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Kindling change: shaping a New Fire Culture in Mediterranean socioenvironmental systems from the roots

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Abstract: In line with global trends, the Valencian Region (Spain) is experiencing increasingly extreme wildfires, exacerbated by entangled socioenvironmental factors like climate change, the human-nature dichotomy, and wildfires managed basically through technocratic approaches. Rural grassroots movements are emerging amid worsening wildfires, advocating for local agency to build socioenvironmental resilience in wildfire-prone territories. Inspired by these movements, we propose a transformative paradigm – a New Fire Culture – to elicit critical reflections on current wildfire management and build socioenvironmental just futures. By drawing on our experiences around the 2022 Vall d'Ebo and 2023 Villanueva de Viver wildfire events and resulting from an interdisciplinary deliberation process, we present a comprehensive analysis of the present wildfire context and suggest guiding principles for a New Fire Culture. Acknowledging its context-specificity, we call for transdisciplinary processes among local actors, academics, and practitioners to collectively explore and build a New Fire Culture within their socioenvironmental systems.

***Key Words**: wildfires, mediterranean socioecosystem, grassroots movements, rural areas, climate change, human-fire relationship*

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Introduction

In the last century, major social changes have accelerated across the globe, including profound demographic shifts as well as alternations in humankind's relationship with nature (S. Díaz et al., 2019). In the case of Spain, processes of rural depopulation have played a core role in these changes, especially since the mid-20th century (Collantes & Pinilla, 2020). Compounded by other socio-demographic issues, including agricultural industrialisation and an ageing rural population, territorial imbalances are associated with an increased vulnerability to disasters such as wildfires (J. Díaz & García, 2018; Lloret et

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al., 2024). These imbalances are further reinforced by extractivist activities (such as natural resources exploitation, large-scale energy production, or livestock industries), whereby impacts deriving from urban lifestyles are inequitably distributed towards rural territories, thus enhancing socio-environmental conflicts (del Romero, 2019). Simultaneously, the severe processes of depopulation, entailing both a loss of inhabitants and territorial infrastructures, have led to the disappearance of activities and knowledges linked to managing the territory, as well as reducing social articulation, thus decreasing the resilience of rural socio-ecosystems towards disasters like wildfires (Moreno et al., 2023; Vázquez-Varela et al., 2022).

Fire is an essential ecological process, inherently part of many ecosystems – including the Mediterranean – and an element humankind has learned to control, at least to a certain extent (McLauchlan et al., 2020). However, rapid changes in the wildfire regime (including frequency, extent, intensity and seasonality) are causing increasingly severe socio-environmental impacts, such as human lives lost, economic losses, decrease in soil, water and air quality, and biodiversity loss (Moreira et al., 2020), and simultaneously contributes to, and is further exacerbated by, climate change (Tedim et al., 2020). To manage and solve the wildfire issue, technocratic approaches are often used, such as developing and using high-tech (and highly costly) equipment to detect and fight fire or decision-making led exclusively by a select group of experts with techno-scientific knowledge. This model has been amply critiqued in past years for paradoxically exacerbating extreme wildfires (Kreider et al., 2024; Tedim & Leone, 2017), as well as increasing social vulnerability by failing to work on aspects such as community strengths and capacities (Hermans et al., 2022). However, less attention is paid to how it also strongly reduces civil society's (pro)active roles in wildfire management. Namely, technocratic approaches perpetuate a notion of members of society as passive and ignorant individuals who must be directed under expert guidance to prevent citizens from either causing or becoming victims of a wildfire (Castelló, 2024; Ottolini et al., 2023).

On the contrary, in this article, we argue that local inhabitants in wildfire-prone territories play an important role in mitigating wildfires and, overall, building socio-environmental resilience, particularly through rural grassroots movements. Oftentimes articulating a critique towards technocratic approaches, these non-institutionalised groups are constituted by inhabitants who are deeply connected to, and knowledgeable of, their surrounding environment. Also called 'plataformas de defensa del territori' in Valencià (one of the official languages of our research area), these are a well-known organisational structure in the world of rural defence (del Romero, 2023). Examples of these movements in our research area are Recartografías and Pego Viu, which promote territorial preservation in its broadest sense through land stewardship. Notably, as Salesa and Ottolini (2022) explain, these movements' territorial strategies and specific actions are a fundamental pillar for managing wildfires in socioenvironmental-just ways.

The socioenvironmental complexity surrounding the emerging wildfire issue prompts us to look for novel approaches to understand and relate to fire. For this purpose, we advocate for a New Fire Culture as a transformative paradigm that moves away from technocratic, managerial perspectives. Instead, a New Fire Culture takes a deeply situated approach in wildfire-prone territories that is informed by those who – often literally – live alongside fire.

It elicits a profound revision of our current relationship with our fiery kin and allows us to imagine and create more reciprocal relationships with it. Inspired by rural grassroots movements in wildfire-prone territories, we suggest guiding principles for this novel paradigm, evolving around acknowledging fire as part of the socioenvironmental system; strengthening transdisciplinary collaborations and polycentric governance; and moving beyond fire management, towards a holistic socioenvironmental framework.

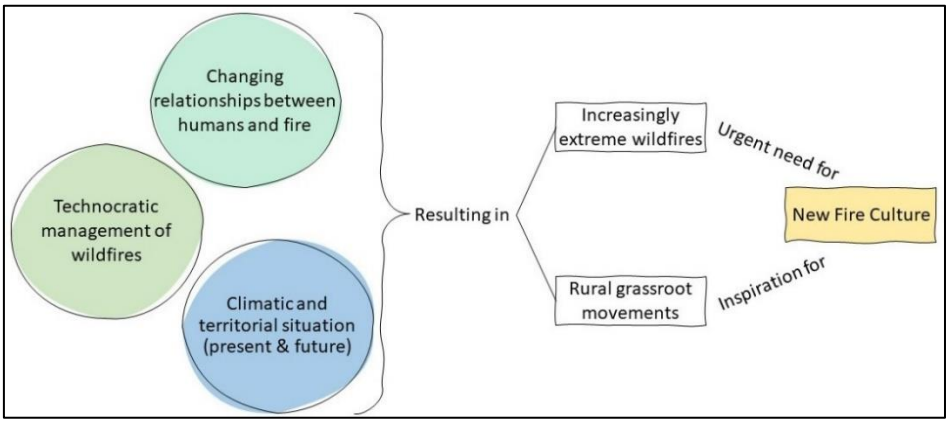

Figure 1. Framework with the basic themes underpinning this article and from which the transformative paradigm of a New Fire Culture emerges

Source: Authors' elaboration

Based on insights and reflections from a Mediterranean Spanish context, particularly the Valencian Region, this article evolves around a series of themes as presented in Figure 1. The evolving human-fire relationships, rapidly shifting wildfire regimes, and the limitations of technocratic approaches, all intersect and contribute to increasingly extreme wildfires, and, simultaneously, to the emergence of rural grassroots movements. Whilst the former underscores the urgent need for a New Fire Culture, the latter serves as a source of inspiration for its guiding principles.

Research area and approach

This section presents the research area and the two wildfire events in the Vall d'Ebo (2022) and Villanueva de Viver (2023). These wildfires sparked many reflections and insights, which we have transformed into the present article through an interdisciplinary collaborative approach.

Our research area is located in the eastern Iberian Peninsula, specifically in the Valencian Region and adjacent areas. This area is characterised by a typical Mediterranean climate (specifically Csa and Csb climates as per the Köppen-Geiger climate classification; Kottek et al., 2006), with hot and dry summers and template winters. Particularly, we focus on rural territories, where the landscapes shaped by humankind for millennia (Ruiz & Sanz-Sánchez, 2020) have seen a drastic decline in human presence and activity during the last century (Stellmes et al., 2013).

The Villanueva de Viver wildfire occurred in March 2023, affecting 4,723 hectares in seven municipalities across two autonomous regions: Valencian Region and Aragon (Figure 2). Around 96% of the burned surface was forested, including emblematic landscapes and important Natura 2000 sites (Alloza et al., 2023) (Figure 3). Although this region has never been densely populated, there was an efficient and extensive territorial management thanks to the dispersed spatial distribution of the population.

However, due to land abandonment and mass reforestation in the past decades, the 2023 wildfire spread rapidly through the continuous forest cover and took 20 days to

suppress. The severity of the wildfire – both due to its rapid evolution and scale – required the evacuation of more than 1500 residents. One reason that challenged and lengthened fire suppression was the difficult orography, thus leading to significant suppression costs of around two million euros (Martínez, 2023). Furthermore, this wildfire – burning outside of the traditional 'wildfire season' – required the early mobilisation of firefighting brigades (Generalitat Valenciana, 2024). This event exemplifies that wildfires do not heed administrative boundaries nor the traditional temporality of the fire season in the Mediterranean, and that substantial economic costs arise from extreme wildfires.

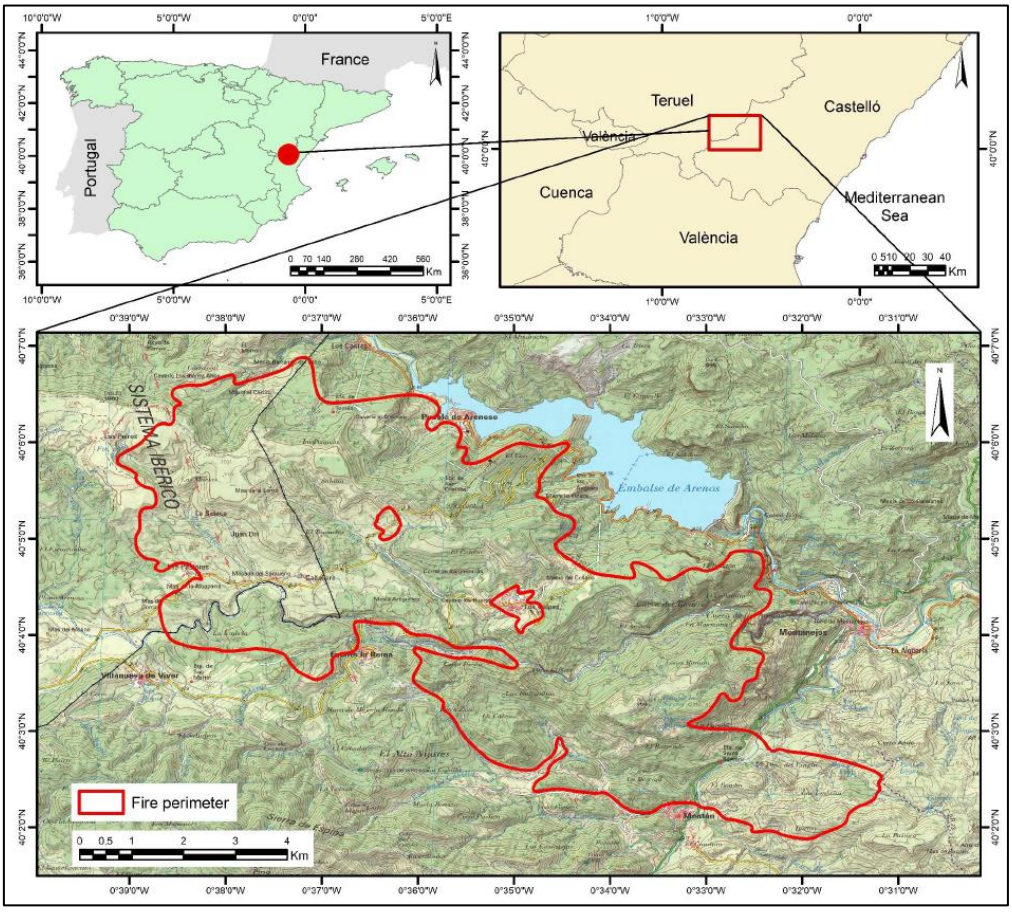

Figure 2. Location of the Villanueva de Viver 2023 wildfire perimeter between Teruel (Aragón) and Castellón (Valencian Region) provinces. The red line indicates the definitive wildfire perimeter according to the Copernicus Emergency Management Service.

Source: Authors' elaboration

The Vall d'Ebo wildfire is yet another example of recent extreme wildfires in the Valencian Region. This wildfire happened in August 2022, during an episode of simultaneity whereby extreme weather conditions of lightning, drought and heat caused the ignition of multiple wildfires and their uncontrollable propagation throughout the region (Alloza et al., 2022).

Figure 3. On the left, the pond of the Barranco de la Maimona in August 2021. On the right, the same spot, the 15th of April of 2023

Source: Núria Salvador

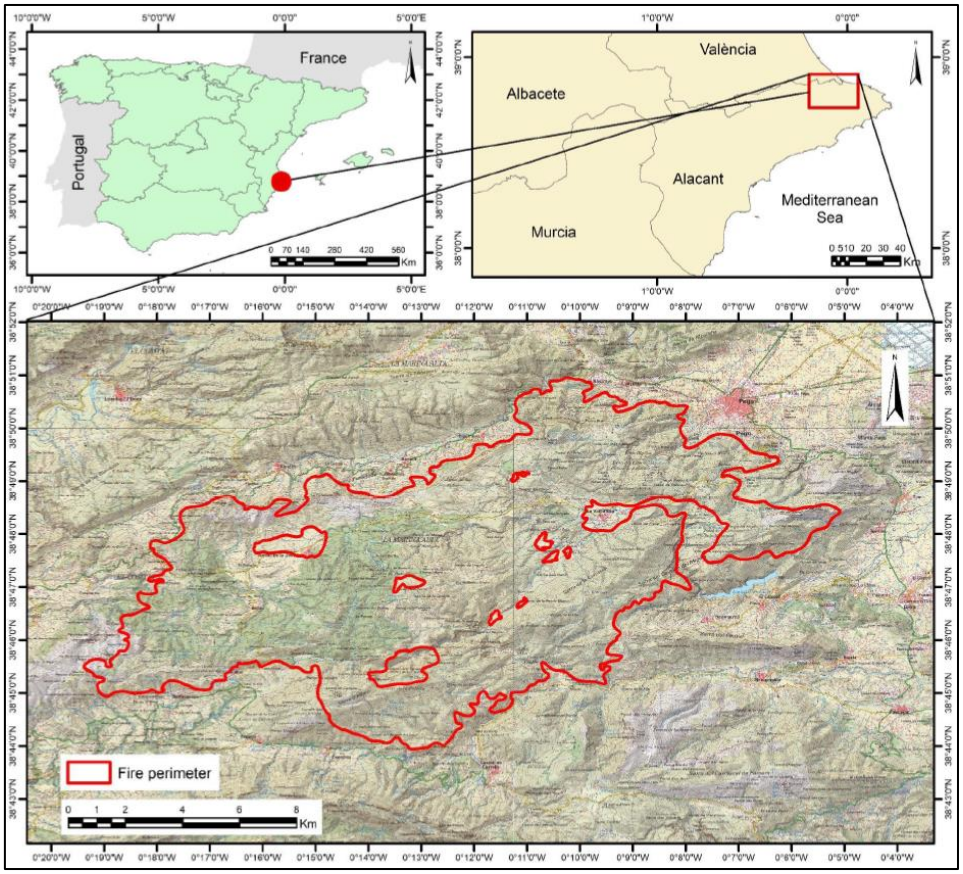

Figure 4. Location of the Vall d'Ebo 2022 wildfire perimeter. The red line indicates the definitive perimeter taken from the Copernicus Emergency Management Service

Source: Authors' elaboration

This wildfire burned for eleven days, affected 10,572 hectares and required the evacuation of over 1500 inhabitants (Figure 4). Similarly to the Villanueva de Viver wildfire, this wildfire surpassed diverse administrative boundaries, affecting fifteen municipalities across two counties. The affected region is located in a rural area with low population densities, where some villages have less than 1.000 inhabitants (IVE, 2022). Here, the abandoned agricultural terrains and deteriorated cultural and architectural heritage evidence the process of rural depopulation (Figure 5). Although wildfires are recurrent in Mediterranean Spain, the Vall d'Ebo has experienced manifold extreme wildfires in past years. Moreover, the 2022 wildfire was one of the most catastrophic fires ever registered in the Valencian Region (Cirujeda, 2023), and the ecosystems – located within a Natura 2000 site – have consequently suffered considerable damage.

Figure 5. The Vall d'Ebo wildfire affected the local ecosystems and much of the cultural heritage of dry-stone buildings.

Source: Isabeau Ottolini, 25th August 2022

Throughout this article we further analyse and discuss both cases, illustrating wildfires' multifaceted challenges in the Valencian Region and highlighting the urgent need for a New Fire Culture, especially under a climatic context that increasingly creates conditions conducive to more extreme wildfires.

Inspired by disaster researchers like Morss et al. (2021), Peek and Guikema (2021) and Subedi et al. (2021) concerning the methodological intricacy of conducting interdisciplinary research, the collaborative process that materialised into this article started with the intention to comprehensively understand why extreme wildfires and their socioenvironmental impacts are becoming so manifest, and what could be done to prevent future disasters. One of the authors personally experienced the Villanueva de Viver wildfire and was evacuated. Moreover, as an expert in depopulation dynamics and causes in rural Iberia, this author provides critical insights into the social response to, and management of, wildfires. Together with the lead author, who does their doctoral thesis on community-led wildfire initiatives and similarly experienced an extreme wildfire up close – namely in the Vall d'Ebo – an initial idea emerged to reflect jointly on the above-mentioned topics. The insights shared here, especially around rural grassroots movements, stem from three years of ethnographic fieldwork with the Pego Viu association.

Aware of the above-mentioned wildfire events, as well as the social responses to them, unfolding under a changing climate and exacerbated by technocratic approaches to managing wildfires, contributions from the additional authors have been vital. One author does their doctoral research on the response of Mediterranean ecosystems after wildfires within a global change context, specifically under altered drought regimes. The final author is a geography PhD candidate at the Action-Research Group Recartografías, and researches the transition towards New Ruralities, particularly in depopulated areas of the eastern Iberian range, thereby contributing with critical insights into the complexities of managing wildfires in the Valencian Region.

During the writing process, the authors engaged in manifold discussions for an in-depth exploration of the core topics. These discussions consisted of an open exchange of ideas, allowing joint reflection on our scientific backgrounds and lived experiences around wildfires, their management, and grassroots movements. Iteratively, the discussions allowed for refining and enriching the present article. Resulting of this synergistic collaboration, the diverse perspectives and reflections presented here go beyond individual contributions to offer an interdisciplinary, unified narrative that advocates for a paradigm shift in the ways we understand and relate to fire.

Shifting human-fire relationships: from co-evolution to domination

The co-evolution between Humankind and Fire

The relationship between fire and humankind has evolved from their initial co-evolution to humankind's current dominance over fire. Considering this ongoing changing relationship is essential, firstly, to understand the increasingly adverse impacts of wildfires and, secondly, to re-establish more balanced and reciprocal relationships with fire and nature.

Fire, as a natural element, appeared on Earth shortly after the first terrestrial plants evolved (ca. 400 million years). About 2 million years ago, the genus *Homo* learned to control and use anthropogenic fire, by Seijo and Gray as: "*patterns of wildland fire shaped by the dynamic interactions of vegetation [fuels] and human populations [ignitions] whether voluntary or involuntary*" (2012, p. 59). This anthropogenic fire has provided, and continues to provide, humankind with all sorts of benefits and uses (Montiel, 2013b; A. Scott et al., 2016). Furthermore, fire is part of our (im)material cultural heritage and knowledge around managing and caring for the land (Cifre-Sabater, 2020; Seijo & Gray, 2012; Yelo, 2016). The major influence of anthropogenic fire on our planet has led authors like J. Scott to consider it a landscape architect: *"a deliberate disturbance ecology in which hominids create, over time, a mosaic of biodiversity and a distribution of desirable resources more to their liking*" (2017, p. 38). In this sense, humans can be considered a fire-adapted species, with our habits, diets and bodies shaped by the use of fire, and, considering this dependence, authors like J. Scott suggest that fire has, in fact, domesticated us.

Such reflections invite rethinking our current relationship with fire, not from a position of dominance but from one of deeply entwined reciprocity. Particularly in Mediterranean socio-ecosystems, fire is at the centre of many interlinkages between the cultural landscapes, the climate, the biodiversity, and ancient practices around the use of, and care for, the environment. All of this is well reflected in the history of fire in Spain, as presented next.

Anthropogenic fire in the Spanish context

For millennia, Spanish agropastoral communities have used controlled burning for land management, based on a deep knowledge of the socio-ecosystem and the need to ensure an

ecological balance to sustain their livelihoods (Huffman, 2013; Montiel, 2013b; Yelo, 2016). Although fire's presence in the landscape was frequent, wildfires (understanding these as uncontrolled fires) rarely caused severe damage, both because of the reduced fuel load and the existing social organisation enabling quick suppression (Montiel, 2013a; Seijo & Gray, 2012). This pre-industrial anthropogenic fire regime helped to create highly biodiverse landscapes that differ greatly from continuous and homogeneous forests that Western society now associates with 'wild' nature (Castellnou et al., 2007; Seijo & Gray, 2012).

From the 19th century onwards, tensions around fire increased in Spain: arson increased for multiple socio-political reasons, and the social imaginary of the 'incendiario' (or arsonist) appeared, intertwined with the narratives of rural Spanish society being underdeveloped and backwards (Araque, 2013; Montiel, 2013b). Also, the perceptions around fire shifted from considering it a valuable tool to seeing it as 'destructive', informed mainly by forestry productivity aims (González-Hidalgo et al., 2014). Then, from the mid-twentieth century onwards, both industrialisation and modernisation drove the disappearance of many economies that relied on fire as a tool and replaced them with economies reliant on fossil fuels (Huffman, 2013; Moreno et al., 2023; Seijo & Gray, 2012). Consequently, anthropogenic wildfire regimes shifted significantly, intensifying and increasing their spatial and temporal extent (Montiel, 2013b; Seijo & Gray, 2012).

These transformations were accompanied by modernisation processes 'from above' imposed by the authoritarian regime in Spain between 1939 and 1975. This led to conflicts between state forestry agencies and local communities over fire use and land ownership and the migration of rural populations to be *"incorporated into the new urban labor force thus manning the emerging industries"* (González-Hidalgo, 2023; Seijo, 2009; Seijo & Gray, 2012, p. 61). Additionally, informed by Nazi Germany's forest propaganda model and later by USA foresters in the 1950s (Seijo, 2009), different fire exclusion and institutionalisation policies arose. Simultaneously, communal-based land management was further undermined as regional or national entities took over territorial competencies (Yelo, 2016). On top of this, using technologies has promoted an illusion of power over nature, replacing natural agents of change, such as fire and large herbivores, with human technology to suppress fires and manage vegetation (Castellnou et al., 2007). The consequences of these profound transformations include the disappearance of subsistence economies and the creation of fossil fuel-dependant food systems; the loss of knowledges related to land management; and the emergence of homogeneous landscapes, all of which are linked to a rise in uncontrollable wildfires (Castellnou et al., 2007; Montiel, 2013b; Seijo & Gray, 2012). Both the shifts in landscapes and worldviews that drove such transformations underpin present-day changes in our fire culture (Iglesia, 2023). This process's legacy remains present today throughout the social imaginary and public awareness campaigns of 'bad' fire and the fire suppression model in Spain (Santín et al., 2023).

Spain's fire context reflects broader global trends. In combination with the already-present impacts of climate change, several authors propose calling this geological epoch the 'Pyrocene', characterised by increased planetary flammability (Gough et al., 2021), whereby the *"escalation of our firepower through industrial combustion underwrites the Anthropocene"* (Pyne, 2017, p. 1). Beyond fire and its uncontrolled burning – whether in the form of fossil fuels or biomass – characterising this epoch, there is also the deep and growing fracture between humankind and nature (including fire) and amongst humankind ourselves (such as between rural and urban environments). In this sense, the transformations of our fire culture can only be understood fully within the context of broader socio-political dynamics and the historical-geographical processes specific to each time and place, which have mediated and modified our relationships with nature. Next, we will delve into how some of those factors influence wildfire regimes in Mediterranean Spain.

Mediterranean wildfires under the current context: a multifactorial approach

Since the first advances in climate-change science more than 150 years ago (van der Veen, 2000), humans have unequivocally increased the global temperature by 1.3°C at an unprecedented rate (IPCC, 2023). This global warming is reflected in a changing climate, a process that not only has widespread impacts, ranging from negatively affecting health and economies to gender inequalities and migration (Carleton & Hsiang, 2016; S. Díaz et al., 2019), but also intensifies, among others, heat and drought events that consequently influence wildfires (Benetó & Khodayar, 2023; Vicente-Serrano et al., 2014).

Droughts are intrinsic to the Mediterranean climate, but climate change increases their frequency and/or intensity (Vicente-Serrano et al., 2014). New drought regimes can simultaneously overlap with heat events (which, in turn, can further intensify rainfall deficits; García-García et al., 2023), generating compound events such as hotter droughts (Gampe et al., 2021). For instance, the most significant number of hectares burned in Spain since 1994 – the year with the most catastrophic wildfires – was in 2022. That year we witnessed the warmest and driest May-August period since meteorological records began in 1961 (AEMET, 2022). One of these wildfires affected the Vall d'Ebo area, which experienced an extreme climatic year in 2022 with extremely dry and wet periods according to the SPEI drought-severity index (in August and March, respectively; Vicente-Serrano et al., 2010).

Climate change also modifies the regimes of disturbances such as wildfires, rainfall, or droughts by moving them out of their seasonality. This might be what happened during the spring of 2023 in the Valencian region when the driest March-April period since at least 1950 was recorded (AEMET, 2023). This period coincided with the Villanueva de Viver wildfire, making it the biggest wildfire ever recorded in March in the Valencian Region (Generalitat Valenciana, 2023; Figure 6). Then, in November 2023 another extreme fire burned 2,077 hectares in Montitxelvo, influenced by the driest autumn ever recorded (whilst this is the statistically wettest season there). In Figure 6, shaded lines show the maximum wildfire size for each month in 1968-2021 and the 95th percentile for the same period. Green and blue points show the largest wildfire in each month of 2022 and 2023, respectively. Wildfire size, in hectares, is shown on a logarithmic scale.

Both the increased intensity and likelihood of extreme events, whether occurring in isolation or concurrently, are globally lengthening the wildfire risk season (Jain et al., 2022). This has been observed regionally (Moreno et al., 2023) and seems to also be the case in the Valencian region. The data shows that, since 1968, three out of the five largest wildfires in the low-risk wildfire season (November - March) have happened in the last 20 years (specifically, two of them in 2023, Figure 7). Moreover, while only 10% of years since 1968 were rated as 'extremely dry', 54% of these large wildfires (of over 500 hectares) happened during these severely dry years, indicating the influence of drought conditions on wildfires. This data shows that socio-ecosystems are transitioning towards an uncharted fire-regime. Thus, significant socio-environmental impacts are more likely due to new climatic conditions during, before and after the fire (Salesa et al., 2022; Stevens-Rumann et al., 2018).

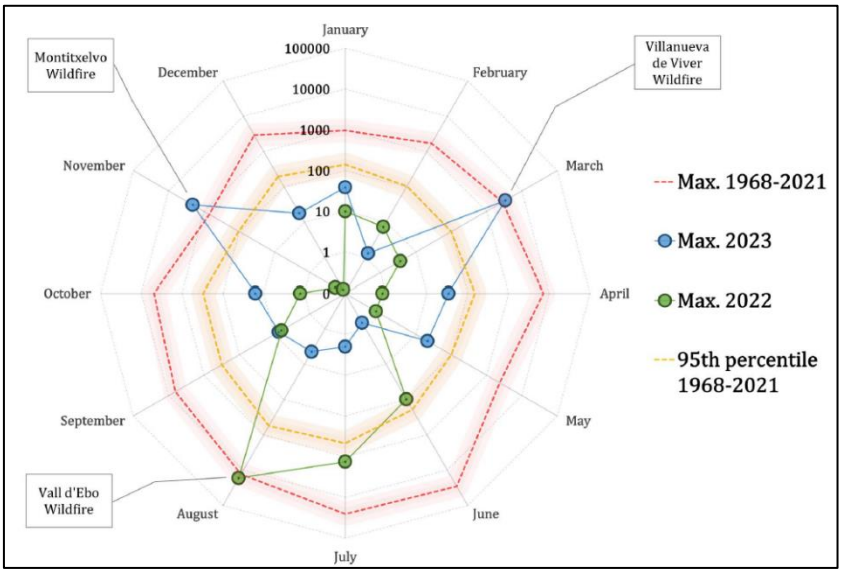

Figure 6. Radial plot showing different wildfire metrics in the Valencian region sorted by months.

Source: Authors' elaboration

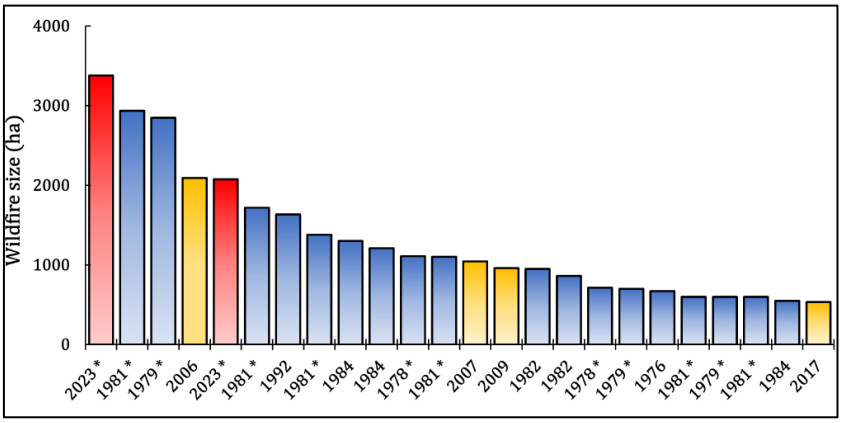

Figure 7. Barplot showing the extreme wildfires (>500 ha) burning during the low-risk wildfire season (November till March) in the Valencian region between 1968-2023.

Note: We differentiate between wildfires occurring during the last 20 years (yellow) and those that occurred in the last year of data (red). Additionally, asterisks (*) indicate those years rated as 'Extremely dry' (namely, a >33% rain deficit compared to the reference period of 1991-2020).

Source: Authors' elaboration

Nonetheless, the relationship between drought conditions and wildfire impacts is not necessarily direct but is mediated by many other socioenvironmental factors. Specifically, a wildfire needs the alignment of four factors: 1) the presence of biomass, 2) its availability (i.e., it needs to be dry enough), 3) weather conditions that allow fire propagation, and

4) the presence of an ignition source (Bradstock, 2010). Starting with the last factor, ignition, statistics reveal that human negligence is Spain's leading cause of wildfires (MITERD, 2023a). While this problem should be addressed, it would be a mistake to focus exclusively on anthropogenic causes, given the complex matrix that encompasses wildfires. In fact, in 2022, lightning-caused wildfires burned over 50,000 hectares in Zamora (north-west Spain). Similarly, around 97% of the 30,000 hectares burned that same year in the Valencian Region were also due to lightning-originated wildfires. As such, it has been suggested that lightning might become a more frequent ignition source in the Mediterranean basin in the coming years, yet again influenced by a changing climate (Pérez-Invernón et al., 2023).

On the other hand, weather conditions associated with extreme temperature and wind events facilitate the fire's spread, constituting Bradstock's third factor. Specifically, higher temperatures lead to lower moisture of the air, biomass, necromass and soils, as well as a higher proportion of available (dry) biomass because of the vegetation's increased vulnerability to drought (Carnicer et al., 2011; Peñuelas et al., 2017). Together with shifts in the intensity of different weather variables, such as drier winds, this facilitates the spread of fire (Aparício et al., 2022). Weather conditions that underpin fire propagation are also closely linked to the second factor: fuel availability. Particularly, fuel moisture facilitates or hinders a fire's development, meaning that, generally, less energy is needed for vegetation to burn when it is less moist (Resco de Dios, 2020). Europe's air has the largest drying potential in centuries (Treydte et al., 2024), and the hotter the air mass, the more water vapour it can hold. Thisc reates a larger gradient between plants and air and, therefore contributes to a bigger force of the air to absorb moisture from plants. This trend towards drier air has also been seen in Spain, especially during summer (Noguera et al., 2023). Recent evidence suggests that the continuous reduction in moisture will likely continue to increase fire risk (Balaguer-Romano et al., 2023). Last, the first element mentioned by Bradstock is the biomass load. This determines the energy released by fire and, therefore, largely influences the fire suppression capacity (which has been suggested to be around 10,000 kw/m; Tedim et al., 2018). The amount of biomass has increased due to land abandonment and shifting energy sources and raw materials towards fossil fuels (Gallardo et al., 2023). Additionally, the high effectiveness in suppressing small fires has increased the biomass load, leading to the 'wildland firefighting trap', which is further reinforced by short-sightedness and overly focus on the physical aspects of fire (such as fuel quantity and properties, spread patterns, etc.; Moreira et al., 2020; Tedim et al., 2020).

Whilst many recent extreme wildfires have been associated with extreme weather conditions (e.g. Greece and Canada in 2023 or Chile in 2024), the relative importance of each factor mentioned above is context-dependent. In our case, situated in the Valencian region, socioeconomic aspects play a key role in the emerging fire-regime (Chergui et al., 2018). According to the National Forest Inventory, in Spain, between the 1970s and 2010, the forest area increased by more than 64% due to the abandonment of agriculture and forestry activities (MITERD, 2023b). This has caused a substantial loss of the characteristic Mediterranean mosaic landscapes, composed of different land uses and habitats, such as cropland and pastures, wooded riverbanks, forests at different maturity stages, and shrublands (Blondel, 2006). Whilst biomass-load reduction seems to be the fastest and most effective way to reduce the significant impacts of wildfires, the influence of new climatic and territorial contexts may dilute its effectiveness as a management strategy (Clarke et al., 2022; Jain et al., 2022; McWethy et al., 2019). The present amount of forested area makes forest management challenging, especially if additional management measures with a broader territorial focus are not considered (Moreira et al., 2020).

Ways forward in decreasing wildfire disasters are, for instance, recovering the small-scale primary sector (what some authors call 'back to the future'; Bergmeier et al., 2021) and society's involvement in managementing and caring for the territory (McWethy et al., 2019). However, this is far from easy. As to the first, in addition to the primary sector's decline – particularly of small-scale, extensive agrosilvopastoral models– an agricultural intensification is also taking place. These two interlinked processes play out at different scales. On a global scale, it is suggested that the spontaneous increase of biomass (a process known as regreening) in Mediterranean areas occurs at the cost of resource extraction from tropical rainforests (S. Díaz et al., 2019; Martínez-Valderrama et al., 2021). At the Spanish level, the surface area dedicated to agriculture grows solely due to the expansion of macro-industries, and in areas like the Maestrazgo, they account for more than 80% of the total cultivated area (Ordaz et al., 2022).

Silver bullet solutions are a panacea considering the intertwinement of wildfire with countless other socioenvironmental issues. Solutions need to be adapted to local particularities, not only to build territories resilient to extreme wildfires but also to other socio-environmental problems (known as transformative resilience; McWethy et al., 2019). Hence, we argue that local actions arising from the territory – which allow leveraging synergies derived from dealing with other environmental concerns – are fundamental to adapting to changing wildfire regimes and decreasing disaster (McWethy et al., 2019; Pörtner et al., 2023). Nevertheless, this also implies a different perspective on wildfires and their management.

The social response to wildfires: rural grassroots movements

Having shown how fire is a key element to humankind's very evolution and how we currently face a climatic context with increasingly extreme wildfires, as is the case of the Valencian region, we now turn to the analysis of two of the region's largest wildfires in recent years; the Villanueva de Viver (2023) and Vall d'Ebo (2022) wildfires. Specifically, we aim to illustrate the related – yet unique – social responses to such wildfire events and technocratic fire management.

The case of Villanueva de Viver

The Villanueva de Viver wildfire is a poignant example of the hegemonic paradigm of firefighting through a deeply technocratic approach. In the emergency phase, during which civil security is prioritised, this implies militarising the affected territory for practical purposes. This occurred for 15 days in Villanueva de Viver with the installation of an incident command post (PMA), not only for the intervention of the Military Emergency Unit (UME) but for the entire management of the firefighting operation. The language used during those days was riddled with war metaphors, reflecting a technical vision of fire completely separated from the historically complex relationship between humankind and fire. There was talk of 'fronts' and 'single commands' (Alba et al., 2023); roads were blocked with permanent detachments of the Guardia Civil; and 'security perimeters' were established to limit neighbours' movement. People were evacuated – sometimes forcefully – with no other function than to wait helplessly while the fire spread, affecting the lands on which their livelihoods depend. This approach meant reducing the inhabitants to passive and ignorant individuals, stripping them of their decision-making power in a context where others take control without any space for dialogue. As such, the valuable help that numerous neighbours offered as informants (as they are deeply knowledgeable about their

territory) was ignored, especially when it came to advising on how to get to the firefront, where there were safe – or dangerous – places from which to carry out extinguishing manoeuvres, etc.

This scenario of militarisation during the wildfire contrasted with the almost total institutional abandonment after the fire. Few resources were allocated to assess the wildfire impact and monitor post-fire recovery, and mechanisms and spaces were absent for dialogue with the inhabitants. Since 2015, a participatory tool has existed in the Valencian Region: the Post-Fire Consultation Tables, which aim to "encourage citizen participation after wildfires and jointly define the territory we want" (Generalitat Valenciana, 2020). However, over time, its participatory dimension has diminished. In fact, a consultation committee was set up in Villanueva de Viver, but beyond announcing environmental restoration measures, there is no news of any follow-up meeting to date. Furthermore, as this tool is used in the Valencian Region, affected municipalities in the neighbouring province, Teruel, could not participate in any debate or propose measures. This hints at just one of the many limitations stemming from managing wildfires based on administrative boundaries.

Villanueva de Viver's wildfire-affected area is one of Europe's most depopulated regions (Gallardo et al., 2023). Despite the low population density, several citizen groups mobilised in the municipality of Olba (Teruel), as well as the Platform in Defence of the Landscapes of Teruel and other associations in the region, such as Recartografías, to disseminate information on the fire situation, and organise internal debates on the wildfire's causes and how to avoid future disasters. Several (in)formal meetings were coordinated by the mayor of Villanueva de Viver between May and July 2023, with the participation of municipal technicians, academics, and Recartografías members to reflect on what actions to implement in the affected area. Currently, there are plans to demand a different approach to fire and post-fire management and, additionally, a debate about the wildfire risk is also arising, as just seven months earlier, another fire took place only 17 km away in Bejís, burning 17,206 hectares in August 2022.

The case of Vall d'Ebo

The Vall d'Ebo is an area with recurrent extreme wildfires, both in 2015 and 2022 and – in similar lines to Villanueva de Viver – also here, the wildfire and its aftermath were managed through a technocratic approach. The 2015 wildfire elicited profound emotional responses, such as grief, anger, impotence, and the intention to take action to prevent future disasters. These feelings were exacerbated by a deep sense of institutional abandonment, fuelled by poor institutional communication, which, rather than informing and reassuring people, contributed to inhabitants experiencing much uncertainty during the wildfire. While the fire was still burning, widespread citizen unrest materialised, with almost 2000 people taking to the streets to demand accountability for the neglect of rural regions, poor wildfire preventive measures, and the budget cuts impacting the efficiency of emergency services. In the months following the 2015 fire, those feelings were channelled into developing actionable proposals, and – by bringing together people with similar concerns to defend the territory – eventually crystallised into the rural grassroots movement, Pego Viu. In the years since, Pego Viu has undertaken many land stewardship, education, and environmental volunteering activities, addressing territorial challenges holistically.

However, in 2022, the Vall d'Ebo area experienced a new, even more destructive wildfire, as shared in the 'research area' section. Having experienced deficient institutional communication during the 2015 fire, Pego Viu took on an essential communicative role in 2022, both during and after the wildfire. Firstly, they disseminated crucial information to

local inhabitants on the fire's evolution, evacuation details, and offerings or calls for aid, facilitated by the extensive network of Pego Viu volunteers as informants on the ground. Once the flames died out and the wildfire's scale became evident, Pego Viu started advocating for much-needed improvements in wildfire prevention policies and forest management and, above all, more dialogue with the public administrations. While the Post-Fire Table following the 2015 wildfire allowed space for dialogue with technicians from the regional government, the 2022 fire was experienced by Pego Viu as being more unidirectional and hierarchical. Particularly, the public administration used this space to communicate a series of actions within its competency framework whilst disregarding opportunities for participation and co-designing policies with the affected population.

In response to this repeated institutional abandonment, various entities and individuals from the affected territory started a process of self-diagnosis, prompted by the question, *'Why have we experienced two extreme wildfires in only 7 years?*'. Among others, they identified manifold root causes of current fires in their territory (such as the technocratic management of both the territory and fire or territorial imbalances, mainly rural depopulation). From here on, they explored possible ways forward, imagining desirable futures and initiating a local governance framework. The continued efforts and actions from Pego Viu have led this social movement to become a regional reference for collective action around wildfires and beyond. Reflection on what prompted social mobilisation here throughout repeated cycles of wildfire disaster reveals several aspects: the high intensity and recurrence of wildfires; a rural territory with sufficient population to preserve social networks and cultivate organised civil society; and a historical legacy of social mobilisations in defence of the territory, including against unsustainable water uses, speculative urbanism and touristification (Cervera et al., 2013). The coalescence of these aspects has thus been conducive to collective action around wildfires and their many beyonds.

Reflections from both rural grassroots movements

The above narratives reflect the deep entrenchment of wildfire management in a technocratic model prevailing in the Valencian Region and throughout the entire disaster cycle, from prevention to suppression to recovery. Notably, it is carried out both from unequal positions of power (where the population is subject to the decisions of a handful of experts) and from places far away from local realities (whereby decisions made from urban environments are implemented in rural areas). In perpetuating such dynamics of marginalisation and disempowerment of communities in terms of managing fire in their territories, as well as the materialisation of recurrent disasters, this model reflects the profound disconnect between wildfire managers and policy-makers, on one hand, and the lived realities (including experiences, knowledges and needs) of those living in wildfire-prone territories on the other hand (Copes-Gerbitz et al., 2024; Otero & Nielsen, 2017; Yelo, 2016).

Figure 8 summarises the emergency action response plan in the Valencian Region, detailing the roles and actions of involved actors. When a wildfire starts, the Wildfire Emergency Centre mobilises a Basic Unit of Intervention to suppress it, and the national law enforcement agencies inform the public about the wildfire, issue evacuations, and restrain access. Depending on the level of emergency (ranging from 0 to 3), different actors and actions are activated. Level 1 is declared when the fire threatens human assets, infrastructures, or large forest areas. Basic Units of intervention, support, medical care and security are activated, and an in-situ Incident Command Post is set up. Meanwhile, the Emergency Coordination Centre – located in the capital city of Valencia – is informed about the wildfire and its evolution, and final decisions on firefighting are made from here. In worst-case scenarios (levels 2 and 3), extraordinary measures can be taken, including

military mobilisation. Both wildfires presented in this article severely endangered entire villages and large forest areas, hence reaching level 2. Another coordination centre is then created to inform the central government and call for (inter)national aid. Finally, level 3 is declared when the wildfire overwhelms wildfire suppression capacity, and extraordinary means need to be mobilised.

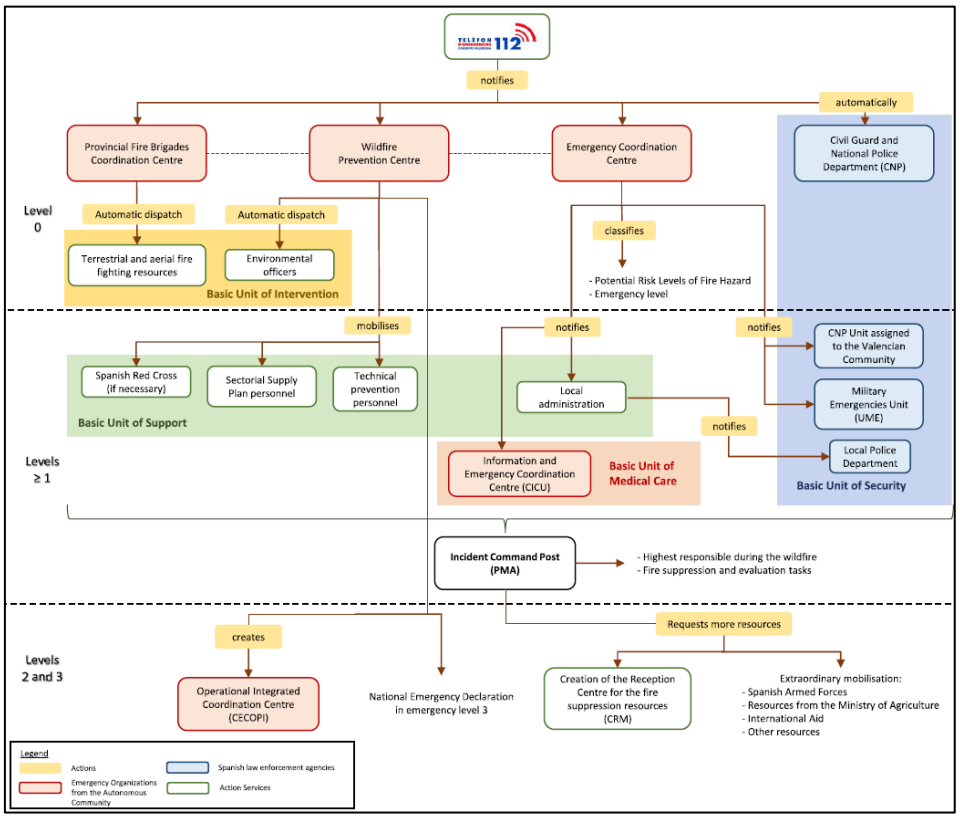

Figure 8. Diagram of the emergency action response plan in the Valencian Region.

Source: Author's elaboration, based on the "Plan Especial frente al riesgo de incendios forestales" (Generalitat Valenciana, 2021).

Overall, this diagram reflects the extremely centralised model in the Valencian region. Inevitably, this makes it strongly dependent on technologies for interagency communication, with direct consequences such as misinformation and marginalisation of the population living in the territory. As stated before, the high level of militarization of the territory unfolds from the very start of the wildfire, and consequently, contact with the local population is made from inequal positions of power, pushing key local knowledge and tools aside.

Now, rural social movements offer a glimpse of hope despite the major socioenvironmental impacts that wildfires often entail, such as in Villanueva or the Vall d'Ebo. These movements point to a proactive and resilient citizenry, diverging greatly from the social imagery of passive citizens, which predominates in technocratic viewpoints (González-Hidalgo, 2023; Tedim & Leone, 2017). Rather, these movements seek to reclaim local agency in matters directly affecting them, advocating for dialogue and collaboration with all wildfire-related actors to mitigate future wildfire disasters. Even within the

constraints of the current wildfire management system, the local inhabitants of Villanueva and Vall d'Ebo have demonstrated their agency by mobilising and organising themselves after experiencing impactful wildfires. This has led, amongst others, to creating (in)formal networks, establishing collaborations, facilitating learning, and initiating deliberation processes, all of which point towards key relational dynamics that are entirely overlooked under technocratic wildfire management approaches (Copes-Gerbitz et al., 2024; Ottolini et al., 2023). Moreover, the social responses in both cases allow for a re-examining of the wildfire issue from more locally situated and transversal perspectives, recognising the diversity of ways to address both extreme wildfires and the underlying socioenvironmental issues that drive these disasters. This recognition is essential amidst the current climate emergency and calls for co-constructing a general resilience of the entire socio-environmental system in the face of compounding future disasters, thus moving away from simplistic endeavours to enhance only specific resilience to wildfires (Rodríguez Fernández-Blanco et al., 2024).

Discussion: Towards a New Fire Culture

The above experiences in the Valencian Region reflect the entrenchment of wildfire management in technocratic approaches, as critiqued by many authors, like Gaillard (2022) and Tedim et al. (2020). Its limitations are well known, and the need for an urgent transition towards other ways of managing wildfire is becoming increasingly evident, especially as scenarios with greater negative impacts from wildfires become more prevalent (Moreira et al., 2020; Santín et al., 2023; Tedim et al., 2020). In response to the hegemonic paradigm, diverse alternatives have been proposed for years, including Integrated Fire Management (Myers, 2006; Rego et al., 2018) or Living / Coexisting with Fire (Moritz et al., 2014; Otero & Nielsen, 2017). However, informed by the lived realities of people living in wildfire-prone territories, and particularly the rural grassroots movements emerging after the fire, we propose a different paradigm altogether: A New Fire Culture (henceforth, NFC).

In line with Sayedi et al. (2024), we acknowledge the importance of experts in wildfire management but also advocate for moving away from overly managerial practices towards taking a deeply situated approach in wildfire-prone territories that is informed by local inhabitants, hence taking on more transformative processes of co-production (Uyttewaal et al. in press). Furthermore, an NFC takes on deeply sociological – even philosophical – perspectives. This includes acknowledging that fire is not merely a physical element to be managed or necessitating a new model of risk society but, first and foremost, an element deeply entwined with humankind. In this sense, an NFC is a profound revision of our current relationship with fire based on the interrelated history between fire and humanity. As such, it aligns with a much broader critique of capitalist modernity emerging from political ecology, which proposes a new culture of water (Aguilera, 2006), a new culture of territory (Colegio de Geógrafos, 2018) and other alternatives to techno-optimism and "climate feudalism" (Peirano, 2022). These critiques express the imperative need to transition from the current culture of capitalist growth based on the exploitation of bodies and nature towards a post-capitalist model of society that recovers the historical links of human beings with nature and is more resilient to compounding disasters of wildfire, climate change and more (del Romero, 2023).

In the words of Cidrás and González, the "relationship between human beings and nature is mediated materially by the figure of fire" (2023, pp. 999). Hence, when seeking

to (re)build more reciprocal relationships with our fiery kin, we propose starting with the following principles for a New Fire Culture:

1. *Acknowledging fire as part of the socioenvironmental system*. This implies moving beyond predominantly framing fire solely as a problem to be solved through managerial and technocratic approaches. Fire, whether in the form of uncontrollable wildfires or deliberately used by humans, embodies manifold, ambiguous and contradictory meanings, thereby underscoring the inseparability of society and nature. Rather than adopting reductionist perspectives that inform short-term measures limited to administrative boundaries, we urge fully embracing complexity and uncertainty. One way of doing so is to recognise that fire is, like water, an ecosocial asset with many social, economic, and environmental values (Benarroch et al., 2021). These range from fire's role in soil fertility and the life cycles of more-than-human beings to its deep entanglement with livelihoods worldwide and holding deep cultural and spiritual meanings.
2. *Strengthening transdisciplinary collaborations and polycentric governance*. In the current technocratic paradigm, the voices of wildfire experts predominantly inform how society relates to, and lives with, fire. An NFC calls for addressing structural power imbalances in wildfire management by embracing diverse ways of knowing (including experiential and situated knowledges) and enhancing the decision-making power of those living in wildfire-prone territories. To achieve this, we encourage transdisciplinary and transformative approaches to wildfire (Copes-Gerbitz et al., 2024; Uyttewaal et al., in press). This requires important changes in wildfire governance towards models of polycentric wildfire governance aimed at "bridging and integrating wildfire initiatives based on local knowledge, values, and culture" (Kirschner et al., p. 5, 2023).
3. *Moving beyond fire management towards a holistic socioenvironmental framework*. The discourse must transcend merely managerial approaches and acknowledge fire's intrinsic entanglement with the broader socioenvironmental system. As such, moving 'beyond management', refers to not only promoting "*productive functions, currently in decline, [such as] extensive grazing, forest exploitation, or the use of fire itself*" (Castellnou et al., 2007, p. 8), but also all the rich and diverse sociocultural dimensions of fire. This includes recovering the cultural heritage and uplifting knowledge around fire (Moreno et al., 2023; Seijo & Gray, 2012) and creating spaces for dialogue to make consensus-based decisions (Yelo, 2016). In addition, the notion of 'beyond fire' underscores the acknowledgement that wildfires can be slow disasters in the making, resulting from the interplay of decades of social, economic, political, and ecological dynamics (Knowles, 2020). As rural grassroots movements exemplify, specific resilience to wildfire is limited, and instead, we need a general resilience around the complex interplay of all the socioenvironmental challenges of our times.

In this sense, substantial differences exist with the afore-mentioned alternative paradigms like Integrated Fire Management or Living with Fire. For one, an NFC holds space for the many sociocultural dimensions of fire and is both rooted and emergent from the ground. Whilst Integrated Fire Management urges moving away from focusing solely on suppression to contemplate the complete disaster cycle and thereby reduce both the damages and increase the benefits stemming from fire, the social dimensions considered are primarily limited to planning and policy (Myers, 2006; Rego et al., 2018). Living with Fire additionally focuses on adapting to wildfire, which, amongst others, implies a social

acceptance of fire having an ecological role and overall increasing the socioenvironmental system's resilience towards wildfires (Moritz et al., 2014; Otero & Nielsen, 2017). However, both approaches remain largely informed by expert perspectives, which determine what, for instance, a 'Living with Wildfire' should look like. Equally, it continues to reproduce the imaginary of a largely passive and unknowledgeable society whose behaviours must be guided by experts to either accomplish an integrated management of fire or coexistence with this element.

These principles on the ground can play out in manifold ways, influenced by local particulates such as the fire regime, social capacity, and governance systems. In our case study area, it could translate to jointly (re)building more resilient mosaic landscapes and vibrant rural livelihoods. Whilst economic activities in wildfire-prone territories are diverse, from rural tourism to teleworking to renewable power plants, the Mediterranean the much-needed mosaic landscapes cannot exist without agrosilvopastoral activities. However, this would imply revising existing agricultural, forestry and rural development policies from the local to the European level, shifting away from policies that presently favour urban lifestyles and intensifying the primary sector whilst simultaneously causing the abandonment of rural territories and agrosilvopastoral activities. Achieving lively and dynamic rural territories is a must, and strategies to promote traditional activities as well as strengthen the local social fabric, must be articulated around building the above-mentioned general resilience. Herein, spaces of co-production are crucial, where diverse knowledge systems are integrated, from expert, local, traditional to experiential knowledge, embodied by manifold social actors to catalyse meaningful transformation in their socioenvironmental systems. And, when a wildfire does materialise, restoration efforts should not focus just on immediate action, such as introducing more fire-resilient species or simply not intervening at all. It should be taken as an opportunity to recover traditional agricultural and forest uses and revive ancestral and traditional knowledge about the ecosystems we inhabit, from ethnobotany to local legends and folklore to land management practices, thereby building a new ethnology of fire.

Conclusion

Recent major wildfires in large parts of the world, and specifically in the Valencian Region, evidence unprecedented wildfire scenarios triggered by the complex interplay of socioenvironmental factors like anthropogenic climate change, increasingly depopulated and destructured rural territories, and the disconnection between humankind and nature. Despite calls for changing how we understand and relate to fire, in practice, a technocratic vision of wildfire management predominates in the Valencian Region, as exemplified by both cases. This approach reinforces framing fire as a problem to be solved by experts whilst reducing the inhabitants to passive and ignorant individuals. As evidenced by this article's case studies, this scenario materialises both in the disempowerment of rural communities in managing wildfires and the territory and the occurrence of highly devastating wildfires, which are increasingly characterised by their uncontrollability despite the intensive and costly deployment of wildfire suppression resources. Repeated wildfire disasters in the Valencian Region have sparked social reactions in the form of rural grassroots movements, as locally situated entities that criticise technocratic approaches. Particularly, the examples of Villanueva de Viver and Vall d'Ebo offer a glimpse of hope under unprecedented scenarios of global and climatic change in the shape of a proactive and resilient rural citizenry that seeks to reclaim local agency through dialogue,

negotiation, and participation, advocates for more situated and transversal perspectives to fire, and aims to build general resilience of the places they care for.

As shown throughout the article, the new wildfire and socioenvironmental context calls for novel approaches. Namely, a profound critical reflection on how we have reached this point and, more importantly, imagining more hopeful, socioenvironmental just futures. Informed by the examples analysed in this article around rural grassroots movements and situated within a broader critique of capitalist growth based on the exploitation of bodies and nature, we advocate for the transformative paradigm of a New Fire Culture to redefine humanity's relationship with fire. Such a paradigm shift is more necessary than ever to (re)build more reciprocal relationships with our fiery kin, as well as amongst ourselves. Therefore, this article presents an initial set of guiding principles that we hope serve as reflection and inspiration. Namely, a NFC entails acknowledging fire as part of the socioenvironmental system; strengthening transdisciplinary collaborations and polycentric governance; and moving beyond fire management towards a holistic socioenvironmental framework.

This article's reflections and principles represent the first steps towards building an NFC. Still, we acknowledge the challenges associated with its practical implementation and recognize several limitations to the present research. A European Mediterranean setting informs the proposed paradigm, and how an NFC could play out in other socioenvironmental systems remains to be seen. Whilst the proposed principles have been informed by grassroots rural movements in the Valencian Region, many more inspiring examples from wildfire-prone territories exist and can further complement the NFC principles presented here. Moreover, whilst an NFC offers a transformative paradigm around fire, further empirical and situated research is required on how to carry it out in practice and identifying obstacles. Lastly, we acknowledge that our proposal of an NFC overlaps with existing practice and research on related endeavours, such as transformative and decolonising processes around wildfire management, thus requiring further dialogue and collaboration to foster synergies and avoid redundancy.

As such, the next steps require further theoretical development of the NFC principles and applying these in practice, thus opening up avenues for future research. By no means are the principles we propose set in stone. Rather, in acknowledging the context-specificity of the manifold elements informing an NFC, its principles have to be adapted to each unique socio-environmental system and informed by the rich diversity of perspectives and knowledges of the people inhabiting these places. Therefore, we encourage academics, practitioners, and, most importantly, anyone living alongside fire to engage in transdisciplinary and transformative processes to jointly explore and build a New Fire Culture in their socioenvironmental systems.

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