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Political Will Has Been Critical for Protecting Forests in the Brazilian Amazon and Indonesia

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ABSTRACT

Deforestation remains a prominent contributor to climate change and biodiversity loss. Yet while 76 million hectares of primary tropical forest have been lost since 2000, two thirds of tropical forests remain. What factors have been most important for protecting these forests? Unlike policies, which often have clearly defined spatial and temporal boundaries, the roles played by dynamic underlying political and economic structures, and their interactions with policies and emergent factors, can be challenging to identify. Expert knowledge can bridge this gap by revealing the full range of factors needed to achieve forest protection. Here, we conducted a Delphi study with 36 experts, focusing on the Brazilian Amazon and Indonesia. Our results highlight the importance

Joss Lyons-White and Matthew Spencer are co-first authors.

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of political will, civil society advocacy, and intergovernmental diplomacy, and shifts in the importance of different factors over time. These findings illuminate the interactions between international and national structures and policies in generating the conditions for forest protection.

1 | Introduction

Global demand for agricultural commodities is a major driver of tropical deforestation, contributing to climate change, biodiversity loss, and the destruction of forest-based livelihoods (Pendrill et al. 2022; Struebig et al. 2025). Although "zero deforestation" has proven elusive in commodity production (Lyons-White et al. 2020), high deforestation rates are not inevitable. Rates have fallen substantially in various countries (e.g., Brazil, Colombia, Ecuador, Indonesia) at different times since 2000 (Garrett et al. 2021; Gaveau et al. 2022; Calvas et al. 2024; Prem et al. 2020). In the Amazon, Borneo, and the Congo Basin, large swaths of tropical forest still exist. Globally, over a billion hectares of primary tropical forests remained in 2020 (WRI 2024).

Among the two thirds of tropical forests that remain, substantial areas are protected by inaccessibility (Busch and Ferretti-Gallon 2023). In more accessible areas where agricultural frontiers have expanded, advances in econometric methods and geospatial analysis have revealed the contributions of individual policies to reducing deforestation (Garcia and Heilmayr 2024) and the impacts of diverse governance, economic, and demographic factors (Busch and Ferretti-Gallon 2023; Benzeev et al. 2022; Wuepper et al. 2024). Emerging research is also revealing how policies can be combined in context-specific mixes to reduce deforestation (Furumo and Lambin 2021). Yet the underlying structural factors that influence the adoption of individual policies often have unclear spatial, temporal, and social boundaries, making them challenging to assess using geospatial and statistical methods. Qualitative studies have highlighted the underlying political and economic structures that drive deforestation (Hecht 1993, 2005; Dauvergne 1993), but less focus has been placed on the political and economic structures that lead to greater deforestation control. No matter what the methodological approach, it remains challenging to assess the relative impacts and interactions of direct policies and underlying factors for protecting forests.

Co-producing knowledge with experts can bridge these knowledge gaps by helping to synthesize understandings of complex phenomena (Bammer et al. 2020; Miller and Wyborn 2020). Although expert opinion is often ranked low in evidence hierarchies (Golden and Bass 2013), it can be useful for investigating systems where controlled studies cannot explain all interacting elements. Indeed, co-production is fundamental to both public administration and sustainability science as practitioners must engage with a diversity of knowledge to manage complex social and social–ecological systems (Miller and Wyborn 2020). By integrating box-and-arrow analytical models of forest protection with co-production, we can both examine the relative importance of different factors and expand the boundaries of what these models include. This enables a more holistic understanding of the linkages between systemic political–economic contexts and policy levers that can protect forests.

Here, we applied the Delphi method, a systematic approach to elicit expert insights, to co-produce an understanding of the factors leading to forest protection in the Brazilian Amazon and Indonesia, which contain some of the world's largest remaining tropical forests. We focused not only on individual policy instruments, but also on the factors leading to their creation, destruction, existence, or absence. Although the Brazilian Amazon is a biome and Indonesia is a country, and each comprises multiple subregions, they both represent large forest basins in which combinations of factors have reduced deforestation dramatically at different times in recent decades (see Supplementary Information). Our first aim was to identify the range of factors that experts considered important for forest protection in each region under actual and idealized conditions. Next, we aimed to identify areas of consensus about which factors protected forests during different periods. Our integration of iterative Delphi surveys with a workshop discussion enabled us to reveal the complex and dynamic interactions linking systemic features and policies to perceived forest outcomes and identify the most important features in each system.

2 | Methods

The Delphi method is a structured approach to solicit expert insights through multiple rounds of surveys (Mukherjee et al. 2015). By iteratively conducting surveys and providing participants with anonymized results, groups of experts can generate and refine multiple views on a topic while avoiding unconstructive features of discussions such as domineering individuals and groupthink (Belton et al. 2019). The aim is often (though not always) to produce consensus according to a predefined criterion (Mukherjee et al. 2015). Delphi can be used to fill data gaps, evaluate policies, validate models, and address complexity, using inputs from different disciplines and locations (Mukherjee et al. 2015; Belton et al. 2019).

We conducted an online Delphi with semistructured questionnaires (Supplementary Information) to facilitate open thinking about the most important factors influencing forest protection in the Brazilian Amazon and Indonesia. Two survey rounds were conducted in Qualtrics (Provo 2024) to identify factors and assess their perceived importance. We defined consensus between experts as an interquartile range (IQR) of up to 25% of the scale range for Likert scale items (i.e., 1.75 on a 7-point scale) (Beiderbeck et al. 2021). Following recent conservation studies (e.g., McCarthy et al. 2024), the Delphi was modified by including a workshop after the second-round survey to discuss findings with participants. Workshop discussions indicated that the time periods when forest protection factors occur are critical. A third-round survey was therefore conducted to assess participants'

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TABLE 1 | Experts in the Brazilian Amazon and Indonesia taking part in each survey round. "National" columns show participants who were Brazilian or Indonesian; for these participants, nationality correlated exactly with regional expertise. "International" columns show participants who were citizens of other countries. Percentages show the proportion of participants for each region in each round who were, respectively, experts from Brazil or Indonesia (national) or from other countries (international). Details of participants' professional roles (researcher or practitioner) are shown in Table S1.

	Participants: Brazilian Amazon			Participants: Indonesia			Total participants per round
	National	International	Region total	National	International	Region total	
Round 1	8 (47%)	9 (53%)	17	11 (52%)	10 (48%)	21	36[a]
Round 2	8 (53%)	7 (47%)	15	8 (50%)	8 (50%)	16	30[a]
Round 3	7 (47%)	8 (53%)	15	10 (53%)	9 (47%)	19	33[a]
Workshop	6 (50%)	6 (50%)	12	8 (57%)	6 (43%)	14	26

[a]Two participants had expertise in both regions. Both answered the Round 1 survey for both countries; one answered the Round 2 and Round 3 surveys for both countries.

judgments about factors' importance over time. All respondents to the first-round survey (which included all co-authors except J.L.W. and M.S.) were invited to become study co-authors and 32 accepted.

2.1 | Participant Selection

Following guidance on Delphi sample sizes (Manyara et al. 2024), a direct sampling approach was used to compile a list of ~60 researchers and practitioners with expertise on forest conservation spanning the Brazilian Amazon (n = 33) and Indonesia (n = 26). Candidates were invited to participate by email. Participants (Tables 1 and S1) either had recently authored a high-profile paper, had participated in an expert panel, or were members of an organization doing policy or advocacy work on the topic.

2.2 | Identifying Factors and Evaluating Their Importance

The Round 1 survey involved open-ended questions and focused on identifying forest protection factors during the most successful recent periods of reduced deforestation, in the Brazilian Amazon between 2004 and 2015 and in Indonesia since 2016. Qualitative data were coded in NVivo (QSR International 2022).

In Round 2, participants selected the "Top Five" most important factors in their region from a list of factors identified in Round 1. Only the 15 most frequently mentioned—and, by implication, most important—factors were listed to avoid overburdening participants (Table S3) (Belton et al. 2021). Factors not included in participants' Top Five lists were ranked on 7-point Likert scales. Participants were then presented with a conceptual model of factors influencing forest protection (Figure 1), which incorporated the most-mentioned factors across both regions in Round 1. Participants selected five factors from this model that would constitute an ideal mix to protect forests. Data from Round 2 (and Round 3) were analyzed in R (v.4.3.3).

After Round 2, factors selected by ≥33% of participants in Top Five or ideal mixes were presented in a 2-hour online workshop. The most frequently selected factors were arranged into a simplified model of forest protection for each region (Figure S1), which provided a tool to spark discussions in region-specific breakout groups and a plenary with all participants. Workshop discussions informed the interpretation of findings.

2.3 | Exploring Changes in Factors' Importance Over Time

In Round 3, the timeframe was expanded to three decades (1990s, 2000s, 2010s). Participants rated the importance of factors in each decade using 7-point Likert scales. Factors were presented if in Round 2 there was consensus (IQR ≤1.75) that they were important (median score >4, "Neither important nor unimportant") or if they were selected by ≥33% of participants in their Top Fives or ideal policy mixes.

3 | Results

3.1 | Identifying Factors and Evaluating Their Importance (Rounds 1 and 2)

3.1.1 | Brazilian Amazon

For the Brazilian Amazon, 73 forest protection factors were identified in Round 1 (Table S2). Factors related to the public sector immediately emerged as the most frequently mentioned (Table S3). These included enforcement of national law (n = 15 participants), political will and leadership (hereafter "political will") (n = 13), and national legislation including the Forest Code (n = 12).

This tendency to focus on the importance of the Brazilian state continued in Round 2. The factors most frequently selected in experts' "Top Fives" were political will and law enforcement (73% of participants each) (Figure 2a), followed by the Plan for Prevention and Control of Deforestation in the Legal Amazon (Portuguese acronym PPCDAm; 67%) and monitoring capacity (60%). These selections were often reflected in participants' ideal mixes: political will was selected by 73%, followed by law enforcement (60%), alongside recognition of Indigenous and traditional

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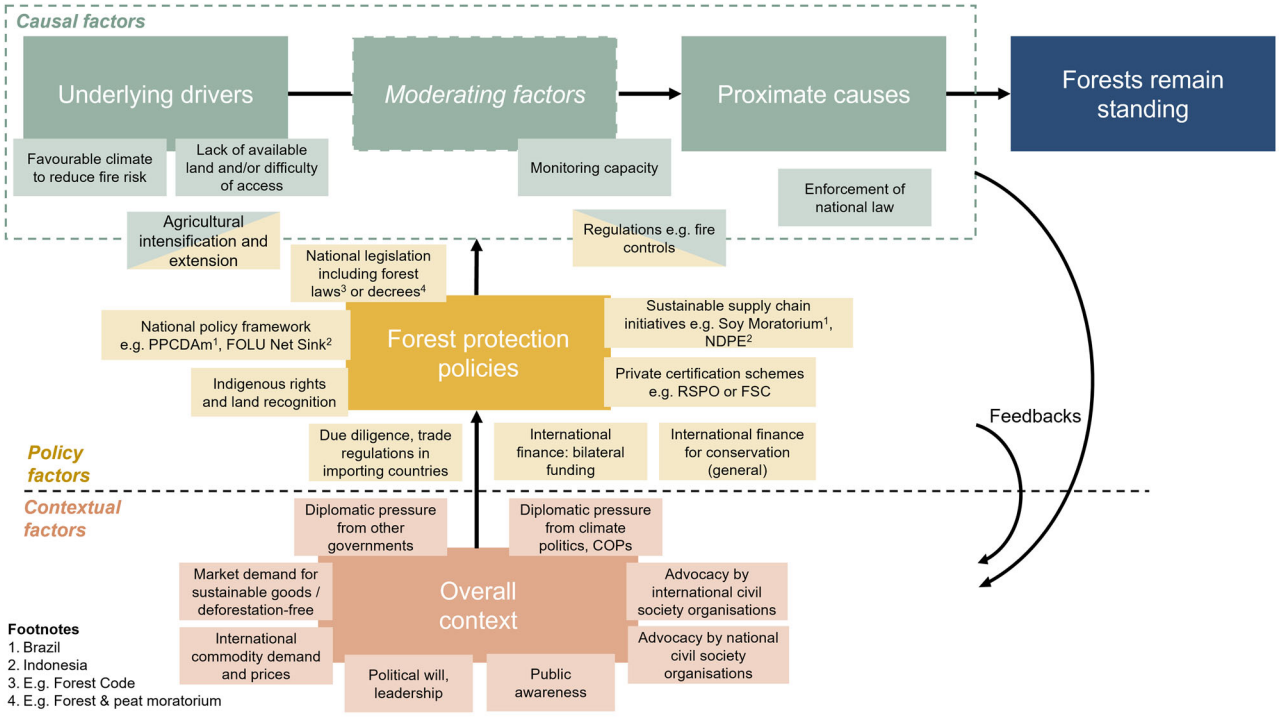


FIGURE 1 | A conceptual model of forest protection which organizes different types of forest protection factors, based on a model of the mechanisms influencing deforestation by Hänggli et al. (2023). The model is not necessarily a valid representation of forest protection but was used as a heuristic device in the Round 2 survey to arrange the factors mentioned by participants from both regions in Round 1 and to stimulate discussions in the workshop. Factors were arranged into five groups. Three of these are presented as "causal" forest protection factors (green): (1) underlying drivers of forest protection; (2) proximate causes of forest protection; and (3) moderating factors that influence whether underlying drivers become causes. Group 4 represents policies (yellow). Group 5 represents contextual factors (pink). Participants selected factors from this model for their ideal mixes in the Round 2 survey.

peoples' rights and lands (hereafter "Indigenous rights"; 60%) (Figure 2b).

The roles of the private sector and civil society were deemed important, though less so. International finance appeared in the Top Five for 47% of participants, while forest-focused supply chain policies (FSPs; policies by companies to reduce deforestation in their supply chains) were selected by 33%. Despite being ranked lower than public-sector factors, participants identified international initiatives as important components of an ideal mix, with 33% highlighting each of international finance and the UN Framework Convention on Climate Change Conferences of the Parties (COPs).

When participants rated factors' importance for the Brazilian Amazon, 15 of 17 factors achieved consensus (IQR ≤1.75; all except agricultural intensification and diplomatic pressure from other governments). Sixteen of 17 were considered at least "somewhat important" (median score >4; all except Due Diligence legislation/trade regulations) (Figures S2 and S3). The factors considered most important were monitoring capacity (median score 7, "very important"), law enforcement (6.5), the Forest Code (6, "Important"), and PPCDAm (6).

3.1.2 | Indonesia

Seventy-eight forest protection factors were identified for Indonesia in Round 1 (Table S2). In contrast to the Brazilian Amazon, both private- and public-sector factors emerged as frequently mentioned (Table S3). Private-sector factors included FSPs (including companies' commitments to "zero deforestation"; $n = 15$ participants) and international commodity demand ($n = 10$). On the public-sector side, participants mentioned the national moratorium on new logging licenses in forests and peatlands ($n = 9$) and fire controls ($n = 9$).

Participants' perceptions of factors' importance broadened in Round 2 to include activities not just by the public and private sectors but also by civil society (Figure 2c). FSPs remained the most frequently selected factor (69%) in Top Five lists, followed by the forest moratorium (62.5%). The moratorium on new oil palm concessions, law enforcement, and advocacy by civil society organizations (CSOs) were each mentioned by 50%.

The list composition and frequency of selection of different factors shifted when participants were asked to consider an ideal mix. FSPs dropped to only 37.5% of participants, while law enforcement grew to 62.5%, and political will—not among the most frequently mentioned factors in Round 1—was selected by 56.2% (Figure 2d). Indigenous rights, another factor not mentioned in Round 1, was selected in the ideal mix by 37.5%. Market demand for sustainable goods, advocacy by CSOs, and national legislation remained important, each selected by ≥33%.

Participants' ratings of factors' importance in Indonesia achieved consensus for all factors except bilateral finance (e.g., the Norway–Indonesia partnership) and public awareness (IQR 2.0

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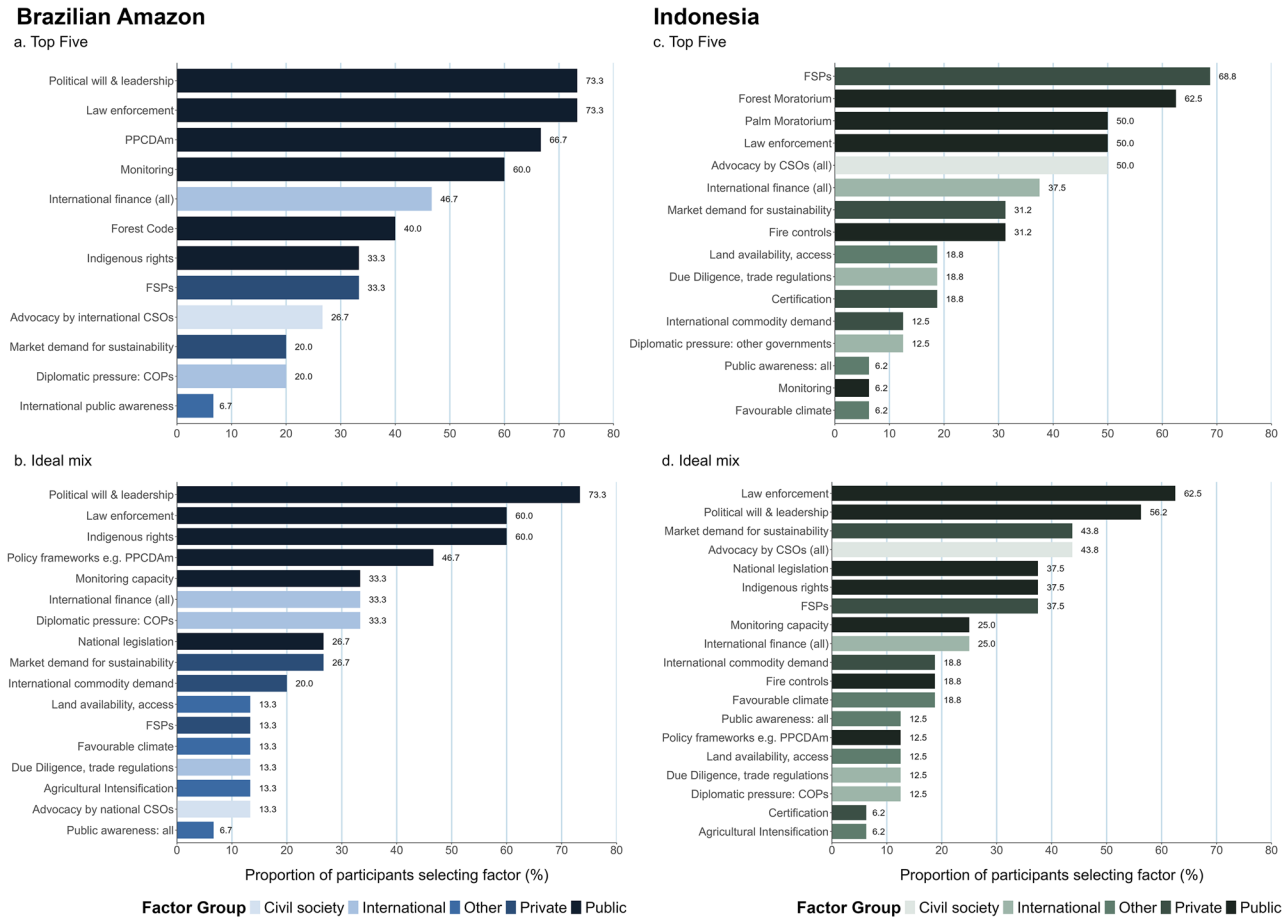


FIGURE 2 | Proportion of participants in Round 2 with expertise in the Brazilian Amazon (left panel, $n = 15$) and Indonesia (right panel, $n = 16$) selecting factors as part of their Top Five most important (a, c) or as part of an ideal mix (b, d) to protect forests. Factors have been grouped according to whether they principally relate to the public, private, civil society, or international sectors, or other domains. "Monitoring" and "Monitoring capacity" have been classed as "public" due to the predominance of state-led forest monitoring in Brazil, although we note that this differs in Indonesia. "Public awareness" has been classed as "Other," as it may be either public or international. Labels vary between plots because factors selected in Top Five lists were region specific, whereas factors in ideal mixes were region general. COPs, Conferences of the Parties; CSOs, civil society organizations; FSPs, forest-focused supply chain policies; PPCDAm, Plan for Prevention and Control of Deforestation in the Legal Amazon.

for both). FSPs, advocacy by national CSOs, fire controls, and the forest and oil palm moratoria were considered "important" (median score 6). All other factors were "somewhat important" (median 5; Figures S2 and S3).

3.2 | Evaluating Factors' Importance Over Time (Round 3)

For both countries, participants' ratings of factors' importance increased over time (Figure 3), as did the level of consensus (Figure S4; Tables S4 and S5).

3.2.1 | Brazilian Amazon

Despite a general trend of increasing consensus over time, there were shifts in the distribution of factors' perceived importance in each period. There was consensus that advocacy by international CSOs and Indigenous rights (both median 6, "important") were the most important factors in the 1990s. By the 2000s, however, Indigenous rights, political will, law enforcement, monitoring capacity, and national policy frameworks like the PPCDAm (implemented in 2004) all rose to "very important." In the 2010s, the Forest Code (revised in 2012) joined political will and monitoring in being considered "very important." However, Indigenous rights, law enforcement, and the PPCDAm (which underwent budget cuts in the same period) declined to "important." Market demand for sustainable goods and FSPs never achieved median ratings greater than "somewhat important." There was consensus that national and international public awareness were "important" in the 2000s and 2010s.

3.2.2 | Indonesia

In Indonesia, no factor obtained a median rating greater than "somewhat important" in the 1990s (Figure S4). However, by the 2000s and 2010s, consensus emerged that a mix of public, private, and civil society factors was "important" (Figure 3). There was consensus that both political will and advocacy by national and

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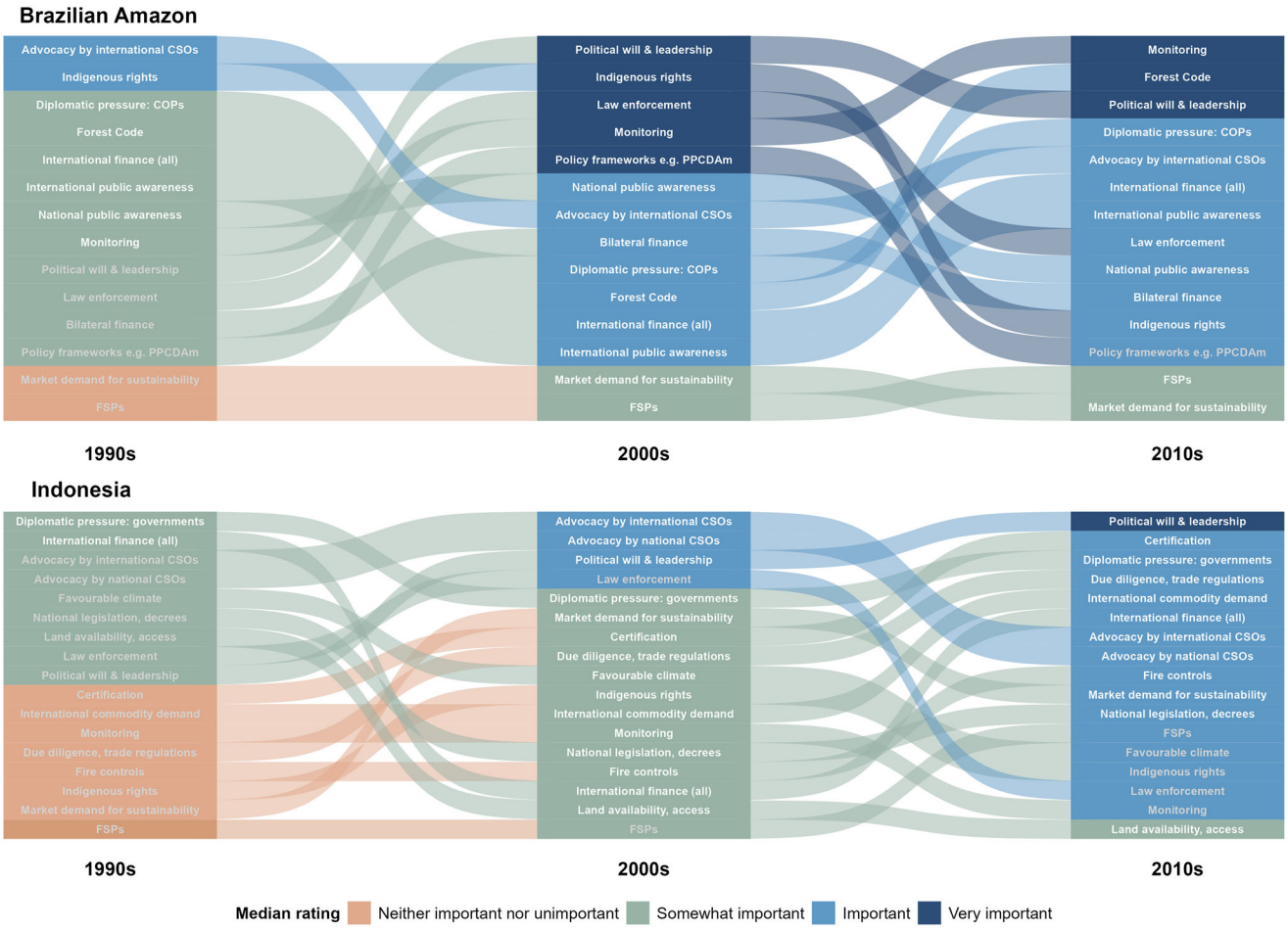


FIGURE 3 | Changes in the perceived importance of forest protection factors in the Brazilian Amazon and Indonesia over three decades: 1990s, 2000s, and 2010s. Participants indicated the importance of factors on 7-point Likert scales ranging from "*Very unimportant*" to "*Very important*." Consensus was defined as an interquartile range (IQR) ≤1.75. Within time periods, factors are listed by median score (highest to lowest) and then by IQR (ascending); thus, the most important factors with the greatest agreement are listed at the top. Factors in gray text did not achieve consensus.

international CSOs were "important" in the 2000s and 2010s. Political will was the only factor rated "very important" in any period (the 2010s). Notably, perceptions about the role of FSPs (the most frequently mentioned factor in Rounds 1 and 2) shifted substantially; once timing came into focus, participants failed to agree about FSPs' importance in any period. This is likely explained by the fact that participants honed into the role of private certification programs rather than FSPs more generally. Despite disagreement about the magnitude of their importance over the years, on average FSPs were deemed "important" in the 2010s.

4 | Discussion

Our findings highlight the complex dynamics affecting forest protection across the Brazilian Amazon and across Indonesia. By drawing on expert knowledge, we revealed the perceived importance of combinations of forest protection factors including political will, advocacy by CSOs, and international diplomacy, which are often overlooked in quantitative evaluations of policy and governance impacts (Benzeev et al. 2022).

In the Brazilian Amazon, participants considered the state to have an important role in forest protection, while in Indonesia, they highlighted a complex and evolving mix of public, private, and civil society factors. Our results also point to uncertainty about the importance of private-sector initiatives including FSPs. These initiatives have received tremendous attention and are now being codified into forest-focused due-diligence regulations in the European Union, the United Kingdom, and other countries (but not yet in the major markets of China and India). Yet in the Brazilian Amazon in particular, the importance of private-sector initiatives was considered low relative to the state. In Indonesia, there was more certainty about the importance of private certification programs, but consensus about the importance of FSPs over time was lacking.

In both regions, differences between participants' perceptions of the factors already influencing forest protection and an ideal mix highlighted the difference between actual historical responses and aspirations for a more rounded approach incorporating aspects of hybrid (Lemos and Agrawal 2006), multi-scalar (McGinnis and Ostrom 1996; Ostrom 2010), and transformative governance (Pascual et al. 2022). In the Brazilian Amazon, we saw

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a desire for state governance and international finance to be complemented by bottom-up efforts to expand rights and empower Indigenous communities. The lower perceived importance of monitoring in the ideal mix may reflect it having been considered as a given due to the institutional resilience of the National Institute for Space Research (INPE). In Indonesia, we saw a desire to complement private influence with increased state inputs in a more hybridized system.

The similarities and differences between actual and idealized mixes of factors across the Brazilian Amazon and Indonesia reflect their distinct political economies. In both countries, perceptions of state importance were low in the 1990s. This may be linked to the fact that from the 1950s to the 1980s, the state in both Brazil and Indonesia supported forest clearing for national security and integration, as well as to service foreign debt (Dauvergne 1993; Hecht 2005).

In the 2000s, however, the factors participants considered most important in the two regions diverged. In this period, Brazil's government leveraged a longstanding, centralized policy in the Forest Code, which had (on paper) restricted forest clearing since 1965. Since the Forest Code was largely unenforced until the 2000s, the PPCDAm enabled the government to ramp up enforcement on private lands and expand protected areas on undesignated government lands (Tsujino et al. 2016; West and Fearnside 2021). This was prompted by social movements, international pressure, and CSO advocacy (Schwartzman et al. 2010). In Indonesia, the decentralization of forest management following the fall of the Suharto regime in 1998, and subsequent recentralization in 2002, created a complex set of governance arrangements (Barr et al. 2006). This complexity may explain the lack of agreement about the importance of law enforcement in Indonesia in Round 3. In this context, private actors may have offered a more impactful target for CSO advocacy, leading to greater perceived importance of market governance mechanisms including private certification.

Despite these differences, the perceived importance of a range of public, private, and civil society factors increased over time in both regions. This may reflect actual improvements in political will and policy effectiveness between 2006 and 2013 in Brazil (Garrett et al. 2021) and between 2016 and 2020 in Indonesia (Gaveau et al. 2022), and/or advances in data and methods to assess policy impacts (Garcia and Heilmayr 2024). The fact that advocacy by CSOs—and public awareness in Brazil and international diplomacy in Indonesia—were perceived as important in earlier periods suggests that these factors are vital antecedents of political will by governments and companies to protect forests.

Although political will, environmental institutions, and legislation often emerge in response to civil society activity, our findings also suggest that these factors' importance can wane with political upheaval. In the workshop, participants referenced political cycles and policy feedback, including feedback between CSOs and states that has amplified forest protection, and political backlash as land-expansive business interests have grown in influence. This suggests that the long-term sequencing of forest protection factors may be nonlinear, a notable contrast to the policy mix conclusions developed by Furumo and Lambin (2021), which show a sequence of forest protections ramping-up from domestic public policies to intergovernmental programs (REDD+) to private-sector initiatives.

Drawing on expert opinion enabled us to complement advances in quantitative research by revealing the perceived importance of factors such as political will in the design, adoption, and sequencing of policy mixes to protect forests. Future research could examine the complex emergence, relationships, and impacts of these factors, and address three further limitations of this study. First, the reliance on "expert" opinions elided other important views. This could be addressed through studies exploring the perceptions of government officials, Indigenous groups, smallholder farmers, and other actors. Second, this study operated at the large spatial scales of either biome (Brazilian Amazon) or country (Indonesia), which do not necessarily reflect the scales at which all factors operate. This could be addressed by examining differences in forest protection factors' importance across Brazilian states, Indonesian islands, and lower jurisdictional levels. Third, this study initially asked participants about forest protection factors across the Brazilian Amazon between 2004 and 2015 and Indonesia since 2016, and then expanded its scope to examine those factors over three decades (1990–2020) based on participant feedback. Consequently, important factors from earlier periods (1990s in Brazil, or 1990–2010s in Indonesia) may have been underrepresented. Future research could revisit earlier periods to identify if any factors were omitted.

5 | Conclusion

This study highlighted the importance of forest protection factors that can be difficult to assess but are nonetheless critical for understanding trends in remaining forest stocks and flows of deforestation. Less tangible factors including CSO advocacy, public awareness, diplomacy, and political will play crucial roles in forest protection. The importance of these factors underscores the urgency of responding to changes in political will, as are currently occurring in Indonesia (Jong 2025), and understanding how changes in political support for conservation develop (Patterson 2023; Barbosa de Andrade Aragão et al. 2024). To assist with foreseeing and preventing political barriers in future, a new interdisciplinary research agenda is needed that marries conservation science with political science to help move from examining which conservation policies and policy mixes work to understanding why they work or are not designed or implemented at all (Brandão et al. 2025). A first step could expand conceptualizations of policy mixes beyond policy processes and instruments to incorporate the range of factors identified here, including political will, civil society advocacy, and international diplomacy. This could provide crucial insights for designing actions that go beyond reducing deforestation to halt and reverse forest loss.

Author Contributions

Joss Lyons-White: methodology, investigation, data curation, formal analysis, writing – original draft, visualization, project administration. **Matthew Spencer**: conceptualization, methodology, investigation, writing – original draft, writing – review and editing, supervision, project administration, funding acquisition. **Rachael D. Garrett**: conceptualization, methodology, investigation, resources, writing – original draft,

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writing – review and editing, supervision, project administration, funding acquisition. **All other co-authors**: investigation, writing – review and editing.

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Ethics Statement

Ethical approval for this study was provided by the University of Cambridge Department of Geography Ethics Committee.

Conflicts of Interest

J.L.W. has received a meal from Musim Mas, an Indonesian palm oil company. M.S. is an employee of IDH, a mission-driven nonprofit organization that works with companies and governments on forest risk in agri-commodity markets. R.N. is employed by Proforest, which is a mission-driven nonprofit but works closely with many companies. R.N. is also a board member of GenZero. M.P. is an employee of SAIL Investments, a private asset manager that is responsible for the management of the &Green Fund that invests in agricultural value chains with a clear link to deforestation in both Brazil and Indonesia. R.D.G. has received funding from Suzano, a Brazilian forestry company, and works as a paid science advisor for Rainforest Builder.

Data Availability Statement

Qualitative data from the Round 1 survey are presented in aggregate in the Supporting Information. Data and code for the Round 2 and 3 surveys are available on OSF at https://osf.io/23wuz/?view_only=69268ff21ebe49ed84b675b8a7ff4e4c.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

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