

ARTÍCULO DE INVESTIGACIÓN

Socio-Environmental Controversies in Chile's Peatland Governance: From Global Climate Discourses to Local Extractivist Realities

*Controversias socioambientales en la gobernanza de las turberas en Chile: de los discursos
climáticos globales a las realidades extractivistas locales*

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ABSTRACT This article analyzes the legislative process that culminated in Chile's 2024 Peatland Protection Law (Law 21.660), employing critical discourse analysis to examine the parliamentary debates that shaped this regulatory framework. Unlike previous studies on environmental governance in Chile—which have focused on identifying specific conflicts, characterizing extractivist patterns, or diagnosing institutional fragility—this work exposes the socio-technical controversies underlying peatland governance. It demonstrates how global climate commitments (NDCs) articulate with—and often clash with—local extractivist realities, offering an analysis of peatland governance at the intersection of legal regulation, ecological knowledge, and political economy.



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The study shows that environmental legislation does not emerge solely from scientific or political consensus, but from contentious negotiations in which knowledge, power, and economic interests are co-produced. The analysis identifies three central axes of controversy: the strategic mobilization of scientific knowledge; the negotiation of legal frameworks around conservation and regulated extraction; and the institutional compromises through which sustainability is translated into policy under unequal conditions of power and oversight.

The Chilean case illustrates how a regulatory process, such as the construction of a climate agenda, is subject to controversial dynamics, which relativize the characteristics of local economies and socio-ecological dynamics, thereby generating weaknesses in normative strength. The article contributes to debates on environmental governance by demonstrating the limits of implementing Nationally Determined Contributions (NDCs) when global commitments encounter entrenched power relations and unequal regulatory capacity.

KEY WORDS Peatland governance; Climate policy conflicts; Nationally Determined Contributions (NDCs); Socio-ecological controversy; Chilean environmental legislation.

RESUMEN Este artículo analiza el proceso legislativo que culminó en la Ley 21.660 de Protección de Turberas de Chile (2024), utilizando un análisis crítico del discurso para examinar los debates parlamentarios que moldearon este marco normativo. A diferencia de estudios previos sobre gobernanza ambiental en Chile —que se han centrado en identificar conflictos específicos, caracterizar patrones extractivistas o diagnosticar la fragilidad institucional—, este trabajo expone las controversias socio-técnicas subyacentes a la gobernanza de las turberas. Demuestra cómo los compromisos climáticos globales (NDCs) se articulan y, a menudo, chocan con las realidades extractivistas locales, ofreciendo un análisis de la gobernanza de las turberas en la intersección entre la regulación legal, el conocimiento ecológico y la economía política.

El estudio muestra que la legislación ambiental no surge únicamente de un consenso científico o político, sino de negociaciones controvertidas en las que el conocimiento, el poder y los intereses económicos se co-producen. El análisis identifica tres ejes centrales de controversia: la movilización estratégica del conocimiento científico; la negociación de marcos legales en torno a la conservación y la extracción regulada; y los compromisos institucionales a través de los cuales la sostenibilidad se traduce en políticas bajo condiciones desiguales de poder y supervisión.

El caso chileno ilustra cómo un proceso regulatorio, como la construcción de una agenda climática, está sujeto a dinámicas controvertidas que relativizan las características de las economías locales y las dinámicas socio-ecológicas, generando así debilidades en la fuerza normativa. El artículo contribuye a los debates sobre gobernanza ambiental al demostrar los límites de la implementación de las Contribuciones Determinadas a Nivel Nacional (NDCs) cuando los compromisos globales se enfrentan a relaciones de poder arraigadas y una capacidad regulatoria desigual.

PALABRAS CLAVE Gobernanza de las turberas; Conflictos en materia de política climática; Contribuciones determinadas a nivel nacional (NDC); Controversias sociotécnicas; Legislación medioambiental.

1. The Peatlands of Patagonian Chile: A Controversial Resource

The 2015 Paris Agreement established a global framework through which 196 signatory countries committed to submitting and periodically updating their Nationally Determined Contributions (NDCs), in line with the objective of holding the increase in global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5°C. Within this context, peatlands have emerged as critical ecosystems for global climate change mitigation (Leifeld & Menichetti, 2018). In 2019, the Intergovernmental Panel on Climate Change (IPCC) formally recognized peatlands as key ecosystems for climate action (Frolking et al., 2011; Frolking & Roulet, 2007).

Beyond their carbon sequestration capacity, peatlands support rich plant biodiversity, including vascular and cryptogamic species such as bryophytes, liverworts, hornworts, mosses, and lichens (Gewin, 2020). They also play a critical role in trophic chains, sustaining vertebrate populations like amphibians and insectivorous birds (Jérez & Muñoz-Escobar, 2015), while regulating local weather cycles (Mansilla et al., 2021). Their triple ecological impact—as carbon sinks, biodiversity hotspots, and water reservoirs—underpinned Chile’s 2020 commitment to the Nationally Determined Contributions (NDCs) (Banerjee et al., 2025; Siriwardana & Nong, 2021)¹. Under this pledge, Chile agreed to develop a national peatland inventory within five years and, by 2030, to establish standardized metrics for assessing their capacity to adapt to and mitigate climate change².

1. The 2020 Nationally Determined Contribution (NDC) of Chile can be found at this link: https://unfccc.int/sites/default/files/NDC/2022-06/Chile%27s_NDC_2020_english.pdf.

2. Chile recently updated its NDCs, postponing the peatland inventory and associated metrics until 2035, while strengthening regulations on peatland exploitation effective from 2028. See the full document here: <https://unfccc.int/sites/default/files/2025-09/NDC-2025-220925%201.pdf>.

Despite their ecological significance, the selection and regulation of peatlands in Chile have long been marked by political and regulatory inconsistencies³. As of 2020, only 16 wetlands were registered under national conservation categories, while peatlands remained subject to two conflicting legal frameworks (León et al., 2021, pp. 13–14). Under the Mining Code, peat was classified as a concessionable and exploitable fossil resource, whereas agricultural regulations—administered by the Ministry of Agriculture—designated *Sphagnum* moss as an absorbent horticultural substance. This regulatory dualism fragmented peatlands into disjointed legal categories, treating concession rights as private property and leaving extraction processes largely unmonitored (Gearey et al., 2025, p. 4). These systemic barriers hindered conservation efforts and exposed the structural limitations of peatland protection. As seen in other parts of the world, conservation policies (such as NDCs) are undermined by contradictory sectoral frameworks (Gearey et al., 2025, p. 8).

The 2024 Peatland Law—which aims to “*preserve and conserve*” these ecosystems, as stated in Article 1—is a direct outcome of Chile’s Nationally Determined Contributions (NDCs). While its approval marks a milestone as a paradigm shift in Chilean environmental governance (Delgado et al., 2025), the debate that preceded it reveals a controversial process in which global scientific agendas, diplomatic commitments, regulatory omissions, economic interests, and weak oversight mechanisms had to be negotiated. The law therefore offers a focused case through which to examine how environmental governance is translated into domestic regulation.

The intersection of global climate commitments with local governance presents critical challenges (Kreimer, 2021). Political and economic contexts often privilege short-term development, while territorial needs may clash with global objectives. These tensions are intensified by the lack of systematic mechanisms to monitor how global scientific agendas are interpreted and implemented locally (Cancino et al., 2025). This study therefore examines how the NDC framework shaped debates over conservation and resource extraction, forcing political and civil society actors to reconcile local priorities with the global climate agenda (Griscom et al., 2017; Jernnäs, 2024; Leinaweaver & Thomson, 2021; Peterson & van Asselt, 2026).

3. Most of Chile’s peatlands are located between 41° and 56° south latitude and are predominantly distributed throughout the Magallanes region and the Chilean Antarctic region (Fig. 1). When combined with the Argentinean austral zone, they cover an area of approximately 4.5 million hectares (Yu et al., 2010), making them the largest terrestrial CO₂ deposit in the southern hemisphere. Their southern location places them under the direct influence of westerly and southerly air flows, as well as the Antarctic circumpolar currents, rendering them unique land-based laboratories for studying the interrelationships between earth, ocean, and atmosphere at regional and global scales (Aguilera & Larraín, 2018; Fuentes & Gajardo, 2017).

The specificity of these controversies lies in their feedback dynamics: they are not simply local problems with global effects, or global agendas with local consequences, but interactive loops between scales. Scientific knowledge moves between field-based observation and global climate discourse, while regulation addresses local conflicts through frameworks shaped by international commitments. This dynamic raises key interdisciplinary questions about how, when, and by whom knowledge is invoked; what regulation signifies; and how peatlands are constructed as controversial objects.

This article analyzes the discursive and institutional dynamics that shaped Chile's 2024 Peatland Law (Law 21.660)⁴. Through an examination of parliamentary debates, scientific contributions, and civil society inputs, we interpret the legislative process as a contentious and multilayered negotiation, marked by persistent tensions between exploitation and sustainability. At its core, this study asks how global climate-change discourses articulate with local extractivist realities in Chilean peatland governance between 2018 and 2024, and what socio-environmental tensions emerge when conservation agendas clash with economic interests and the livelihood demands of extraction-dependent communities.

This overarching question is explored through three key lines of inquiry: first, how scientific knowledge is invoked and mobilized in the definition of peatlands as ecosystems of 'glocal' value; second, how legal frameworks are negotiated and redefined around the tension between conservation and regulated extraction; and third, how power relations and institutional trade-offs shape the final policy outcome, particularly in the attempt to reconcile global climate commitments with local socio-economic priorities.

Studies on environmental governance have approached socio-environmental conflicts as critical spaces where power, scientific knowledge, and social values converge and often collide. One strand of research has focused on identifying conflicts, institutions, and actors (Berasaluce et al., 2021; Carranza et al., 2020; Maillet & Carrasco, 2021; Martínez-Alier, 2021). Another has examined how resources are redefined through discursive and normative frameworks that determine what counts as "natural" and what becomes "exploitable" (Bogen & Åm, 2025; Kama, 2020; Sarewitz, 2004).

Socio-technical controversies are not merely obstacles but are analyzed as spaces where solutions are negotiated—or polarized—often in the name of "nature" (Latour, 2004). These controversies also encapsulate the inherent tensions in the search for a shared language to recognize environmental problems, as well as the asymmetries in interpreting the multiple definitions surrounding them (Ellis et al., 2024).

4. Complete text of the Bill here: <https://www.bcn.cl/leychile/navegar?idNorma=1202472>.

In the case of peatlands, these conflicts acquire an normative dimension: Are they ecosystems to be conserved, resources to be exploited, or contested territories? Authors such as Palmer et al. (2025) frame them as interconnected, multidimensional landscapes where tensions arise from divergent ontological understandings—how their biophysical composition and the conflicting efforts to “rationalize” their management are conceived as a whole. This explains why ecological restoration agendas are often promoted simultaneously with extractivist initiatives that conceptualize peatlands as “wastelands” or assets for generating carbon credits in offset markets (Quinn et al., 2010). This duality reflects a struggle to define their value: Are they critical carbon sinks for climate change mitigation or economic resources for local development?

Peatland governance has been analyzed through multiple controversial scenarios worldwide. In Europe, studies have focused on policy inconsistencies between environmental regulations and their implementation, as well as the loss of territorial agency among local actors (Suárez-Rojas & Widmark, 2025; Lees et al., 2023; Ekardt et al., 2020; Carmenta et al., 2017). Research has also explored how peatlands are perceived by communities (Nath et al., 2017), revealing inconsistencies between technical discourses and social realities. In Latin America, analyses have emphasized the exclusion of key actors—such as Indigenous communities—and the ambiguity of legal frameworks, which often overlook local knowledge and territorial dynamics (Cadillo & Bennett, 2024; Beer et al., 2024).

A paradigmatic case is that of Patagonian peatlands (Pacheco-Cancino et al., 2025), which inspired the parliamentary debate analyzed in this article. While literature on their bioecological importance has grown over the past decade (Blanco & Balze, 2004; Díaz et al., 2012, 2008; Iturraspe et al., 2013; León et al., 2021; Mansilla et al., 2021; Schlatter & Schlatter, 2004), discrepancies persist regarding their political, social and cultural relevance. Few social science studies examine how they are perceived by citizens, nor is there sufficient work on the historicity of their uses or the role of private actors in their conservation. Similarly, further contributions are needed to explain the tensions between scientific uncertainty and regulatory gaps (Amstein, 2016).

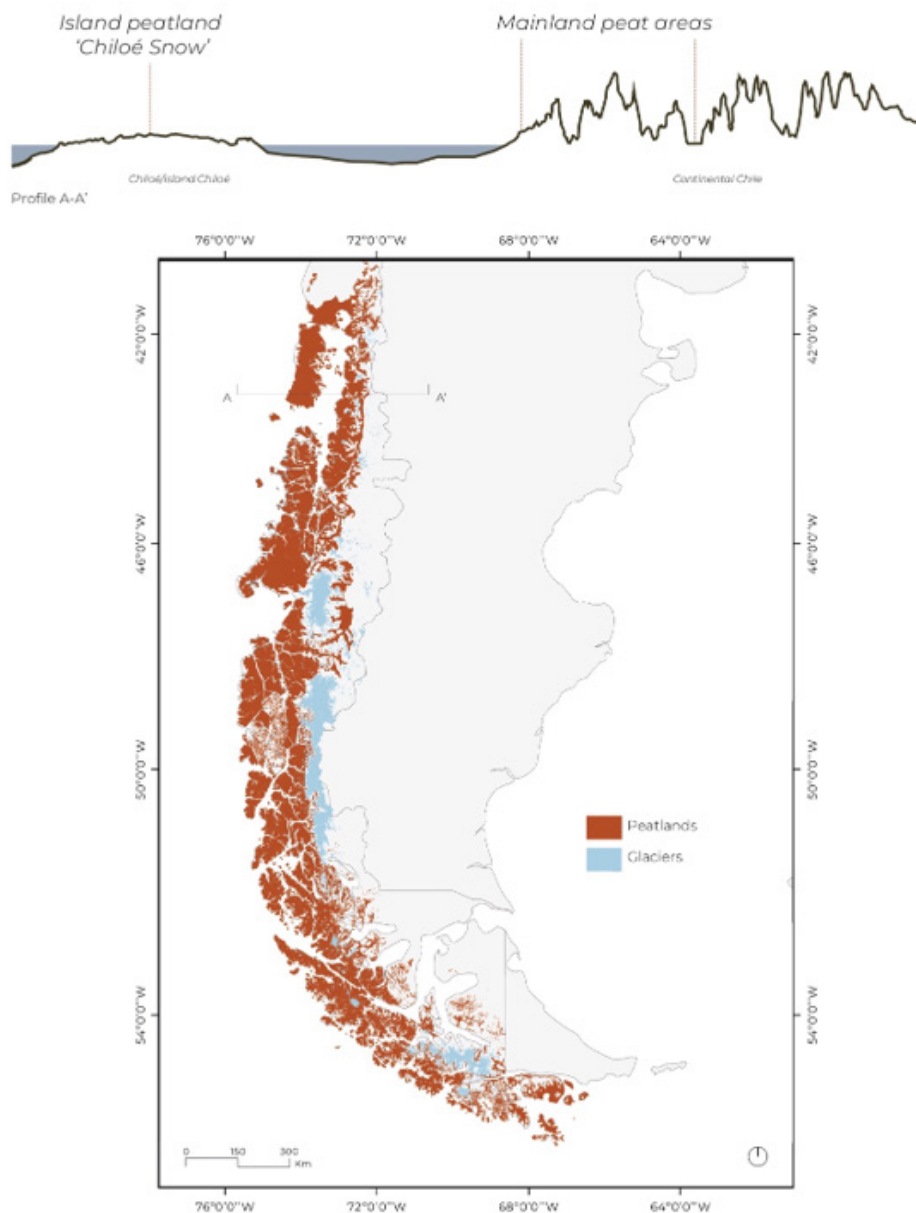
In this regard, we highlight the work of Delgado et al. (2025), who legally analyze the contributions of Law 21.660 in relation to other key frameworks, such as the Climate Change Framework Law (2022) and the Biodiversity Law (2023). They frame this law as a milestone marking a transition toward an ecocentric approach in Chile's environmental policies. Through this legislation, peatlands are consolidated as “nature-based climate solutions.” According to their arguments, this triad of laws introduces innovative legal frameworks for nature protection, moving away from the country's historically anthropocentric governance (Delgado et al., 2025, pp. 5–6; Delgado, 2021; Costa & González, 2024; Tecklin et al., 2011).

This study identifies the socio-technical controversies that have shaped Chile's peatland debate over the past decade, offering a framework for understanding how solutions are negotiated—and sometimes imposed—when global and local scales collide. Unlike existing studies, it reconstructs the “narrative plots” (Baulenas et al., 2023; Hajer, 1995) that dominated public discourse, such as the contrast between peatlands as carbon sinks and peatlands as economic resources. It also examines legislative milestones as a “political situation” (Barry, 2012), where actors, discourses, and normative frameworks converge in dispute, in line with holistic approaches to peatland governance (Gearey et al., 2025, p. 16).

The article is structured into interconnected sections. The first part, “The first key stage of the controversy: defining the ‘glocal’ value of an ecosystem,” examines the critical moment in the 2019 parliamentary debate, where the initial discursive framework was established: peatlands as “strategic reserves” for climate regulation but also as economic resources, revealing how scientific knowledge was selectively mobilized to justify opposing positions. The second part, “The Second Key Stage of the Controversy: redefining the object of dispute,” delves into the phase of controversy co-production (2021–2024), analyzing how political, scientific, and economic actors redefined peatlands as “objects of dispute” through rhetorical strategies, contradictory legal frameworks, and the exclusion of local knowledge. Finally, the discussion synthesizes the unresolved tensions between the initial ecocentric ideal (2019) and the final extractivist compromises (2024), assessing how Law 21.660 reflects—and perpetuates—power asymmetries in Chilean environmental governance, where global discourses clash with territorial realities.

Fig. 1.

Distribution of Chilean peatlands in the southern region⁵



5. The map is sourced from Mansilla et al. (2021, p. 157). This is a modified version of the original.

2. Methodology

This study adopts a critical discourse analysis to explore how socio-environmental controversies surrounding peatland governance in Chile are constructed, negotiated, and redefined. The methodology integrates three primary sources central to the legislative process: parliamentary records from the Senate and Chamber of Deputies (2018–2021), legal and technical documents (including Law 21.660 and Supreme Decree No. 25), and contributions from scientific and civil society actors. The corpus was selected based on its direct relevance to the legislative trajectory of peatland regulation and was coded thematically to trace recurring framings, actor positions, argumentative strategies, and moments of discursive tension. The analysis focuses on key legislative moments—such as the approval of Bill No. 12.017-12 in 2019, subsequent amendments, and Joint Committee sessions in 2023—while examining dominant narratives (e.g., peatlands as “carbon sinks” vs. “economic resources”) and rhetorical strategies like appeals to science and issue reframing. To ensure methodological rigor, parliamentary discourses were triangulated with legal texts and technical reports, situating debates within their broader historical context, including events like the 2019 social uprising and COP 25. A limitation of this approach is its emphasis on institutional perspectives, highlighting the need for future research to incorporate community voices and local knowledge.

The thematic coding process identified recurring patterns in how scientific evidence, legal frameworks, and economic interests were mobilized during policy debates. The coding was organized around three analytical categories: ecological valuation, economic use, and institutional governance. These categories made it possible to trace how peatlands were alternately framed as climate-regulating ecosystems, productive resources, and territories requiring differentiated forms of oversight. By contrasting parliamentary arguments with technical evidence on peatland regeneration and oversight, the study reveals tensions between conservation goals and extractivist pressures. The analysis also considers the historical and political dimensions of these controversies, illustrating how global climate commitments intersect with local governance realities (Callon, 2006).

2.1 The first key stage of the controversy: defining the 'glocal' value of an ecosystem

Chile's legal and conceptual understanding of wetland ecosystems, including peatlands, began evolving in 2005, when the National Environmental Commission established the National Wetlands Strategy and formed the National Wetlands Committee (Barandiaran, 2016). This initiative opened a progressive shift toward recognizing the ecological importance of these ecosystems (Hauser, 1996)⁶. In 2017, the Ministry of Agriculture introduced the first regulatory instrument aimed at protecting peatlands while mitigating the environmental, social, and economic impacts of extraction in affected areas. By classifying *Sphagnum magellanicum* moss as a forest and agricultural resource, the instrument reflected an early attempt to balance conservation with economic use. In 2019, Supreme Decree No. 25 further formalized legal protections by granting the Agricultural and Livestock Service (SAG) authority to oversee harvesting plans and provide training in sustainable practices. Until the enactment of the 2024 Peatland Protection Law, exploitation initiatives were required to register with Chile's Environmental Assessment Service (SEA) through an Environmental Declaration, with approval contingent on the project's scale and its potential impacts on water resources, topography, and biodiversity (Mansilla et al., 2021).

Within this trajectory, the October 2019 debate in the Chilean Senate marked a turning point: peatlands were no longer framed only as resources subject to management, but as key ecosystems for climate change mitigation. Supported by scientific evidence identifying them as natural carbon sinks, water regulators, and biodiversity reservoirs, this consensus temporarily stabilized peatlands as objects of global climate governance. It also aligned the debate with international frameworks such as the Paris Agreement and the Ramsar Convention (Kingsford et al., 2021), as well as with Chile's preparations to host COP25 later that year. On October 8, the Senate formally defined peatlands as "strategic reserves," essential for atmospheric regulation, hydrology, biodiversity protection, and sustainable tourism. However, this unified approach was soon challenged by subsequent political events.

The legislative process to protect peatlands, initiated in 2018, sought to reconcile two fundamental tensions: environmental conservation and economic exploitation, particularly regarding the harvest of *Sphagnum* moss—a critical resource for local communities but also subject to commercial pressures. While the Senate Environment Committee approved the first draft of the bill in general terms on October 8,

6. We use the consolidated document of all sessions provided by the Library of the Chilean Congress on the legislative history of Law 21.660: https://obtienearchivo.bcn.cl/obtienearchivo?id=recursoslegales/10221.3/75117/1/documento_7297_1712792190924.pdf (hereafter cited as *Historia de la Ley 21660*).

2019, the social uprising of October 18 radically altered the political landscape. The initial urgency to demonstrate legislative progress before COP25 faded, and although the debate temporarily reinforced conservationist perspectives, it postponed deeper analysis of the underlying conflicts of interest. Thus, what began as an effort to align national legislation with international commitments evolved into a reconfiguration of priorities, where social demands—at least temporarily—overshadowed the environmental agenda (Hoyos-Santillan et al., 2019).

Beneath this scientific consensus, however, lay divergent perspectives on how to balance conservation with economic realities, revealing the complex connection between ecological imperatives and local interests. Alfonso de Urresti (Socialist Party, Los Ríos), the bill's primary sponsor, emphasized the hydrological and carbon-sequestration functions of peatlands, framing them as ecological infrastructure and prioritizing their climatic and hydrological roles over economic valuation. He described them as vital regulators of local weather patterns and reservoirs of potable water, underscoring their role as “archives of paleo-environmental and archaeological information”—particularly in southern Chile, where their capacity to absorb precipitation and prevent river overflows during dry months makes them critical for climate adaptation (León et al., 2021, p. 5). His arguments resonated with the broader scientific community, which had long recognized peatlands as unparalleled ecosystems for mitigating droughts and floods while sustaining ecological balances.

Carolina Goic (Christian Democrat, Magallanes) warned that unregulated extraction risked “giving up on preserving carbon, losing water reservoirs, and impacting other productive activities.” She invoked the work of Finnish geologist Väinö Auer—the so-called “father of climate change”—to underscore the long-term consequences of peatland degradation based on his 1928–1952 Patagonian assessments. Her argument reflects a discourse aligned with ecological modernization (Hajer, 1995), where scientific knowledge—such as Auer’s historical data—is mobilized to justify regulatory intervention, even as it exposes a post-normal decision-making context, in which scientific uncertainty, incomplete knowledge, and competing values coexist (Funtowicz & Ravetz, 1993). From a political ecology perspective, Goic’s warnings critique how economic development, despite scientific consensus, continues to undermine sustainability, revealing the tensions between evidence-based governance and entrenched extractivist interests.

Similarly, Carmen Gloria Aravena (Republican Party, Araucanía) framed peatlands as “pristine ecosystems” sustaining forests and water cycles, advocating for policies that embrace scientific progress while safeguarding these landscapes for future generations. Her stance was particularly urgent in the context of Chile’s upcoming COP25 responsibilities, where the country’s environmental leadership was under global scrutiny.

The debate also revealed deeper philosophical divides, encapsulating what scholars have termed the ‘glocal’ tension—the intersection of global ecological importance with local economic realities (Swyngedouw, 2004). While some senators viewed peatlands as resources to be managed, others saw them as ecosystems to be preserved, a divide that mirrored broader societal conflicts over natural resource governance. This tension was most vividly articulated by Senator Alejandro Navarro (Progresista Party, Biobío), who emerged as a leading critic of exploitative practices. Though not a primary voice in the October 2019 debate, his subsequent arguments framed peatlands as “gold medal ecosystems” due to their unmatched CO₂ capture capacity—one-third of global totals, despite covering only 4–5% of the Earth’s landmass. Navarro highlighted the moral and practical contradictions of prioritizing extraction over conservation, arguing that failure to implement a moratorium would undermine Chile’s climate credibility and render its peatlands ecologically barren—a risk the country could ill afford as it prepared to host COP25.

Navarro rejected both the conservationist stance and the incremental reforms proposed by his peers, advocating instead for peatlands to remain entirely off-limits to exploitation. He posed a rhetorical challenge to the legislative framework, asking: “What do peatlands have to do with mining?” From his perspective, the historical isolation of peatlands in southern Chile—where they had been used exclusively as domestic fuel—had shielded them from industrial-scale degradation. However, he criticized environmental impact assessments (EIAs) as mere formalities, arguing that they were designed to “rubber-stamp extractive projects” rather than ensure genuine ecological protection. Navarro contended that environmental law was being reshaped by economic priorities, stating: “These studies are designed to ensure projects are approved, while the law is molded to prioritize development and production over environmental safeguards.” His stance reflected a fundamental critique of the existing regulatory approach, which he viewed as inadequate for addressing the ecological urgency of peatland conservation.

As discussions evolved, the focus shifted from scientific consensus to the politics of exploitation, marking a transition from a science-driven framing to a politically contested arena where competing valuations of peatlands became explicit. The second phase of the debate centered on the ecological and economic consequences of peatland extraction, particularly in regions like Biobío and Magallanes, where industrial-scale harvesting had already degraded ecosystems and disrupted local hydrological systems. This divide—between those framing peatlands as resources to be extracted and others insisting on their protection as ecosystems—echoes Sheila Jasanoff’s (2004) argument that scientific knowledge and policy are co-produced, each shaping how nature is understood, governed, and ultimately contested.

Lawmakers explored pathways for regulated extraction, attempting to define a middle ground in which peatlands could be protected while also being productively managed. Yet this approach revealed deeper questions of governance: how the state defines, controls, and optimizes natural resources while balancing the often-conflicting demands of economic growth and environmental stewardship (Agrawal, 2005).

De Urresti reiterated the urgency of regulation, noting that extractive technologies—such as drying, packaging, and transport—lacked provisions for regeneration or mitigation of environmental harm⁷. He warned that unregulated extraction, particularly by private entities, posed a far greater threat than the harvesting of live moss, risking permanent damage to water reservoirs and soil integrity. His proposals called for stricter oversight under the Environmental Act and the Regulations of the Environmental Evaluation Service (SEA), which govern drainage and land-use activities in ecologically sensitive areas. These measures aimed to ensure that extraction—where permitted—would minimize long-term degradation, though critics argued that current practices fell far short of this goal.

The indiscriminate exploitation of *Sphagnum* moss—locally known as ‘pompón’—exposed key tensions in Chile’s peatland governance, as Senator Rabindranath Quinteros (Socialist Party, Los Lagos) emphasized. He warned that industrial extraction using heavy machinery, particularly on Chiloé Island and around Reloncaví Bay, destroys wetlands’ regenerative capacity and leaves soils exposed in regions where peatlands regulate water cycles (Girkin et al., 2022). Quinteros identified three failures: legal voids, including the weak implementation of Decree No. 25 (2017); institutional inertia in the protection of non-timber products such as *Sphagnum*; and the persistent undervaluation of peatlands as carbon sinks and hydrological regulators.

His proposals—banning heavy machinery, mandating Environmental Impact Assessments (EIAs), and reviewing subsidies under Law 20.283—sought to address these systemic issues. More broadly, his critique underscored the disconnection between legislative intent and enforcement, where institutional weaknesses allow unsustainable practices to persist despite scientific warnings about climate and biodiversity risks.

In this context, Senator Goic not only advocated for the sustainable use of peatlands but also urged immediate legislative action to address the inadequacies of existing regulations. While recent progress included a Supreme Decree establishing measures for *Sphagnum* moss protection—such as mandating manual extraction, leaving a 5 cm peat layer for recovery, and preserving 30% of each area unharvested—Goic argued that these measures were insufficient for meaningful conservation, stating, ‘This is not enough for the protection we need today.’ She emphasized the need to

7. For comparative purposes with other parts of the world, see: Swails et al., 2024.

remove peatlands from the Mining Code and develop a distinct legal framework, proposing that Chile's Agriculture and Environment Committees debate their optimal use—one that balances ecological integrity with socio-economic realities⁸.

Goic's concerns extended to employment impacts, acknowledging the 250 direct jobs dependent on peat extraction while insisting that alternatives must be explored. She also highlighted the hidden costs of unsustainable extraction: *'Every time peat is extracted for uses with alternatives, we pay a price as a country—losing carbon fixation, water reserves, and harming other productive activities.'* Her intervention stressed the need to view peatlands and *Sphagnum* moss as a unified ecosystem, while also recognizing regional differences in their regeneration (12 years in Los Lagos vs. 80 in Magallanes)⁹.

Amid these developments—which underscored both the global scientific interest in peatlands and growing concerns over their governance and sustainable use—the committee approved foundational legislation on the matter (as recorded in Bulletin No. 12.017-12 on 28 October 2019). This approval marked a decisive step toward establishing a legal framework designed to reconcile peatland protection with their regulated exploitation. The draft bill's four articles explicitly embodied this dual objective:

“Article 1. This law aims to protect peatlands, with the objective of preserving and conserving them as strategic reserves for the regulation of atmospheric chemistry and hydrology, the protection of biodiversity, and sustainable tourism.

Article 2. For all legal purposes, the following definitions shall apply:

a) Peatland: A type of wetland constituting an ecosystem characterized by the continuous and progressive production of peat, which normally contains on its surface plant species with which it is functionally connected, such as *Sphagnum* moss.

b) Peat: A mixture of plant remains at various stages of decomposition, present in peatlands.

Article 3. The phrase “peat” shall be inserted in Article 7 of the Mining Code, between the word “lithium” and the comma preceding it.

8. The Office of Agrarian Research and Policy (ODEPLA) is responsible for record keeping for this matter. The data supplied during the discussions is notable for being from as long ago as 2013, when the last report on *Sphagnum* moss was made public on the Office website: <https://www.odepa.gob.cl/wp-content/uploads/2018/05/Musgo-sphagnum-Manejo-sostenible-del-recurso.pdf>.

9. Regarding the topic of regeneration (Cancino-Pacheco et al., 2025).

Article 4. A new third paragraph shall be incorporated into Article 11 of Law 19.300 on the General Bases of the Environment, with the following wording:

“In any case, projects or activities involving the extraction of peat and/or the vegetation found on its surface—including, among others, *Sphagnum* moss, with which it is functionally connected—shall require the preparation of an Environmental Impact Study.”

This legislative framework marked the first formal attempt to balance conservation with exploitation, though its success hinged on implementation—a challenge that would become apparent in the years to come. Overall, the debate reveals how three competing discourses shaped the regulatory outcome: ecological preservation, sustainable use, and extractivist pragmatism. Their coexistence exposed tensions that transcended partisan divides and turned the peatland controversy into a microcosm of broader governance challenges, where scientific knowledge, policy frameworks, and local extractivist realities collide in the pursuit of sustainable futures.

2.2 The Second Key Stage of the Controversy: redefining the object of dispute

The legislative process entered a critical phase after a period of stagnation shaped by social, political, and global crises. Although the Senate had approved Bill No. 12.017-12 in 2019, defining peatlands as “strategic reserves” for climate regulation and biodiversity, the debate stalled amid constitutional reform and the COVID-19 pandemic. When discussions resumed in mid-2021 in the Chamber of Deputies, two shifts re-oriented the process: expert testimony introduced new ecological and socioeconomic evidence, and the legal definition of peatlands and their components became a central object of dispute.

Expert Perspectives

The Ministry of Agriculture, through Juan José Donoso (Head of Natural Resources and Biodiversity), played a crucial role in reconceptualizing peatlands’ legal status. Donoso argued for a scientific reclassification of peatlands, stressing that—unlike lithium or other minerals—peat cannot be treated as a fossil fuel. This distinction was vital for shifting peatlands from the Mining Code’s extractive framework to a conservation-oriented approach, aligning with Chile’s 2020 Nationally Determined Contributions (NDCs). He warned that unregulated extraction threatened these commitments, citing data showing Chile’s peatlands store 4.8 gigatons of CO₂—equivalent to 99 years of national emissions. Such degradation, he argued, would undermine

10. Historia de la Ley 21660, pp. 6-7.

Chile's climate leadership, particularly after its 2019 COP25 presidency, which had positioned the country as a regional environmental standard-bearer.

Donoso outlined four primary threats to peatlands:

1. Industrial extraction for agricultural substrates.
2. Cattle farming, which degrades soil and disrupts water retention.
3. Invasive species altering hydrological systems.
4. Climate change, exacerbating precipitation variability.

His data underscored the crisis: peat exports grew from 4,400 tons (2012) to 6,249 tons (2018), with Los Lagos and Magallanes as primary sources. Donoso concluded that the Ministry of the Environment needed a thorough conservation roadmap, balancing ecological protection with community needs—a challenge later addressed in the 2024 Peatland Law (Law 21.660)¹¹.

The 2021 scientific consultations introduced additional complexity, as experts from diverse disciplines presented new evidence that further polarized the debate. Ariel Valdés, an environmental biologist and Doctor of Agricultural Sciences at the University of Chile, contextualized the global decline of peatlands, noting a 64% reduction in coverage over the past century. He cited studies from Ireland and Scotland where restoration efforts had proven ineffective in offsetting greenhouse gas emissions from degraded peatlands, underscoring their irreversible destruction. Valdés explained that peatlands form over millennia, originating from Ice Age glacier retreat, which left water-saturated landscapes ideal for peat accumulation. The combination of high humidity, acidity, and cold climates in regions like Chilean Patagonia has fostered extensive peatland systems, now threatened by climate change and human intervention. However, he criticized Chile's lack of validated data, arguing that current estimates—derived from native forest registries—underrepresent peatlands' true ecological and economic value, hindering effective policymaking.

Flavia Liberona, Director of the Terram Foundation, described peatlands as transitional ecosystems characterized by permanent water saturation, low oxygen levels, and high acidity—conditions supporting unique biodiversity and critical hydrological functions. She highlighted that peatland mosses can retain up to twenty times their dry weight in water, making them indispensable for water purification and drought resilience—a vital function in Chile's increasingly arid regions. Liberona contrasted peatlands' carbon storage capacity with forests: while Chilean forests store 39 million

11. This roadmap entitled 'Conservation and Sustainable Management of Chilean Peatlands' was drafted by the Wildlife Conservation Society (WCS). The proposal identified "the principal direct and indirect threats affecting the state of conservation of wetlands" in Chile; and identified the opposing legal framework as a threat to their conservation. See (Wildlife Conservation Society – Chile, 2020).

tons of carbon per million hectares, Patagonian peatlands hold an estimated 1.548 billion tons, underscoring their outsized role in climate mitigation. However, she warned that peat extraction releases methane (CH₄), a potent greenhouse gas, further complicating Chile's emission reduction efforts.

Liberona acknowledged that regulation could impact local communities dependent on peat extraction but insisted the state must promote alternative livelihoods. She stressed that Chile would fail to meet its NDCs for 2025 and 2030 if current practices persisted. Unlike other panelists, she advocated for including peatlands in the Mining Code as non-concessionable and mandating environmental impact assessments prior to extraction. To strengthen this framework, she proposed integrating these measures into Bulletin No. 11.672-12 (banning peat extraction on Chiloé Island) and Bulletin No. 14.179-12 (declaring *Sphagnum* moss a resource of national importance). If adopted, these initiatives would establish a “robust and integrated” regulatory system.

Bárbara Saavedra, Director of the Wildlife Conservation Society (WCS) in Chile, reiterated peatlands' global significance as “bastions for humanity's safety”, warning that their destruction could double atmospheric CO₂ releases. She cited evidence that peatland degradation already accounts for 5% of global CO₂ emissions, highlighting the urgency of integrated, sustainable legislation. Saavedra argued that peatlands' multidimensional value—spanning climate regulation, water purification, tourism, and cultural heritage—justified protection under international frameworks, including UN environmental programs. In her closing remarks, she reiterated the need for integrated legislation that balances conservation with sustainable use, aligning peatlands' climate and biodiversity value with international frameworks.

Representatives from organizations like the Centre for the Study and Conservation of Natural Heritage in Chiloé (CECPAN) acknowledged the ecological risks of unregulated extraction but stressed the need for pragmatic regulation, particularly for ‘pompón’ (*Sphagnum* moss), whose harvesting had altered hydrological patterns in the region (Domínguez et al., 2015). These actors supported provincial protection networks that safeguard local economies while permitting controlled collection, though they conceded that scientific proposals for sustainable management remained unfeasible due to shortfalls in species-level data and enforcement challenges.

Claudio Cárdenas, representing the Agricultural and Livestock Service (SAG), outlined the agency's regulatory role under Decree No. 25 (2017), which governs *Sphagnum magellanicum* harvesting. The decree's provisions—such as prohibitions on heavy machinery, mandatory manual harvesting, and requirements to leave a 5 cm layer of live moss—were designed to ensure regeneration, though persistent enforcement voids (e.g., limited oversight, non-compliance) undermined their effectiveness, as noted in legislative debates. These challenges highlighted how institutional weaknesses hindered sustainable management, even when regulatory frameworks existed on paper.

Gabriela Navarro, a scientific representative from Austral University, expanded the debate beyond traditional uses of peatlands to include commercial applications such as thermal insulation and water filtration. She warned that these new demands—coupled with evidence of regeneration failures (Jorquera-Jaramillo, 2012)—were driving ecosystem degradation, particularly in regions like Chiloé. Navarro's testimony also underscored the precarious labor conditions tied to peat extraction, a sector generating 20 million USD annually (INFOR, 2020) but imposing environmental and social costs disproportionately on local communities. She called for strengthened regulatory frameworks and alternative livelihoods, though she recognized the economic dependencies that complicate transitions away from extraction.

At the heart of these negotiations was the precautionary principle, which became a cornerstone of the legislative process (Delgado et al., 2025, pp. 29–30). The debates clarified two distinctions that reshaped the legal and political framework: i) Scientific reclassification: Peatlands were redefined as distinct from fossil fuels—a paradigm shift that challenged their historical treatment as mineable resources under existing legislation. While this redefinition aligned with global climate discourses and Chile's NDC commitments, it also introduced ambiguities by framing peatlands as ecological systems that could still be subject to regulated exploitation under the guise of “sustainable management.” ii) Differentiation of extraction scales: A distinction was drawn between traditional small-scale uses (e.g., local fuel sources, artisanal harvesting) and industrial-scale extraction, which had accelerated ecological degradation and disrupted hydrological systems. However, this differentiation risked depoliticizing the controversy by presenting peatlands as “manageable resources”—a technocratic framing that obscured the power dynamics between subsistence harvesters, agribusiness corporations, and policymakers.

Together, these distinctions exposed the political dimensions of peatland governance, where economic actors reshaped peatlands into commodities while scientific evidence was mobilized to justify both conservation and exploitation—ultimately reducing intricate socio-ecological conflicts to market-based solutions.

As Jasanoff argues, knowledge is not a neutral reflection of reality but a product of negotiations among actors who reconfigure both ecosystems and governance structures (2004, p. 2). This aligns with Bandola-Gill et al. (2022) understanding of co-production as a relationship between science and politics, where knowledge is shaped by power dynamics and institutional agendas (Åm, 2015). Latour's actor-network theory (2005) further helps explain how scientific knowledge is mobilized as a tool for political action in environmental controversies.

Unlike other Latin American contexts, local and Indigenous communities potentially affected by peatland policies were not invited to participate in these discussions. Chile's centralized power structures contrasted with more inclusive approaches elsewhere in the region (Gómez Lee & Roth Deubel, 2023; Goñi Mazzitelli, 2025; Porreca & Janoschka, 2024). Rather than incorporating situated knowledge (Vienni-Baptista et al., 2022), the debate relied primarily on theoretical and technocratic expertise. This exclusion highlights a failure of knowledge co-production, in which perspectives crucial for just and effective governance were sidelined in favor of top-down narratives.

2.3 The Argument for Regulation: The Inevitability of Extraction?

After expert hearings and the Environmental Commission's report, the 12 deputies present initially approved the idea of legislating on peatlands. Yet what began as an ecocentric consensus—defining peatlands as “strategic reserves” for climate and water regulation—shifted toward an economic vocabulary that prolonged the debate for nearly three years. This semantic turn redefined the central question: should peatlands be protected as ecosystems or managed as resources?

Global knowledge about peatlands, initially presented as a climate and biodiversity imperative, was gradually reframed through a dual vocabulary: peatlands remained “strategic reserves” aligned with carbon and water goals, but were also treated as “economic resources” for extraction and trade. This revealed a linearity in knowledge production: expert plurality was short-lived, and the debate followed a path increasingly shaped by political, social, and economic interests. The tension became visible when Deputy Javier Macaya (UDI) proposed amendments replacing the conservation-focused language—“in order to preserve and conserve them”—with terms emphasizing climate adaptation, biodiversity conservation, and ecosystem services. The Senate's original proposal defined peatlands and peat with an ecological approach:

a) *“Peatland: A type of wetland constituting an ecosystem characterized by the continuous and progressive production of peat, normally containing on its surface plant species with which it is functionally connected, such as Sphagnum moss.”*

b) *“Peat: A mixture of plant remains at various stages of decomposition, present in peatlands.”*

In contrast, Macaya proposed:

a) *“Peatland: A type of wetland characterized by the production of peat [removing “continuous and progressive”], normally containing on its surface plant species with which it is functionally connected, including Sphagnum moss.”*

b) *“Peat: Organic, non-mineral soil, consisting of a mixture of dead plant remains at various stages of decomposition, accumulated with variable thickness, containing at least 50% organic matter by dry weight, which is part of the peatland.”*

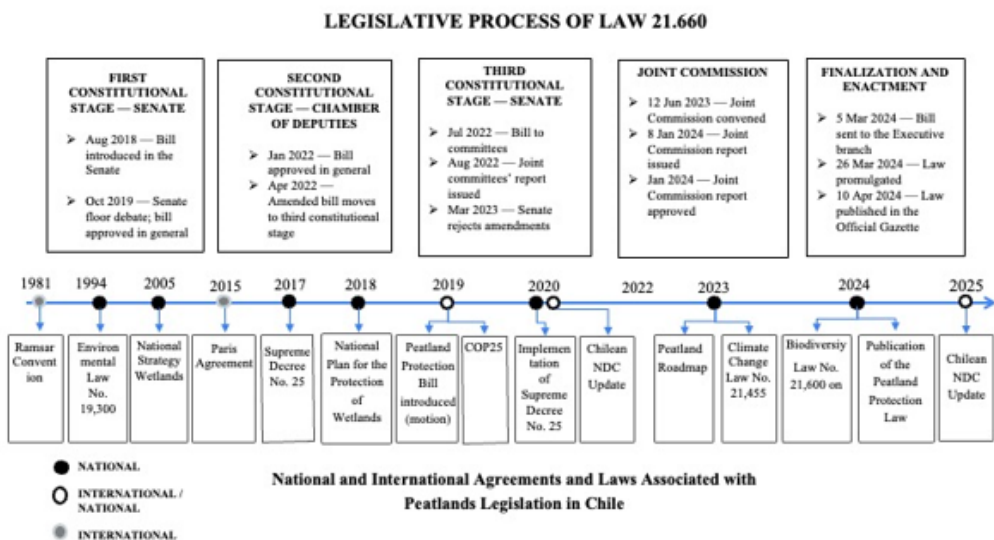
This change was not accidental: by removing the “continuous and progressive” nature of peat production and adding terms like “dead” or “variable thickness,” Macaya reframed peatlands as functional resources rather than fragile ecosystems. The controversy shows how legal language can reconfigure scientific content, making extraction compatible with the discourse of sustainability and weakening the integral the protection, conservation and restoration of peatlands, with the aim of maintaining or increasing their capacity to act as carbon sinks (Mansilla et al., 2021, p. 167).

The situation worsened when a group of center-left deputies proposed Articles 3° and 4°, which sought to explicitly prohibit extraction, drainage, peat and moss commercialization, and impose fines of 10 to 1,000 UTM for non-compliance. However, Environment Minister Carolina Schmidt criticized this total ban, arguing it failed to distinguish between peat (non-renewable) and *Sphagnum* moss (used by Indigenous and local communities for subsistence). She noted that such a measure ignored regional differences: while peatlands in Chiloé are vital for water regulation, their hydrological role is secondary in Aysen y Magallanes regions. Schmidt proposed sustainable management plans and oversight instead, warning that an absolute prohibition would be unfeasible across 4 million hectares without effective enforcement mechanisms.

Meanwhile, new Articles 5° and 6°—which amended the Mining Code (to declare peatlands non-exploitable) and Law 19.300 (requiring Environmental Impact Assessments for any intervention)—reflected an attempt to balance conservation and economic use.

From July 2021 onward, Chile’s peatland legislation entered a new phase focused on reconciling extraction with the bill’s original ecological goals. This shift coincided with the final months of Sebastián Piñera’s administration and pressure from agricultural and mining sectors against stricter regulation. In January 2022, Piñera submitted amendments proposing regulated *Sphagnum* management plans and transition periods for compliance. Although Gabriel Boric’s government, inaugurated in March 2022, promised an ecological orientation, debates remained marked by economic priorities, international comparisons, and competing claims over participation. In March 2023, the lack of consensus led to the creation of a Joint Committee, which reviewed the Chamber’s text and adjusted technical and legal details, including the definitions of peatlands and peat.

After approval by the Joint Committee, the bill returned to the Senate and Chamber of Deputies for its final vote, where it was ratified by a wide majority. The final text established peatlands as strategic reserves for climate change mitigation, biodiversity conservation, and water regulation. It prohibited peat extraction throughout the national territory, while allowing the sustainable management of *Sphagnum magellanicum* vegetation under approved management plans and environmental oversight. The law was published in the Official Gazette on April 10, 2024, marking a milestone in the protection of these critical ecosystems, particularly in southern Chile, where their degradation threatened freshwater availability and carbon capture.



3. Discussion and Concluding Remarks: The End of the Controversy and Law 21.660¹²

Law No. 21.660 represents a significant step toward fulfilling Chile's Nationally Determined Contributions (NDCs), particularly in climate change mitigation and the protection of critical ecosystems. The law prohibits peat extraction (Article 3°) and establishes criteria for the sustainable management of *Sphagnum* moss (Articles 4° and 5°), including regeneration requirements and approval by the Biodiversity Service (SBAP). Its contribution is therefore twofold: it strengthens the legal recognition of peatlands as climate-relevant ecosystems, while also revealing the difficulties of translating global commitments into enforceable domestic regulation.

12. The full text of the Law can be found in the Library of the Congress at this link: <https://www.bcn.cl/leychile/navegar?idNorma=1202472>.

However, the law has critical weaknesses that could limit its effectiveness. Oversight is delegated to the SBAP and SAG—agencies with limited resources and uneven operational capacity—placing compliance at risk in remote areas such as the Magellanic archipelago territories. The absence of a moratorium during the two-year period required to draft regulations also creates a legal void in which questionable management plans could be approved. Although the law includes a just transition strategy for moss harvesters (Transitional Provision 5°), this measure remains voluntary and dependent on interministerial coordination, weakening its potential contribution to climate justice and equity.

The law reflects the three axes of tension that dominated the legislative debate between 2018 and 2024, but its solutions prioritize political compromise over ecological coherence. The conservation-versus-exploitation controversy is resolved ambiguously: while the original Senate proposal called for a total ban on extraction, the final version prohibits peat extraction and allows *Sphagnum* harvesting under sustainable management plans. This compromise protects local economies but leaves open the question of whether sustainability can be verified without stronger oversight, clearer sanctions, and sufficient institutional capacity.

The law inadequately addresses the demands of Indigenous peoples and local communities. Although it includes a just transition strategy (Transitional Provision 5°) and funds for moss substitutes (Transitional Provision 4°), these measures are non-binding and depend on the political will of multiple ministries. Additionally, management plans (Article 4°) do not guarantee Indigenous participation in their design, perpetuating a colonial dynamic where communities are tolerated as users but not recognized as ecosystem stewards. This contrasts with the principles of climate justice and citizen participation promised in the NDCs.

Oversight and enforcement remain the law's weakest points, inherited from the 2021 controversies. Although the text assigns supervision to the SBAP and SAG (Article 6°), no additional resources are allocated to strengthen their operational capacity. The SBAP, established only in 2023, still lacks an effective presence in remote territories, while the SAG has historically shown ineffectiveness in overseeing extractive activities. As Gearey et al. (2025, p. 8) note, most countries—including Chile—lack sufficient public funding for peatland restoration. While Scotland allocates £250 million to its Peatland ACTION program, Law 21.660 does not establish a dedicated fund, limiting its implementation to prohibitions without economic alternatives.

Furthermore, the two-year deadline for drafting regulations (Article 5°) leaves a legal void in which non-sustainable projects could be approved, repeating the pattern of well-intentioned but poorly implemented regulations that characterized earlier debates.

The debate over peatland regulation in Chile illustrates how scientific evidence, legal frameworks, and socio-economic interests reshape both the perception and governance of these ecosystems. Initially, discussions emphasized their ‘glocal’ value as ecosystems relevant to local livelihoods and global climate mitigation. However, as the parliamentary process unfolded, invoking global standards or scientific consensus proved insufficient to secure strong regulation. The debate instead exposed the institutional fragility of Chile’s environmental governance, where conservation goals were repeatedly mediated by competing economic interests and uneven enforcement capacity—a dynamic Bebbington and Bury (2013) describe as the co-optation of reforms by entrenched extractivist agendas.

This tension is reflected in how, while the IPCC succeeded in globalizing the climate change discourse (Miller, 2004), Chile’s Law 21.660 reduced peatlands to a local issue—such as extraction in Magallanes—overlooking their role in global CO₂ emissions and CH₄ (Joosten et al., 2012). National political frameworks thus co-opted global narratives, prioritizing extractivist interests over climate goals. As Peterson and van Asselt (2026) highlight, opposition by interest groups—particularly in contexts where industrial actors hold significant political sway—posed one of the most pernicious risks to implementation. In Chile, this dynamic played out as agribusiness and mining lobbies successfully diluted the law’s original prohibitions, ensuring that *Sphagnum* extraction—critical to local economies—remained permissible under vaguely defined “sustainable management” standards. The Chilean case therefore illustrates a wider dilemma for climate governance in the Global South, where global environmental commitments are often reframed through domestic political economies shaped by extraction, territorial inequality, and uneven regulatory capacity.

The peatland controversy exemplifies the difficulty of reconciling conservation with extractivist pressures in Chile. The trajectory of the debate—from global ecological imperatives to negotiated regulation—exposes a broader pattern in Chile’s environmental governance: sustainability commitments may be weakened when they confront entrenched economic interests and limited institutional capacity.

The law’s exclusion of Indigenous communities and local harvesters from decision-making processes further underscores how power imbalances shape policy outcomes. By sidelining these actors, the law perpetuates a top-down governance model that prioritizes economic continuity over ecological urgency. This aligns with Peterson and van Asselt’s (2026) observation that such dynamics reflect the co-optation of reforms by entrenched extractivist agendas, where well-intentioned policies risk being reduced to negotiable commodities in contexts of institutional fragility. The peatland debate thus shows that environmental governance is not merely a technical or scientific endeavor, but a contested socio-political process in which outcomes are shaped as much by power relations as by evidence.

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