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Governance and management of forest fire prevention in Argentine Andean-Patagonian Forest

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Abstract

Purpose – This paper aims to examine why subnational governments respond differently to forest fire risk, despite facing similar environmental threats. Focusing on the Argentine provinces of Chubut and Tierra del Fuego, it explores how variations in political decision-making and the formation of state–society coalitions influence the design and implementation of disaster risk governance strategies.

Design/methodology/approach – The paper adopts a qualitative comparative case study approach, combining 41 semi-structured interviews with content analysis of public documents and funding databases. The analysis is guided by a governance-based framework that emphasizes how institutional visions and state–society coalitions shape variation in subnational disaster risk responses.

Findings – The study finds that Tierra del Fuego implemented a more integrated and prevention-oriented strategy through alliances with socio-environmental organizations, despite limited bureaucratic capacity. This approach reflects a more holistic vision of forest management, with greater potential to reduce fire risk. In contrast, Chubut relied on a reactive, suppression-focused model, prioritizing productive land use and showing limited engagement with conservation actors.

Originality/value – This paper contributes to the disaster risk governance literature by showing how variation in subnational responses to forest fire risk is shaped by policy vision and state–society coalitions, rather than solely by administrative capacity. The findings underscore the practical value of fostering collaborative, prevention-oriented strategies in resource-constrained settings. These insights are particularly relevant for policymakers seeking to design more effective, inclusive and sustainable risk-reduction frameworks. Socially, the study highlights how integrated approaches to forest management can reduce community vulnerability, strengthen environmental stewardship and promote participatory governance in territories exposed to climate risks.

Keywords Argentina, Policy implementation, Disaster risk governance, State–society relations, Forest fire management, Subnational policy

Paper type Research article

Introduction

In Latin America, climate change has exacerbated a range of extreme weather events, posing significant challenges to societies and states. These include prolonged droughts, extreme heat waves, severe storms, wildfires and floods (Aizaga *et al.*, 2025). In Argentina, forest fires became the leading cause of forest loss in 2021 for the first time this century, surpassing the expansion of agricultural frontiers (Ministerio de Ambiente de Argentina, 2023). Over the past 15 years, one of the most forest regions affected by forest fires is the Andean-Patagonian Forest, situated in southwestern Argentina and extending into Chile (see Figure 1). This ecosystem spans the provinces of Neuquén, Río Negro, Chubut, Santa Cruz and Tierra del Fuego, from north to south, where climate change has exacerbated droughts, extreme heat waves, storms and strong winds (Simon *et al.*, 2024). It has, in turn, intensified the frequency and severity of forest fires, increasing the risk of climate-related disasters with severe material, economic and human consequences across the region (Greenpeace, 2025).

To address this climate challenge, Argentina has adopted relevant environmental policies designed to regulate activities in forested areas. Key regulations include the National Native Forest Law (No. 26,331), enacted in 2007 and the National Fire Management Law, passed in 2013 (No. 26,815) and revised in 2020 (No. 27,604) by the National Congress. The National Native Forest Law mandates provinces to classify their forests into three conservation

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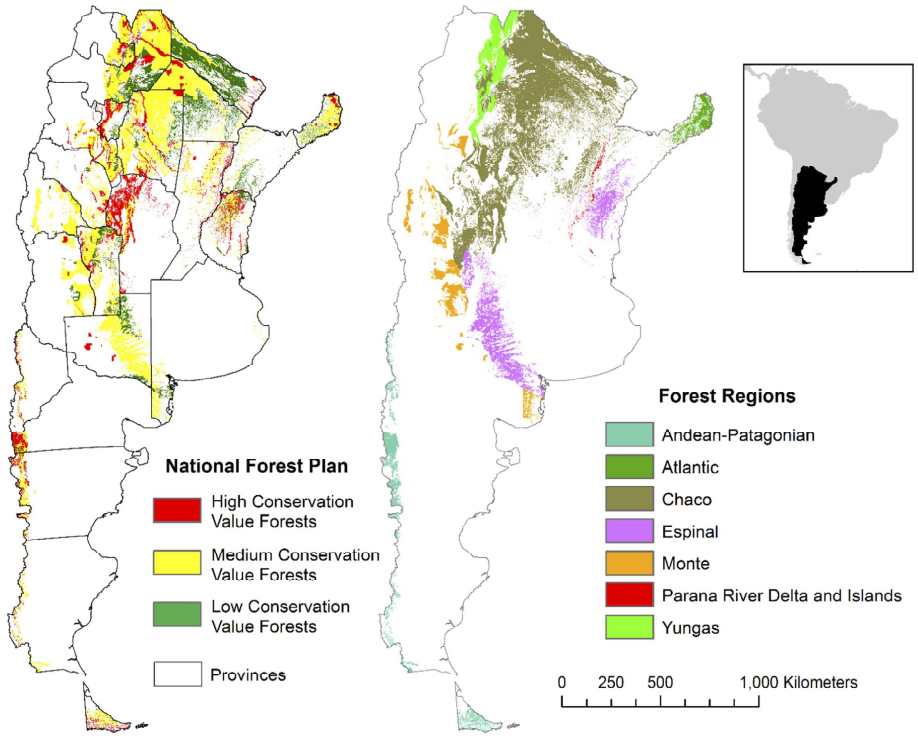

Figure 1. Forest regions in Argentina. **Source**: Martinuzzi *et al.* (2021)

categories: red (for areas with high conservation value, where only activities such as ecotourism or scientific research are permitted); yellow (for areas with medium conservation value, where sustainable use is allowed) and green (for areas with low conservation value, where land-use changes may be authorized by provincial authorities). Furthermore, the law established a national fund, allocated annually, to support conservation initiatives and the sustainable use of forest resources (Figueroa, 2025). The National Fire Management Law comprises three key components: the establishment of a federal commission composed of national and provincial actors responsible for designing coordinated multi-level strategies for forest fire prevention, mitigation and response; the prohibition of land-use changes in areas affected by wildfires and the creation of a national fund to enhance national firefighting capacities. Despite national regulations, with the aim of studying forest fire responses, it is necessary to analyze provincial levels because they have the constitutional competence to regulate the use of natural resources (Article 124, Argentinian National Constitution).

Two provinces are paradigmatic cases in terms of the state response to forest fires: Chubut and Tierra del Fuego. In both, fire season extends from September to April, increasing risk during this period. While they share this characteristic, forest fires are a recurrent phenomenon in Chubut. In contrast, after major forest fires between 2007 and 2012 that burned approximately 3,000 hectares, Tierra del Fuego has not experienced an event of comparable magnitude. Chubut lost around 3,500 hectares due to forest fires between 2008 and 2012. However, in 2015 and 2016, the province suffered an additional loss of 28,000 hectares, followed by another 7,000 hectares in 2021. In addition, in both, some fires occur in the rural–urban interface, increasing disaster risk impacts (see Figure 2).

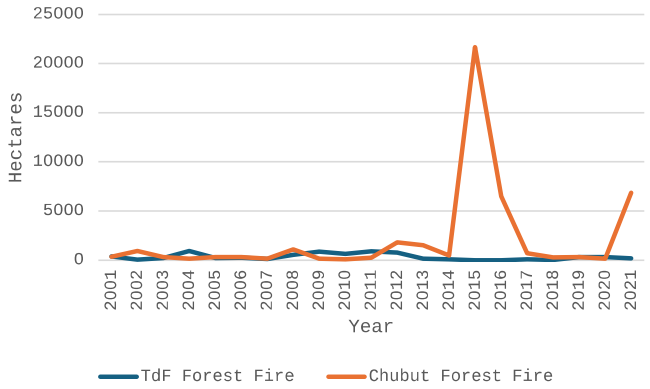

Figure 2. Evolution of forest loss due to forest fire in hectares in Chubut and Tierra del Fuego from 2007 to 2021. **Source**: Own elaboration based on data from Global Forest Watch

Beyond the absence of large-scale fires since 2012, Visible Infrared Imaging Radiometer Suite (VIIRS) satellite records reveal a marked contrast between the two provinces. Between January 2013 and December 2021, Tierra del Fuego registered a total of 1,095 fire alerts, compared to 8,208 in Chubut during the same period. Although Chubut faces a higher fire risk due to its geographical location, this variation raises important questions about the capacity of subnational governments to respond to this challenge. Despite the existence of national policies regulating fire management, prior research and preliminary reviews of provincial regulations (Figueroa, 2025) indicate that subnational governments adopt distinct institutional approaches to forest fire prevention and response. In this context, a key question is: What explains the variation in subnational government responses to forest fire risk reduction?

The hypothesis is that variation can be attributed to two main dimensions.

(1) The vision and decision of government officials to prioritize prevention strategies over relying solely on fire suppression efforts and

(2) The formation of coalitions among state and civil society actors, which enhance state capacities to improve forest fire response.

Regarding the first dimension, there are two main approaches to reducing forest fires. The first prioritizes proactive strategies that focus on prevention, preparedness and recovery measures, such as reducing available fuel and implementing social initiatives to raise public awareness of fire risks (Tezcan and Eren, 2025). The second dimension is more reactive due to focus on early response and fire suppression (Kreider *et al.*, 2024). This paper argues the decision to emphasize prevention is influenced by the visions of policymakers responsible for regulatory design. Allocating resources to prevention, rather than focusing solely on fire suppression, can help reduce disaster risk exposure. In contrast, relying exclusively on suppression efforts carries the risk that, if early response measures fail, fires may spread rapidly (Kreider *et al.*, 2024). The second dimension relates to the ability to implement established institutions effectively. This requires state actors to build connections and foster synergies with civil society organizations that share similar visions and objectives. Such alliances strengthen institutional capacities and enhance the effectiveness of regulatory enforcement. These alliances are important in a context of limited state capacities, which is common in disaster risk and environmental areas within Latin American states (Alcañiz and Gutiérrez, 2022). Briefly, the agency of state actors (their visions and strategies) is crucial in this argument.

Both the research question and the hypothesis presented are significant to Latin American countries. Since disaster risk management agendas are largely shaped by international

organizations, the disaster risk literature has predominantly focused on national governments, often overlooking the role of subnational jurisdictions (International Science Council, 2023). This study centers on the actions taken by provincial actors in Argentina, who are responsible for designing and implementing policies to reduce forest fire risk. At the same time, subnational governments must coordinate actions with national officers.

Moreover, comparing two provinces with similar characteristics in terms of land change caused by forest fire but divergent policy responses allows for identifying the causes behind this variation in state decision-making. This study focuses on human variables, examining the actions taken by both state and non-state actors to mitigate forest fire risk in the context of growing structural vulnerability. Investigating these variables – an aspect largely underexplored in the climate disaster risk literature – contributes to the design and implementation of more effective policy approaches (Thompson, 2019). Thus, the main contribution of this paper is to explore the conditions that shape the actions of key stakeholders and the role of public policies in mitigating forest fire risk. Rather than establishing a direct causal link between public policies and fire impacts, the aim is to understand what enables more integrated approaches to fire management, which can potentially contribute to risk reduction in federal countries in Latin America.

Following this introduction, the article is organized as follows. First, the theoretical and conceptual framework section examines three main approaches to disaster risk reduction (DRR): state-centered, community-based and governance-based frameworks, highlighting their contributions and limitations in explaining variation in subnational responses to forest fire risk. Second, the methodology and case selection section detail the qualitative comparative approach used to analyze the cases of Chubut and Tierra del Fuego. Third, the results section presents empirical findings on how these provinces have implemented forest fire risk-reduction policies, while the discussion section interprets these findings considering the proposed framework. Finally, the conclusion summarizes key insights and discusses their broader implications for subnational environmental governance and disaster risk management.

Theoretical and conceptual framework

The growing socio-environmental impacts of climate change underscore the necessity of designing and implementing more effective climate adaptation policies aimed at strengthening DRR. A review of the three key approaches (state-centered, community-based and governance-based) is necessary because each highlights different ways in which actors define problems, mobilize resources and propose responses to reduce disaster risk. Taken individually, none of them fully accounts for the dynamics examined in this study. Comparing these perspectives clarifies what each one overlooks and justifies the need for an analytical framework that examines how state and societal actors' visions, interests and responsibilities shape the design and implementation of risk-reduction policies.

State-centered approaches suggest that variations in state responses depend on the development of formal institutions and the actions of government actors. Resco de Dios *et al.* (2025) show that many states have applied conservation policies to reduce biodiversity loss; however, inadequate management of conservation lands has led to increased forest fire risks. Similarly, Minnich and Chou (1997), in their study of the Mexico–United States border, highlight that preventive policies implemented during low-fire seasons improve preparedness and reduce fire severity.

Beyond institutional design, some researchers identify the lack of cooperation between different levels of government as a key factor contributing to increased risk (Filho *et al.*, 2018; Nhamo and Agyepong, 2019). In a process of passing the buck, Nhamo and Agyepong (2019) show that national and subnational officials in South Africa frequently shift responsibility and avoid accountability, resulting in government inaction or inadequate responses. These studies

emphasize the importance of multi-level governance frameworks where state officials across different government levels develop coordinated actions to address strategies for DRR.

Another group of research has underscored the significance of bureaucratic administrative resources in the implementation of disaster risk and environmental policies (Alcañiz and Gutierrez, 2020). It argues that when state agencies possess adequate human, technical and financial resources, they are more likely to achieve successful policy implementation. Conversely, resource-constrained bureaucracies lack the institutional capacity required to carry out these functions effectively. Despite the valuable insights provided by the literature on bureaucratic capacity, most of these studies tend to confine their analyses to internal state dynamics, overlooking the influence of non-state actors who frequently seek to promote or obstruct the implementation of disaster-related policies. Moreover, such actors may also emerge as strategic partners in enhancing the capabilities of public bureaucracies, as the following sections show. This consideration is particularly important in the context of Latin America, where institutional weakness constitutes a persistent structural feature of governance (Brinks *et al.*, 2019).

This study shares that regulatory approaches and cooperation among state actors are crucial, but not sufficient, to explain variations in state responses to DRR for two reasons. First, this approach underdetermines the role and knowledge of social actors who have developed valuable strategies to improve risk management. Considering civil society is the most affected by disasters, it is essential to consider their knowledge, strategies, interests and visions to design more effective policies (Fernandez, 2021). Second, these actors not only provide innovative ideas for reducing disaster risk but also serve as key allies to improve state capacities in the implementation of these strategies (Shi, 2012).

A second approach emphasizes the role of community knowledge. Community-based approaches argue that local communities possess situated knowledge, enabling them to assess hazards more accurately and develop more effective responses. In that sense, local communities have the ability to identify and understand the risks in their specific environment (Hardoy *et al.*, 2011; Mwalwimba *et al.*, 2024). This paper recognizes the relevance of local knowledge; however, it identifies that it is insufficient to explain state response variations in DRR. While valuable, this approach often remains limited to successful local experiences and presents challenges when it comes to scaling up or integrating responses at broader territorial or institutional levels.

Lastly, there are studies that focus on the potential of governance frameworks. In brief, this approach highlights the relevance of state–society cooperation to DRR (Chabay, 2018; Schweizer and Renn, 2019; Thompson, 2019). The Sendai Framework, developed under the United Nations in 2015 (UNDRR, 2015), has been a significant reference point by promoting cooperation among different actors, including non-state actors. Such cooperation creates opportunities to reduce conflicts and integrate diverse knowledge into state decision-making processes. However, this approach faces at least two key limitations. First, it tends to overlook tensions and conflicts that often arise among actors involved in disaster risk policy areas. Like any public policy, disaster risk management is expected not to be neutral, because its designers and implementers could have specific visions and interests regarding what constitutes *risk* and how it must be addressed. These differences between interests and visions can lead to tensions or conflicts that undermine the governance system (Alcañiz and Gutiérrez, 2022; Jerez-Ramírez and Ramos-Torres, 2022). Building on Agrawal's notion of *environmentality* (2005), it is possible to understand how state–society alliances can help align policy visions around prevention, generating shared understandings that legitimize and reinforce fire management practices oriented toward environmental protection. Second, this approach emphasizes specific local experiences while neglecting broader-scale considerations. This is relevant because the ecosystems and disaster risk do not follow administrative boundaries (national or subnational). For this reason, it is essential to examine decision-making processes and multi-level actor negotiations.

Variations in state responses cannot be fully understood through the lens of state actions or community knowledge. Instead, it is crucial to analyze how state and social actors interact in

the design and implementation of disaster risk management policies. This is because the negotiations, which can be potentially conflicted, may lead to different policy strategies depending on which actor's vision or interest prevails. As well as being important, it is relevant to consider how strategic synergies between state and society can enhance state capacities to deliver effective DRR responses.

Methodology and case selection

This paper employs a qualitative methodology, due to its utility for capturing the course of action taken by state and non-state actors involved in the cases under analysis. Moreover, it facilitates the development of new theories (Gerring, 2007) to explore and explain variation in state responses to forest fire challenges. A comparative case study approach is applied because it allows for an in-depth analysis of how two similar provinces develop different implementation approaches and experience different effects of forest fire management policies (Gerring, 2007).

The provinces selected (Chubut and Tierra del Fuego) were chosen due to their extensive forest loss caused by forest fires, the leading driver of deforestation in the Andean-Patagonian Forest, during the period from 2007 to 2021. The period was selected because the National Native Forest Law was enacted by the National Congress in 2007, and 2021 is the most recent year for which forest fire data is available.

To collect data, extensive fieldwork was conducted in Argentine Patagonia between 2019 and 2022. During this period, 41 open and semi-structured interviews were carried out with key stakeholders, including officials from provincial forest departments and fire management services (16), national environmental agencies (7) and representatives of civil society organizations and academics (18). Participants were identified through a snowball sampling technique, which allowed access to relevant actors involved in forest fire risk management. Interviews concluded once information saturation was reached, ensuring data reflected the diverse perspectives in forest fire governance. All interviews were conducted under conditions of anonymity to protect participants' security. In each case, verbal consent was obtained to record the conversation for academic purposes. Additionally, a law review was carried out to examine the institutional frameworks of fire management at both the national and provincial levels. This included a historical screening of legislation back in the 1970s and a focused analysis from 2008 onward, following the enactment of the National Native Forest Law (2007). This allowed analysis of how provincial frameworks were updated or not in response to national mandates. Then, databases from the National Undersecretariat of Environment were analyzed, providing insights into the allocation of funds under the National Native Forest Law. In contrast, the National Fire Management Law was excluded from the funding analysis due to the absence of delegated budgetary execution at the provincial level. National data on land-use changes and records from the Global Forest Watch platform were also reviewed to identify subnational drivers of deforestation. These data were essential in assessing the extent of land affected by forest fires.

Results

This section focuses on three key dimensions to analyze the capacity of both provinces to manage forest fires. First, it examines the regulatory framework in each province. Second, it evaluates the administrative capacities of the provincial governments. Lastly, it explores the implementation of these normatives.

Provincial regulations on forest management

Both provinces have had regulation of activities in forest areas for over 30 years. However, in 2010, a report by the then-National Secretariat of Environment and the Andean-Patagonian Forestry Research and Extension Center highlighted the necessity for a coordinated approach

to forest management policies. The report states that coordination was crucial to promote sustainable forest management in the face of emerging challenges, such as increasing urbanization in forested areas, rising forest fire occurrence, inadequate forest management and limited interjurisdictional coordination (Picco and Van den Heede, 2010). For Chubut, the report added a specific challenge: past afforestation efforts that replaced native forest with exotic species to increase wood production. These plantations, established at high densities and left unmanaged, have significantly contributed to the rapid spread of forest fires.

Since the enactment of the National Native Forest Law in 2007, all provinces have been required to align their forestry regulations with national standards. Chubut's legislature approved its Native Forest Land-Use Planning Law (OTBN, acronym in Spanish) in 2010, while Tierra del Fuego passed its version in early 2012. Both regulations established conservation zoning categories in accordance with national requirements. However, they differ significantly in their approaches to forest fire.

Tierra del Fuego's OTBN (Provincial Law 869/2012) adopts an integrated approach to conserving and managing native forests in the face of forest fires. Article 1 establishes the sustainable use and protection of forests as a key component of the province's environmental, social and economic policies. Regarding forest fire management, Article 11 mandates that provincial authorities develop an annual fire management plan, incorporating prevention, early detection and firefighting strategies. These plans must be reviewed by the Advisory Commission on Native Forests (a multidisciplinary body composed of provincial officials, environmental organizations, experts and representatives from the forestry and livestock sectors) and financed through the national forest fund. The regulation also requires continuous monitoring of forest conditions, regularly updated risk maps and periodic revisions of fire management plans, with a particular focus on high-risk areas. In sum, areas affected by the 2010–2012 forest fires were designated under the red category, indicating the highest conservation priority.

Chubut, by contrast, has two key regulations governing fire management: Law XIX-32 and Law XVII-92/2010. The former focuses on forest fire prevention and control, establishing requirements for fire management at the provincial, municipal and landowner levels. These include the development of fire prevention plans, regulations on controlled burns and the obligation to implement preventive forestry practices in high-risk areas. However, enforcement primarily falls on landowners and municipalities, which are responsible for ensuring property safety and adopting necessary precautions. This approach reflects a more decentralized, individual-centered strategy rather than a state-driven model. Additionally, Provincial Law XIX-32 established the Provincial Fire Management Fund, which prioritizes equipment acquisition and firefighter training over preventive investments. This emphasis on fire suppression rather than prevention is further reinforced by the role of the Provincial Fire Management Service, which focuses primarily on firefighting and training, with long-term prevention strategies remaining a secondary concern.

Administrative capacities of provincial states

This section examines provincial bureaucratic capacities. It analyses (1) the institutional position of the provincial agency responsible for the implementation; (2) the agency's staffing levels and (3) the number of regional offices operated by the central implementing agency across the province (see Table 1). The third indicator is relevant because a more decentralized agency might have greater capacity to reach remote areas with native forests, which are often far from provincial administrative centers.

In comparison, Chubut has significant bureaucratic capacity, as its provincial implementing agency holds a strategic position within the government, suggesting substantial access to financial resources. Its institutional prominence increased, evolving from a directorate in 2010 to a secretariat under the Provincial Cabinet Office by 2019. Staffing expanded from around 100 employees in 2010 to over 350 by 2019, with about 200 dedicated

Table 1. Provincial bureaucratic capacity

Province	Agency's institutional level		Number of officials		
	Year of OTBN enactment	2021	Year of OTBN enactment	2021	Regional offices
Chubut	Directorate (2010)	Secretariat	100	372	9
Tierra del Fuego	Directorate (2012)	Directorate	25	23	0

Source(s): Own elaboration based on interviews with provincial officials

to wildfire management. Additionally, Chubut is well-equipped for territorial coverage, with nine regional offices in areas with native forests and a central office in Esquel, the main city in the forest region.

In contrast, Tierra del Fuego has weaker bureaucratic capacity. Throughout the period analyzed, its implementing agency remained a directorate with a small staff (between 23 and 25 employees) and no regional offices within the province, limiting its capacity for decentralized policy implementation.

In summary, the data show that Chubut has greater bureaucratic capacity, which could contribute to the implementation of the regulations. However, as will be seen below, Tierra del Fuego achieved better outcomes despite its limited bureaucratic capacity.

Implementation of forest policies in Tierra del Fuego and Chubut

Tierra del Fuego

The implementation of Tierra del Fuego's OTBN (Law 869/2012) was driven by a collaborative strategy led by the Provincial Secretariat of the Environment (PSE). Recognizing their administrative constraints, officials forged partnerships with other provincial agencies, such as INFUETUR (responsible for tourism) and socio-environmental organizations aligned with a conservation-oriented approach to forest management (v.g. Manekenk). The primary goal of this collaboration was to allocate the greatest part of the National Forest Fund to conservation efforts in native forests, with a particular emphasis on forest fire prevention (Interview with PSE official, Ushuaia, April 2019).

These attempts were not without controversy. Stakeholders from the forestry and livestock sectors – including forestry engineers and industry representatives – manifested their opposition to the fund allocation. They argued that other institutions should have the same opportunity to coordinate with the Provincial Directorate of Forests. Additionally, they claimed that the approved projects were predominantly focused on conservation efforts, with insufficient attention given to forestry and livestock production activities, which are important to the province's economy (interview with an expert, Ushuaia, April 2019).

Despite these criticisms, the PSE prioritized projects submitted by actors with whom it had established alliances. This is shown in Figure 3, which outlines the types of beneficiaries who accessed the plans between 2012 and 2017.

The graph highlights that state institutions oversaw most of the plans, with their participation ranging between 50% and 83% between 2012 and 2017. Among these, the provincial executive branch, particularly the PSE, accounted for 64% of the plans, followed by private landowners (27%) and other government institutions (9%). Among the funded plans, all of them included a fire prevention component, reflecting the impact of the 2012 forest fire. Regarding the budget allocated to provincial agencies, the PSE (1) constructed fire pits in provincial and national reserves; (2) funded initiatives to prevent forest fires in forest-urban interface zones, particularly in Ushuaia (capital of Tierra del Fuego) through properties planning and firebreaks, and (3) developed a mobile application for public use, providing real-

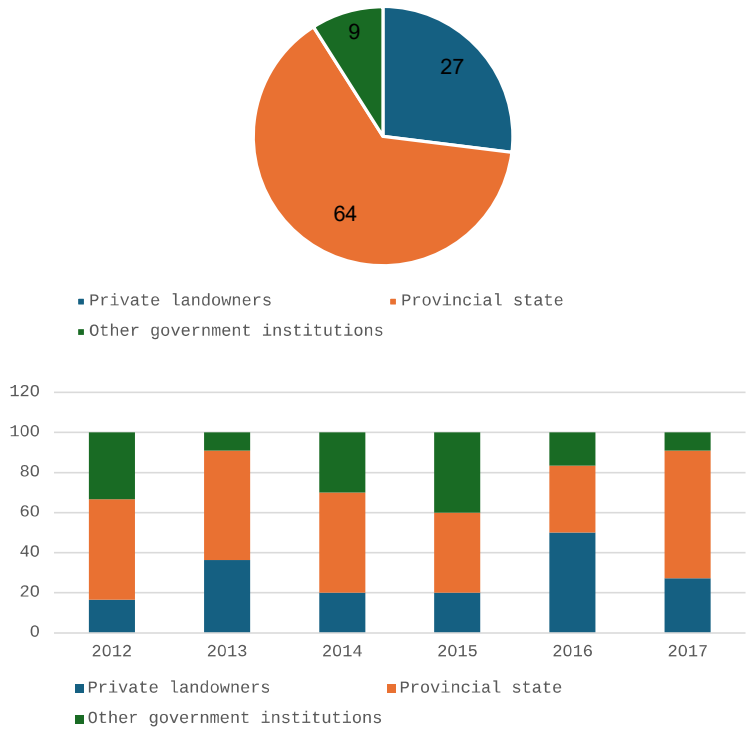

Figure 3. Distribution of National Forest Fund between 2012 and 2017 in Tierra del Fuego. **Note:** Private landowners include individual people and private companies. Provincial state refers to the provincial executive branch. Other government institutions encompass public universities, the national rural extension agency and municipal governments. **Source:** Own elaboration based on data from Undersecretariat of Environment of Argentina

time forest fire risk assessment across provincial territory (Interview with PSE official, Ushuaia, April 2019).

Although it is not reflected in the graph, the qualitative analysis highlighted the role of provincial socio-environmental organizations in the coordinated execution of plans with the PSE. An example of state–society collaboration is the partnership between the PSE and the Mountain Guide Association of Argentina.

Following the 2012 forest fires, the association began exploring strategies to restore portions of the damaged ecosystem and to prevent future fire events. This initiative was motivated by the fact that the affected area comprised mountain and hiking zones traditionally used by its members for recreational purposes and tourism-related ventures. Simultaneously, the PSE sought to leverage national funding to develop projects with the aim of reducing forest fire risks. Considering pre-existing relationships between technicians from the Forest Directorate and members of the association, they proposed a project in 2013 under the National Native Forest Law. This initiative focused on restoring the degraded ecosystem, preventing future forest fires and promoting environmental education. A PSE official said:

> The NGOs said, 'We want to have projects in the forest.' So, we found a way to make it possible, and in fact, we have projects that started in 2013, like the reforestation project in *Bahía Torito* following the 2012 forest fire, which is carried out by the Mountain Guide Association with volunteers from schools. Almost a thousand students participated, traveling by boat, staying for two days, planting trees, and more. It's truly a wonderful project in terms of participation. This is in public forests, so the

> ownership lies with the Secretariat, but what we were able to do was differentiate: the State is the official holder, but the NGO acts as the executing entity (Interview with PSE official, Ushuaia, April 2019).

The synergy between the state and society was well-organized. The Mountain Guide Association took charge of planning, recruiting volunteers, promoting the project and overseeing its on-the-ground implementation. On the other hand, the Forest Directorate's technicians managed the project's submission in response to funding calls, provided technical guidance to project leaders, supplied equipment (e.g. trucks) and facilitated access to the remote site. Reflecting on this partnership, the NGO emphasized the value of these synergies:

> The Forest Directorate has supported us a lot because they've always considered this important, and the support comes through funding [. . .] We've also interacted when it comes to sourcing plants, conducting surveys, and they've accompanied us to measure our trials (Interview with a member of the Mountain Guide Association, Virtual Meeting, June 2020).

After six years of operation, the collaborative management of the project successfully engaged over a thousand volunteers from schools across the province and raised awareness about forest fire prevention, among other accomplishments. The evaluation of its implementation underscores the significance of state–society partnerships in fund management and illustrates how these synergies expanded the project's reach.

Chubut

The implementation of the OTBN in Chubut was driven by the state's decision to prioritize the approval of productive projects in forested areas while enhancing forest fire suppression efforts. To achieve those objectives, the government formed an alliance with the Association of Forestry Engineers, which maintained strong ties with livestock producers who acceded to most funds from the National Native Forest Law. In terms of forest fire management, the province expanded its brigade of firefighters dedicated to combating it.

Historically, the Provincial Directorate of Forests has been a technical agency primarily dedicated to the productive use of forests. A clear example of this focus is the planting of exotic species such as pine (*Pinus*) and eucalyptus (*Eucalyptus*) in the province's northwest during the 1970s. However, due to the lack of immediate economic returns, many of these plantations were abandoned and left unmanaged. It was not until the mid-2000s that the Provincial Directorate of Forests sought to control them, recognizing their role in exacerbating forest fire risks. Nevertheless, the implementation of these initiatives was ineffective, allowing exotic species to continue spreading and further increasing the threat of forest fire.

Another indication of this production-oriented approach is the lack of coordination with stakeholders who prioritize forest conservation. Synergies with the Association of Forestry Engineers of Chubut allowed them to receive the most part of the National Forest Fund, as Figure 4 shows:

Between 2011 and 2017, private landowners – large and medium-sized livestock and forestry producers – managed 72% of the plans, positioning themselves as the main beneficiaries. In comparison, state organizations collectively received 26% and Indigenous communities only 3% of the plans, despite making up 8% of the provincial population. This distribution highlights the production-oriented priorities of the agency responsible for the implementation of the OTBN. Regarding the relationship between the Forest Directorate and the mentioned association, a member of the latter noted:

> When there are no state subsidies or no opportunities to implement management plans, I have little work. Now, regarding the plans under Law 26331, [producers] here mostly apply for *ñire (Nothofagus antarctica)*, mainly *ñire*, which is used for firewood, to clear the forests, and to bring in livestock. (interview with private sector expert, Virtual Meeting, August 2020).

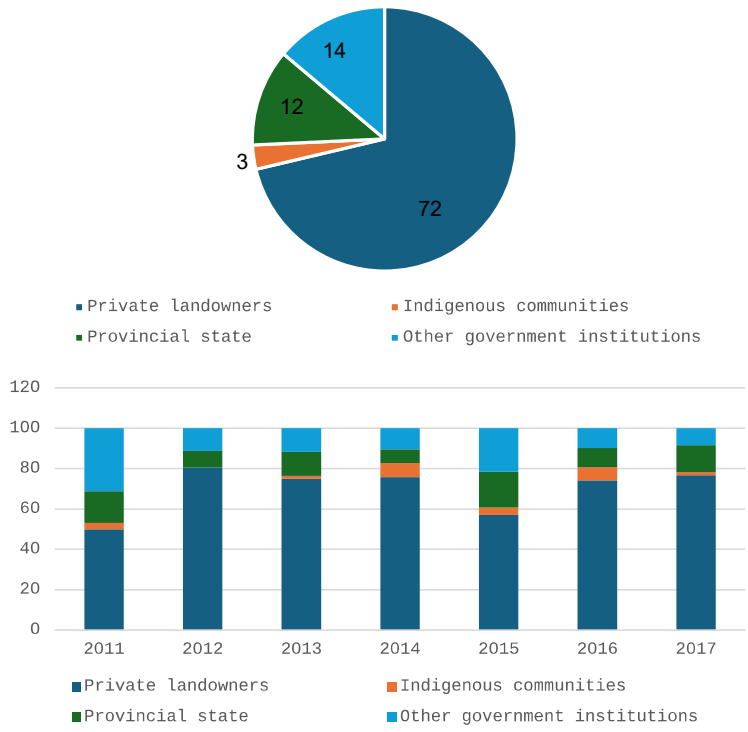

Figure 4. Distribution of National Forest Fund between 2012 and 2017 in Chubut. **Note**: Private landowners include individual people and private companies. Provincial state refers to the provincial executive branch. Other government institutions encompass public universities, the national rural extension agency and municipal governments. **Source:** Own elaboration based on data from Undersecretariat of Environment of Argentina

In this regard, a provincial official said:

> The private technician, who does that work in the field, brings in their clients [. . .] Let's say there is still no proper extension structure on this issue, beyond a few specific actions [. . .] Therefore, the role of the forestry engineer, in the context of forest management, is to serve as that external presence, and I believe that's why we have a fluid relationship. (interview with provincial official, Virtual Meeting, August 2020).

When examining the selection of projects, there is a clear emphasis on productive activities over forest fire management. Of the 85 management projects approved between 2011 and 2017, only 15% (13 plans) included wildfire prevention measures, while most resources were allocated to livestock projects in forested areas. This highlights an approach that prioritizes the use of native forests for economic activities, rather than focusing on their conservation or forest fire prevention. Notably, 54% of the plans with forest fire prevention components were submitted by public organizations (mainly municipalities with forests within their territories) or Indigenous communities, underscoring the limited participation of large and medium producers in such initiatives. In summary, despite being a province that has suffered significant losses due to forest fires, only a small portion of the available resources were allocated to prevention efforts. As a provincial official noted: "In reality, very little of that (funding for forest fire prevention) actually comes through, and that is also a shortcoming on our part, a weakness in the prevention system we have had" (interview with production official II, Virtual Meeting, August 2020).

Discussion

Although Chubut and Tierra del Fuego share similar regulatory frameworks, their policy implementation approaches to fire risk management differ. This divergence can be explained by the political visions, alliances and capacities that shaped how each province translated regulation into action. Regarding implementation approach, Chubut adopts a reactive framing of the problem, where the primary goal has been to control damage rather than reduce risk (e.g. the Provincial Fire Management Service has focused on emergency response and fire suppression). In contrast, Tierra del Fuego follows a more integrated model, incorporating fire management into its OTBN with a more holistic approach, assigning the state direct responsibility for forest fire prevention through continuous monitoring, regular updates to fire risk maps and other proactive measures. This institutional design reflects a centralized vision, where the state is seen as the primary coordinator of risk reduction rather than a mere responder to crises. Besides, the role of actors' visions is further visible in resource distribution. While Tierra del Fuego dedicated most of its National Forest Fund resources to prevention and restoration projects, only about 15% of Chubut's approved plans included preventive measures. This contrast suggests that institutional outcomes depend less on formal rules than on the visions thought by officials to define forest risk reduction.

Officials' visions also shape alliances. Despite their administrative limitations, policymakers from Tierra del Fuego's Forestry Directorate forged synergies with environmental organizations and other provincial government agencies to optimize the use of available funds. Collaborations with social entities enabled the execution of restoration projects in fire-affected areas, the strengthening of environmental education programs and the enhancement of conservation and forest fire risk-reduction policies. This collaboration expanded the state's operational capacity, compensating for the technical and financial constraints of the provincial administration. It also generated shared understandings about prevention and ecological restoration, reflecting Agrawal's notion of environmentality (2005), whereby governance outcomes emerge through networks that align actors' practices and visions around environmental protection. In contrast, Chubut's limited coordination with conservation groups and its strong ties to productive sectors led to a fund distribution that prioritized economic activities over forest fire prevention. Although the province, for example, increased the number of firefighters, preventive measures remained marginal within the provincial strategy. Overall, these contrasting networks confirm that state–society relations are structured by underlying policy visions. Prevention-oriented approaches build ties among policymakers and environmental actors, while reactive or productivist ones strengthen links with economic stakeholders and reinforce firefighting agencies.

Another key factor in environmental policy enforcement is the availability of adequate administrative resources within state agencies. The comparison reveals a paradox: despite Chubut having greater administrative capacity, Tierra del Fuego developed a more coherent and preventive strategy, which, according to the literature on DRR and fire management, can be potentially more effective in reducing long-term fire impacts. The Chubut's capacity paradox illustrates that higher bureaucratic capacity does not necessarily translate into better policy outcomes. Despite having more officials, budget and territorial coverage, the province's strong orientation toward productive use and suppression limited its preventive effectiveness. In sum, this situation reveals that administrative size alone cannot ensure risk reduction if organizational incentives and policy visions are misaligned. Tierra del Fuego suggests that limited but strategically aligned capacities can foster more consistent preventive implementation and may, over time, contribute to reducing forest fire risk when combined with coherent policy ideas and state–society collaboration.

This comparison also offers suggestive evidence consistent with these interpretations. Beyond the absence of large-scale fires since 2012, VIIRS fire alerts show a pattern that aligns with Tierra del Fuego's preventive orientation. Likewise, data on land-use change by fire indicate that the affected area has remained relatively low over the last decade. While assessing policy impacts lies beyond the scope of this study, these data are consistent with the idea that

prevention-oriented strategies can potentially reduce exposure and strengthen institutional preparedness. In this sense, the comparison reinforces that provincial decisions regarding policy orientation and resource allocation may have long-term implications for how effectively states address these environmental challenges.

Conclusion

Forest fires have become an increasing phenomenon with significant threats to human lives, urban and rural infrastructure and national and subnational economies. This study examines the variation in subnational government responses to the risk of forest fires in Argentina. Given that subnational authorities have the primary responsibility for designing and implementing prevention measures, early warning systems and fire suppression strategies in federal countries, this research asked: What explains the variation in subnational responses to forest fire risk reduction?

To address this question, the study analyzed two provinces in Argentinian Patagonia – Chubut and Tierra del Fuego – both of which have experienced severe forest fire-related challenges in recent years. Despite facing similar threats, the two provinces adopted distinct strategies with divergent outcomes in forest fire mitigation.

The findings suggest that these provinces vary, considering two key factors: (1) the extent to which policymakers prioritized forest fire prevention strategies and (2) the state's capacity to foster synergies with societal actors who share aligned interests. Specifically, Tierra del Fuego adopted a prevention and proactive approach centered on forest fire prevention, including reforestation efforts, infrastructure development and the deployment of information technologies. Furthermore, the province established strategic alliances with socio-environmental organizations, expanding its operational capabilities. In contrast, Chubut's approach was predominantly reactive, focusing on fire suppression and productive activities while exhibiting limited coordination with conservation stakeholders. As a result, forest fire management in Chubut remains fragmented and highly dependent on local and municipal initiatives, whereas Tierra del Fuego implemented a more cohesive and centralized strategy under the leadership of its forestry directorate. Considering the governance literature, these findings also reveal that institutional tensions can be steered toward environmental protection when public officials act as active agents in decision-making processes. When their choices are supported and legitimized by specific social coalitions, governance arrangements become more effective in advancing preventive and sustainability-oriented policies. This dynamic offers an important contribution to governance theory by emphasizing the interaction between bureaucratic agencies and social legitimacy in shaping environmental outcomes.

While this study did not focus on evaluating the direct outcomes of fire management policies, the contrasting institutional approaches observed suggest that more integrated and prevention-oriented strategies – such as those implemented in Tierra del Fuego – may be more effective in reducing forest fire risk than reactive models like that of Chubut. This finding is particularly relevant for the design and implementation of disaster risk policies, as it underscores the importance of fostering cross-sectoral collaboration and advancing forest management strategies that prioritize risk reduction over mere impact mitigation.

Finally, the comparison invites reflection on how states allocate resources to address environmental risks. Investing in prevention and restoration can, in the long run, be less costly and more effective than repeatedly funding emergency responses through brigades, helicopters and air tankers. Likewise, prioritizing productive projects without dedicating resources to prevention, as seen in Chubut, can jeopardize both local economies and the development initiatives such funding seeks to promote. These lessons are particularly relevant for Latin American countries, where prevention is rarely prioritized in disaster risk agendas despite its potential to enhance resilience and protect public spending.

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