. E	Total		n. Ds	n. E	Total		n. Ds	n. E	Total	
Research[a]	13	9	22	61%	9	4	13	23%	1	13	14	35%
Activism	2	1	3	8%	18	7	25	45%	–	5	5	13%
Institutional/political	6	2	8	22%	6	3	9	16%	11	2	13	33%
Journalistic	3	–	3	8%	9	–	9	16%	6	–	6	15%
Business	–	–	–	–	–	–	–	–	–	2	2	5%
Total	24	12	36	100%	42	14	56	100%	18	22	40	100%

Ds = Documentary sources.
E = Entities.
[a]Within this category there are sources or organizations whose work is widely recognized in the field of political, climate and human rights activism. Nevertheless, their work is based primarily on research settings.

the group's total sources (Table 3). The variety of scientific domains that it dialogues with is the greatest of all groups and includes Philosophy (the most cited discipline), Politics, Geography, Critical and Feminist Theory, Psychology, Biology, Biodiversity, Ecology, Physics, Climatology, Environmental Studies, Engineering, Technology, and Medicine. We detected efforts to problematize contemporary society by drawing on sources such as the essay "*The Concept of History: Ancient and Modern*" by Hannah Arendt (1961); "*The Imperative of Responsibility: In Search of an Ethics for the Technological Age*" by Hans Jonas (1984); and, on philosophical reflections by Judith Butler, Viriato Soromenho Marques, Spinoza and Leibniz, Timothy Morton, Byung-Chul Han, among others. The intertextual dialogue with human and social sciences indicates the openness of the student movement to subjects that go beyond a technical reading of the climate crisis and an effort to politicize the climate change debate.

The nature of the knowledge mobilized by Climáximo points to the politicized, reflexive, and global nature of its discourse. As shown in Table 3, an important number of the group's sources are activist communication sources (45%). Via mentions to international science and climate justice-based movements and organizations (e.g. OXFAM, 350.org, Global Greengrants fund, GermanWatch, Stay Grounded, and Oil Change International), the group invokes knowledge of other economic and political contexts to reflect on social and political change. We also find references to authors such as Karl Marx and Walter Benjamin to frame the "problem" historically, but also to organizations such as the Club of Rome ("*The Limits to Growth*", 1972) to discuss the issue of economic and ecological sustainability. Although the evoked sources seek to critically reflect on the current state of affairs, the group also frequently draws on climate science, a more "technical", "consensus-seeking" and institutionalized form of research (e.g. IPCC).

LIDERA holds distinct values that differ from the other groups, and primarily engages in scientific knowledge discussions through training sessions and public communication appearances, as opposed to producing essays. Research (35%) and Institutional/political (33%) sources feature in LIDERA's material relative to training events held with the aim of educating and disseminating "certified knowledge" (LIDERA, 2021) to their audience (an example of this is evident in their CLIMATE U training session, guided by the prompt "From information to action"). LIDERA draws primarily Consulting, Finance and Sustainability (most notably) for its scholarly foundation. Additionally, it encompasses Management, Data Analysis, Engineering, Technology, Economy, Sociology, and other areas. LIDERA is the only group that cited Business entities.

Groups such as SSC-PT strive to establish a horizontal connection with different sectors of society, emphasizing a dialogical partnership with science rather than see it as a hierarchical oracle. Climáximo plays an active part in the production of research material, striving to promote local knowledge as a counter-hegemonic force whilst politicizing the discourse on climate change. These groups acknowledge a range of varied forms of knowledge with the objective of scrutinizing power holders and their practices and advocating for social and political transformation beyond the dominant technical comprehension of climate change. This can be contrasted with the clear call for the natural (environment and climate) sciences by several international climate groups to justify their claims (Pavenstädt & Rödder, 2024, p. 1068). LIDERA mentions science as a means of drawing attention to climate urgency. However, in this group's way of operating, scientific knowledge is typically delivered through training sessions, where experts are invited to share their expertise, hence restricting, rather than expanding, the sources that are considered worthy of learning from.

Discussion and conclusions

The role of science in the communication of new climate groups has generated much research interest in recent years. Whereas extant studies find those groups to act (merely or predominantly) as amplifiers of the "message of science", our research suggests that this is a simplistic appraisal. The Portuguese groups analyzed here engage in various forms of discursive (re)construction of science, some of which push science away from the dominant symbolic territory of "universalism" and "neutrality".

We have pointed to three distinct communicative moves. Firstly, as argued in studies about other countries (Pavenstädt & Rödder, 2024; Rödder & Pavenstädt, 2023), we found that all three Portuguese groups frequently invoke "science" as a univocal and seemingly incontestable source of knowledge. The purposes of climate groups are likely to be strategic (e.g. Faehnrich, 2018; Soßdorf & Burgi, 2022): overall, by harnessing science—a respected and trustworthy source of knowledge—they enhance their social legitimacy and persuasive potential. If there are strategic reasons for climate groups to build discursive alliances with science, this also presents potential risks: the reinforcement of the very power structures—both techno-scientific and political-economic—that have contributed to the crisis by expecting science to solely provide solutions to the problems it identifies. This may risk framing the climate change debate as ´conflicts over science` rather than ´conflicts over political alternatives` (Pavenstädt & Rödder, 2024, p. 1080). In addition, science cannot develop and "deliver" at the pace that activists often appear to require (Yearley, 2023, p. 81). Although it can offer clues that can be reflected upon and discussed, scientific knowledge is largely contextual, limited, and provisional.

Secondly, our analysis reveals that the examined groups go beyond simply advocating to "listen to the science" and summon science as a referee to evaluate political commitment to mitigating climate change and the acceptability of government and business actions. Unlike most new climate groups in other countries (Buzogány & Scherhaufer, 2022; Rödder & Pavenstädt, 2023), Climáximo and SSC-PT (the latter having derived from the FFF movement) mobilize science to call for specific steps towards (major) socio-economic and political changes. Climate justice and ethical concerns are then closely tied to economic and social justice, diverging from the predominantly intergenerational justice framing that characterizes FFF in other countries. Our findings show how science serves not only as an ally but also as an ethical referee, supporting initiatives such as the requalification of ´fossil fuel workers`. Rather than depoliticizing discourse, science is mobilized as a resource to critique governance and challenge the "bounded politicization" described by Pavenstädt (2024).

Challenges remain in taking justice and ethical issues to the streets. Invoking "science" in appeals for a "fairer and more inclusive society" (Climáximo 02/2021) or "plans and actions [that] do not leave anyone behind" (SSC-PT 22/10/2021) may raise questions as those matters pertain to value-related positions rather than "knowledge," as it is conventionally understood. Even though the language of "justice" has recently made it into IPCC reports and other mainstream arenas at the science-policy nexus, there is little clarity about how such notion can translate into climate politics. Although challenging, this is potentially the crucial juncture where climate groups can wield significant influence, particularly in translating ambiguous normative language into tangible settings and practices (e.g. Climáximo collaboration in the "Climate Jobs Campaign").

The third communicative move goes in that direction: it concerns discursive constructions of scientific knowledge that are more reflexive and intricate. Climáximo and SSC-PT play a key role in advancing a comprehensive understanding of the climate crisis by blending intersectional and technical perspectives to explore pathways to the future. Unlike LIDERA, Climáximo and

SSC-PT critically examine the functions of science, and pluralize the scientific knowledge that matters for climate change. They even reflect on their own place in civil society (e.g. SSC-PT), resisting the notion of fixed, authoritative science – a stance that can be linked to the environmental movements of the 1970s (Jamison, 2010, p. 813). Science hence becomes a *heterogeneous social construct*: through integrating diverse and critical knowledge domains and sources, these groups expand the boundaries of what counts as climate-relevant "science". These findings resonate with the elaboration of "alternative epistemologies" as put by della Porta and Pavan (2017), which highlights diverse approaches to knowledge that movements adopt to challenge dominant paradigms. Furthermore, the intentional and strategic knowledge practices observed here align with what they describe as diverse "repertoires of knowledge practices".

There is a growing body of research emphasizing the importance of integrating social sciences as well as local, youth, and activist knowledge into climate-related thinking (Hartz, 2023; McElwee, 2023). The latest IPCC report reflects this shift, explicitly recognizing "the value of diverse forms of knowledge," including Indigenous, local, and scientific perspectives, as critical enablers of climate action (2023b, p. 97). It also underscores the relevance of social science frameworks in addressing climate challenges. However, the emphasis remains disproportionately skewed toward economic sciences, often sidelining other crucial dimensions such as cultural and political approaches that could offer transformative insights. Interpretive and critical approaches within the social sciences, which could challenge dominant paradigms and illuminate new pathways for action, continue to be underutilized and undervalued.

This study demonstrates that, rather than a homogeneous voice, new climate groups present distinct discursive reconstructions of science shaped by diverse political imaginaries. LIDERA adheres to political visions that are inscribed in the dominant narrative on climate change, heavily influenced by economics and management sciences. Its discourse on science, primarily represented by highly educated individuals from official institutions, academia, and the financial sector, reflects patterns observed in climate activist groups across other countries. In contrast, the other two groups represent alternative forms of thinking centered on inclusivity, plurality and climate justice: Climáximo emphasizes the social implications of the energy transition, with SSC-PT joining this effort to introduce more transformative discourses. The coexistence of these diverse perspectives within the same country is a distinctive finding of this research, reinvigorating the democratic debate on climate change (Machin, 2022; Ferreira da Silva et al., 2024).

This work advances knowledge through a critical epistemological and analytical approach, examining how the groups mobilize science and its sources. By mapping their thinking, we identify the knowledge they use and how it relates to their political visions. Ultimately, this invites reflection on how validated scientific knowledge is reconstructed—or can be used—to inform decision-making and deliberative processes in the complex context of climate change. The diverse knowledge and social-political transformational steps brought by climate groups challenge the persistent positivist-consensual paradigm, the prevalence of business-as-usual future scenarios and the lack of attention to policy impacts at different scales within climate policy discourse (De Pryck & Hulme, 2022; Petersen, 2022). As Steven Yearley (1991) notes, social movements may struggle to engage with the social sciences due to perceptions of subjectivity and partisanship. However, this cannot justify ignoring such critical perspectives. The call for a "reflexive turn" and "hybrid imagination" in climate knowledge production (Jamison, 2010; Pavenstädt, 2024) is a key theme reflected in our work.

The analysis has limitations. The texts used were collected between January 2018 and June 2022, and, since then, Climáximo and SSC-PT Lisbon have escalated public disruptions, including school occupations and civil disobedience. Meanwhile, in 2023, LIDERA actively joined in the development of a New Portuguese Green Pact, a government initiative. These shifts may have altered the groups' discursive engagement with science. The inherent space limitation of a journal article prevented a comprehensive discourse analysis of all 74 texts from the groups' websites, namely fully exploring co-text, different discursive genres and their specific audiences, and the situational and broader context of each text. Future research could address these gaps and examine social media, banners, and other public interventions of climate groups.

Notes

1. In the collection process, we excluded texts with repeated body text despite having different titles. Additionally, we excluded short texts that only announced events.
2. By using the word root ("scien") in searches, we collected texts that contained the following words: "science/s", "scientist/s", "scientific". In Portuguese: "ciência/s"; "cientista/s"; "científico/s"; "científica/s".
3. The references to the analyzed texts can be found in the Supplementary Material.
4. A financial agreement signed on 8 January 2019 between the French company Vinci Aeroports and the Portuguese government for the expansion of Lisbon airport.

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Author contributions

Both authors contributed to the study's conception and design. Data collection, preparation and initial analysis was carried out by Daniela Ferreira da Silva. While Daniela Ferreira da Silva wrote the first draft, Anabela Carvalho conducted further analysis and contributed significantly to the final version. All authors read and approved the final manuscript.

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