



Scaling up zero-deforestation initiatives through public-private partnerships: A look inside post-conflict Colombia

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ABSTRACT

The rise of public and private zero-deforestation commitments is opening a new collaborative space in global forest governance. Governments seeking to reduce national greenhouse gas emissions by protecting and restoring forests are partnering with companies motivated to eliminate deforestation from supply chains. The proliferation of zero-deforestation initiatives is creating opportunities for policy synergies and scaling up impacts, but has led to a more complex regulatory landscape. Drawing on policy analysis and expert interviews, we explore public-private policy interactions in Colombia as a case study for tropical forested nations with interest in aligning climate, forest, and development goals. We consider how zero-deforestation priorities are set on the national agenda and scaled up through public-private partnerships. We identify zero-deforestation initiatives in three overlapping governance domains—domestic public policy, REDD+, sustainable supply chain initiatives—and highlight ten multi-stakeholder pledges that have catalyzed supporting initiatives at multiple scales. Emerging from decades of armed conflict, Colombia is pursuing a peace building model based on low-emissions rural development. The peace deal provided a focusing event for zero-deforestation that converged with political momentum and institutional capacity to open a policy window. A government pledge to eliminate deforestation in the Colombian Amazon by 2020 set the national agenda and stimulated international REDD+ cooperation. Lessons from Colombia show that governments provide important directionality among the proliferation of zero-deforestation initiatives. Public pledges and the orchestration of actors through public-private partnerships allow governments to scale up efforts by aligning transnational activities with national priorities. The case of Colombia serves as a potential zero-deforestation model for other nations, but challenges around equitable land tenure, illegality, and enforcement must be overcome for multi-stakeholder initiatives to produce long-term change.

1. Introduction

If all tropical deforestation were contained in a single country, the GHG emissions would exceed the total emissions of the European Union (Seymour and Busch 2016). Concern over the contribution of deforestation-related emissions to climate change has energized a proliferation of activities across public and private sectors. Initiatives to slow deforestation have emerged at multiple scales—from global to local—and exist along a continuum of state involvement from purely public policy, such as command-and-control measures, to market-based strategies, such as voluntary certification standards and other supply chain instruments (Lambin et al., 2018). In between exists a range of hybrid

governance strategies like multilateral REDD+ (Reduced Emissions from Deforestation and forest Degradation) and transnational partnerships that seek to leverage knowledge, capacity, and financing from the private sector to deliver public goods (Bulkeley et al., 2012). The variety of zero-deforestation initiatives reflects a shift toward “new climate governance” that complements the largely top-down, multi-lateral approach led by a coalition of states (e.g., UNFCCC), with a polycentric model in which sub-national and nonstate actors play a prominent role in implementation and regulatory oversight (Bulkeley et al., 2014; Hsu et al., 2015; Jordan et al., 2015; UNEP 2015).

Recently, there has been a trend toward zero-deforestation

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initiatives consisting of voluntary, non-legally binding pledges made by public and private actors to eliminate deforestation in territories or supply chains (Lister and Dauvergne 2014). Pledges made by national and sub-national governments have been closely tied with REDD+ and reducing emissions under the Paris agreement. In the private sector, zero-deforestation pledges are being motivated by competitive advantages around reputation and market access, and began with company commitments to eliminate deforestation in commodity supply chains under the Consumer Goods Forum pledge in 2010 (CGF 2020). Corporate commitments soon gave way to pledges involving multiple stakeholders under the Tropical Forest Alliance 2020, a global public-private partnership established in 2012, and the 2014 New York Declaration on Forests (NYDF). These transnational networks seek to align deforestation-reduction efforts in public and private sectors toward time bound targets for 2020 or 2030 (FAO 2018). The aspirational goal of “zero deforestation” has thus become a new banner for global forest governance under which governments, companies, and civil society actors are coming together, creating unprecedented opportunities to forge policy synergies between public and private sectors, but also leading to a more complex regulatory landscape (Ludwig 2018; Lambin et al., 2014).

Today's zero-deforestation policy ecosystem is comprised of three increasingly overlapping domains in public and private sector spheres: (1) REDD+, (2) domestic public policy, and (3) sustainable supply chain initiatives (Nepstad et al., 2013). In the public sphere, international cooperation toward curbing deforestation has been channeled through climate policies that view standing forests as a potential source of emissions mitigation. In developing tropical forested nations, the Agriculture, Forestry and Other Land Use (AFOLU) sector—where emissions from forest loss are reported—represents over 60% of total emissions (CAIT). Lacking a multilateral agreement on forests, most state-led activity addressing deforestation has been the result of priorities developed under the United Nations Framework Convention on Climate Change (Levin et al., 2008). REDD+ is a results-based mechanism to finance forest-based mitigation actions in developing countries. Despite contention about its long-term viability and legitimacy, it remains an integral part of national strategies for reducing emissions under the Paris agreement (Hein et al., 2018; Seymour and Harris 2019). To access REDD+ finance, countries must develop the domestic institutional capacity and supportive public policies to execute in-country projects. Sub-national governments are also tapping REDD+ finance and infrastructure to experiment with jurisdictional implementation, such as the Governors Climate and Forest Task Force (<https://www.gcftf.org/>).

In the private-sector sphere, policy experimentation to control deforestation has advanced most rapidly through sustainability interventions in the agricultural sector. The relationship between commodity production and deforestation in the tropics has shifted pressure onto global production networks to take action along supply chains, giving rise to a suite of voluntary private-sector mechanisms (Byerlee and Rueda 2015). These range from individual pledges by companies (e.g., internal codes of conduct) to market-based sectoral standards that target companies through incentives (e.g., certification) or sanctions (e.g., moratoria) (Lambin et al., 2018). Most notable has been the recent rise in corporate zero-deforestation commitments by producers, traders, and manufacturers of the four highest risk tropical commodities—palm oil, soy, cattle, and paper/pulp—to eliminate deforestation in supply chains by 2020 (Donofrio et al., 2017).

Sustainable supply chain initiatives alone have had only modest success in stopping deforestation thus far (Lambin et al., 2018). The first wave of corporate zero-deforestation pledges will fall well short of 2020 targets, signaling a significant implementation gap that has shifted the conversation from commitments to action (Rogerson et al., 2019; NYDF Assessment Partners 2019; Taylor and Streck 2018). Barriers to the success of zero-deforestation pledges have resulted from governance deficiencies at one or multiple stages of the initiative life-

cycle: (1) *agenda setting*—narrow or unambitious commitments lack time-bound measurable impacts and consistency in the way definitions of “forest” and “zero deforestation” (i.e., *net* vs *gross*) are applied by actors; (2) *implementation*—a lack of public-private coordination and absent actors fail to address the drivers of deforestation and miss opportunities for leveraging finance to scale up impacts; and (3) *monitoring/enforcement*—supply chain traceability challenges and lack of a consistent accountability framework.

Given the need to accelerate and up-scale zero-deforestation commitments into action, the objective of this study is to identify governance opportunities for reducing deforestation at the national scale through public-private partnerships. Governments of tropical forested nations are aspiring to lower deforestation-related emissions under the Paris agreement and emerging transnational networks of sub/non-state actors are beginning to participate in zero-deforestation governance. In areas where these efforts overlap, there is a major opportunity for national governments to engage companies and other actors in novel, multi-level governance arrangements (FAO 2018; Lambin and Thorlakson 2018).

We explore the zero-deforestation policy ecosystem in Colombia, where public and private zero-deforestation commitments are converging. In 2009, the government of Colombia pledged to eliminate deforestation in the Colombian Amazon by 2020, and at a national level by 2030. Following these pledges, a wave of multi-stakeholder initiatives were launched in Colombia to meet these targets. These include public-private zero gross deforestation agreements (ZDAs) in four commodity supply chains—palm oil, beef, dairy, cocoa—that are led by the government.¹ The expectation is that all production of these commodities will be deforestation free at the country level. Two questions guide our analysis: (1) How do states pursue zero deforestation in a diverse ecosystem of initiatives and actors? (2) What motivates the state to engage with non state actors toward zero-deforestation goals and what political conditions are needed for this to become a priority on the national agenda? Analysis of the multi-level, multi-stakeholder zero-deforestation governance framework in Colombia provides insights into how synergistic interactions between public and private sector policies can be scaled up at the national level. We pay particular attention to the role played by the government of Colombia (GoC) in aligning the proliferation of zero-deforestation initiatives with national policies. We begin with a theoretical background on public-private policy interactions, up-scaling of impacts through public-private partnerships, and the creation of policy windows. We then introduce the case of Colombia and consider how these dynamics are unfolding through policy analysis and expert interviews. We reflect on systemic barriers to transformational change that public-private partnerships do not currently address, principally illegality.

2. Theoretical background

2.1. Public-private policy interactions

The polycentric regulatory landscape emerging around zero-deforestation shares similarities with the new “transnational” climate governance for reducing global greenhouse gas emissions (Andonova et al., 2009). Initiatives involve multiple stakeholders and often do not adhere to traditional political borders nor rely on central governments for agenda setting and implementation. This bottom-up approach is theorized to fill in governance gaps at speeds and scales that are unattainable for government, and expected to catalyze a more rapid and flexible response through experimentation (Hale 2016; van Asselt et al. 2018). However, a limitation of the sub/non-state governance domain is *fragmentation*—different actors designing and implementing

¹ https://www.regjeringen.no/globalassets/departementene/kld/kos/joint_declaration_of_intent_colombia_norway_germany_uk_redd_in_colombia-002.pdf

interventions at multiple scales results in a dispersal of decision-making nodes. While fragmentation offers flexibility, it also increases transaction costs and can impede learning (Abbott 2012). Institutional fragmentation can also lower the entry-costs for private actors, setting up a “race-to-the-bottom” (Biermann et al., 2009). To overcome fragmentation, *directionality* is needed that enhances coherence and order in the polycentric regulatory landscape by building linkages between state and non state domains (Ludwig 2018; Betsill et al., 2015). Directionality can be introduced through *agenda-setting* (i.e., zero-deforestation pledge) and *orchestration*, by which one actor steers a target actor, often through an intermediary (Abbott and Snidal 2009). As a governance strategy, orchestration is typically employed by intergovernmental organizations (IGOs) or states and uses top-down legitimacy to unlock the bottom-up agency of sub/non-state actors (Hale and Roger 2014).

The rise of sub/non-state initiatives does not signify the state's retreat as much as its “re-articulation” (Andonova 2014). Transnational governance is viewed as a complement rather than a substitute for state-led intervention (Green 2014; Andonova et al., 2017). States can enable or constrain supply chain and REDD+ initiatives by influencing land tenure, property rights, financial incentives, public procurement, monitoring, and enforcement (Gulbrandsen, 2006; Nhamumbo et al., 2015). An enabling domestic public policy environment is key to the successful outcome of company-led zero-deforestation commitments (Roger et al., 2015; Lambin et al., 2014; Nepstad et al., 2014; Lambin et al., 2018). Governments also play an important role in up-scaling supply chain initiatives though safeguarding the rights of smallholders that might be excluded by more stringent production standards (FAO 2016). Furthermore, governments can negotiate trade agreements with consumer markets to ensure preferential access to deforestation-free products (Bregman et al., 2015). For government-led initiatives, addressing the drivers of deforestation requires private sector engagement and creating incentives that secure company buy-in. Failing to engage companies may compromise public pledges as producers turn elsewhere to sidestep attempts to promote sustainable production (FAO 2016; le Polain de Waroux, 2016). Domestic public policy set by central government therefore represents a platform for aligning multi-stakeholder REDD+ (i.e., subnational) and supply chain (i.e., non state) initiatives. States can integrate sub/non-state initiatives with domestic strategies through nationally determined contributions (NDCs) of emissions reductions under the Paris agreement (Betsill et al., 2015; Chan et al., 2015). The Paris model allows transnational actors to experiment with policy solutions at subnational levels, while reserving a space for the state to provide directionality, select the best policy alternatives, and up-scale solutions to the national level.

2.2. Scaling up with public-private partnerships

In global environmental governance, partnerships are an increasingly sought instrument to engage multiple actors and scale up impacts. They provide a flexible implementation mechanism for governance through goal-setting (Biermann et al., 2017). Partnerships can help overcome governance gaps by leveraging knowledge, capacity, and resources, and dispersing financial and reputational risk among actors. For complex issues associated with divergent views on policy response (e.g., climate change), partnerships help separate political space for interested actors to operate on a narrower subset of related problems that enjoy a higher degree of consensus (e.g., deforestation) (Andonova 2017). Public-private partnership arrangements can attract companies that might otherwise not engage in broad public objectives on their own. Nelson (2013) identifies four levels of intervention in the ecosystem of public-private partnerships: local or project-based partnerships, sector-specific or sub-national partnerships (e.g., Sabah Jurisdictional RSPO Certification), country-based alliances (e.g., Cocoa & Forests Initiative), and global multi-stakeholder platforms (e.g., Tropical Forest Alliance 2020). At one end, global platforms are large and difficult to implement without effective business models, financing, and

on-the-ground delivery mechanisms; on the other end, project-based partnerships are numerous, sometimes fleeting, and difficult to scale in the absence of an enabling ecosystem of markets, policies, and laws. New public-private partnerships for zero-deforestation that are built across these levels offer pathways for scaling up through market-based approaches and improved public sector performance (Nelson 2013).

2.3. Policy windows

Partnerships can be viewed as an example of policy experimentation in an entrepreneurial process. As such, they seek windows of opportunity for advancing new governance mechanisms (Andonova 2017). Thus, how does deforestation get on the national agenda in the first place? The political conditions needed for collaborative governance to take hold at the national level has attracted attention of scholars (Jordan and Huitema 2014b). The multiple streams theory put forth by Kingdon (1984) provides a useful heuristic of how political willingness and policy capacity can converge when a problem is deemed to require attention, creating a window of opportunity for new governance strategies (Kingdon, 1984). The *problem stream* consists of a focusing event or perceived collective issue that opens up public reception to an agenda item, the *political stream* includes national sentiment or current discourse under which a problem is received, and the *policy stream* indicates the capacity (i.e., political and institutional) for a plausible policy alternative. The convergence of these streams creates a window of opportunity for new intervention. If effective policy innovations are upscaled and institutionalized, they can pivot government strategy and lead to transformative change (Jolly et al., 2012; Kates et al., 2012).

3. Methodology

3.1. Case study

Colombia is a tropical emerging economy with 52% of its territory forested (600,247 km²) (SMBYC, 2019). Sixty-seven percent of Colombia's national forest cover occurs in the Amazon region, representing approximately 6% of the entire Amazon basin (González et al. 2018). With the signing of a peace agreement in 2016, Colombia is emerging from 50 years of armed conflict with the Revolutionary Armed Forces of Colombia (FARC), the country's largest rebel group. Implementation of the peace deal during the post-conflict period is expected to be a long process involving rural land reform, land restitution to displaced victims, and the assimilation of former soldiers back into society. The peace deal has also taken a heavy toll on forests as the displaced return to the countryside and new illegal actors move into previously controlled rebel lands (Weisse and Goldman 2018; Murillo-Sandoval et al., 2020). The effects of war and peace on forests is highly contextual and deforestation can be triggered at different stages of conflict and post-conflict (Ordway, 2015; Grima and Singh, 2019). In Colombia, the post-conflict period has been particularly devastating for forests, including inside protected areas (Armenteras et al., 2019; Murillo-Sandoval et al., 2020). The 2015–17 period in which the peace negotiations finalized and began implementation saw a 56% rise in the annual deforestation rate with 220,000 hectares of forest lost in 2017 alone (SMBYC 2019).

Deforestation in Colombia is most prevalent in the Amazon region, accounting for 66% of the national total in 2017; deforestation in the department of Caquetá alone accounted for 27% (SMBYC 2019). The proximate drivers of deforestation vary by region, but principally include extensive cattle ranching, road construction, illegal logging, illicit crops, mining, fires, and land speculation (González et al. 2018). Both large-scale actors and small-scale campesinos (i.e., rural populace) contribute to deforestation. Industrial-scale agriculture is not a major deforestation driver but remains a potential threat in areas targeted by the government for commodity expansion, particularly the Orinoquia. The GoC is prioritizing the modernization of the agricultural sector in

Table 1
Multi-stakeholder REDD + and sustainable supply chain (SSC) pledges for reducing deforestation and emissions in Colombia. Ten pledges are explicitly zero-deforestation. Government of Colombia abbreviated as “GoC”.

ID	Multi-stakeholder initiatives	Domain	Description	Level	Policy mechanism	Lead actor(s)	Timebound target
<i>Zero-deforestation pledges</i>							
1	New York Declaration on Forests (NYDF)	REDD +	Partnership of governments, multinational companies, civil society and indigenous peoples who strive to halve deforestation by 2020 and to end it by 2030.	global	partnerships; incentives	GoC	2030
2	Consumer Goods Forum (CGF) zero deforestation commitment	SSC	Achieve zero net deforestation by 2020 along four commodity supply chains—soy, cattle, palm oil, and paper/pulp.	global (sector)	incentives	companies	2020
3	Tropical Forest Alliance 2020 (TFA)	SSC	Global public-private partnership established to help implement the CGF zero net deforestation commitment in soy, cattle, palm oil, and paper/pulp sectors.	global (sector)	partnerships; incentives	TFA2020; GoC	2020
4	Beef zero-deforestation agreement (ZDA)	SSC	Government-led public-private partnership to eliminate deforestation from beef supply chains in Colombia.	national (sector)	partnerships; incentives	GoC	2025
5	Dairy zero-deforestation agreement (ZDA)	SSC	Government-led public-private partnership to eliminate deforestation from dairy supply chains in Colombia.	national (sector)	partnerships; incentives	GoC	2025
6	Palm oil zero-deforestation agreement (ZDA)	SSC	Government-led public-private partnership to eliminate deforestation from palm oil supply chains in Colombia.	national (sector)	partnerships; incentives	GoC	2020
7	Cocoa, Forests, and Peace (ZDA)	SSC	Government-led public-private partnership to eliminate deforestation from cocoa supply chains in Colombia. National strategy of the “Cocoa & Forests Initiative”.	national (sector)	partnerships; incentives	GoC	2025
8	Intersectoral Pact for Legal Timber	SSC	Ensure all timber extracted, transported, transformed, marketed, and used in Colombia comes from exclusively legal sources. Includes 18 department-level timber agreements.	national (sector)	command-and-control; incentives; partnerships	GoC	n/a
9	Amazon Vision (REDD Early Movers)	REDD +	Achieve zero net deforestation in the Colombian Amazon by 2020; umbrella project for sustainable development initiatives in the region.	subnational	command-and-control; knowledge transfer; incentives; partnerships	GoC	2020
10	Cheese Pact of Caquetá	SSC	Improve sustainability of cattle sector in Caquetá by creating shared value and ending deforestation along supply chain; public-private consortium with the goal of increasing market demand for zero-deforestation cheese.	subnational (sector)	knowledge transfer; incentives; partnerships	Association of Cattle Ranchers of Caquetá (CDGC); regional government	n/a
<i>Supporting pledges</i>							
11	Initiative 20 × 20 (Bonn Challenge)	REDD +	Restore one million hectares of degraded lands in Colombia by 2020.	global	command-and-control	GoC	2020
12	Governor’s Forest and Climate Task Force (GCF)	REDD +	Jurisdictional approach to sustainable low-emissions development with goal of reducing deforestation 80% by 2020.	subnational	command-and-control; knowledge transfer; incentives; partnerships	regional government; Earth Innovation Institute	2020
13	Under2° MOU	REDD +	Coalition of subnational governments that aims to achieve greenhouse gas emissions mitigation by limiting emissions to 80–95% below 1990 levels by 2050.	subnational	command-and-control	regional governments	2050

its national development plan. This focuses mainly on cattle intensification and creating value along supply chains like cocoa, rubber, dairy, and other commodities. Colombia is also the largest producer of palm oil in Latin America (4th largest worldwide) and is keen on increasing exports across commodity sectors.

3.2. Data collection

We established a database of the zero-deforestation policy ecosystem in Colombia by identifying all multi-stakeholder initiatives related to forest conservation in the country. These included initiatives with explicit zero-deforestation targets and those with targets to reduce GHG emissions related to forest use. We also included initiatives that indirectly relate to deforestation – e.g., improved land use planning and governance, institutional capacity building, and sustainable production. We considered active or completed initiatives from 2009, the time the GoC pledge was made, until 2019. We relied on an extensive review of public policy documents, academic articles, reports from NGOs and IGOs, and other gray literature. We characterized initiatives by the actors involved, governance strategies, scale of intervention, and funding where possible. The resulting database represents the REDD+ and sustainable supply chain governance domains active in Colombia (Table S1). For the domestic public policy domain, we compiled a separate database of normative and institutional interventions by the GoC, consisting primarily of laws, alliances, and national strategies (Table S2). Due to the large number of public land use policies, we considered only those with a direct link to forests or agriculture supply chains.

To supplement our understanding of the sequencing of initiatives and how the different zero-deforestation governance domains interact, the lead author conducted 17 expert interviews during two visits to Colombia and remotely over the period December 2018–October 2019. Relevant public and private actors were identified as those participating in collaborative zero-deforestation initiatives. We employed a snowball strategy by asking interviewees to identify other relevant stakeholders (Goodman 1961). In Colombia, interviews were conducted at the respective stakeholder offices in the capital city Bogotá. One limitation was our ability to access sub-national government officials and other territorial actors. We included the key central government officials from different ministries, many Colombian and international NGOs, and private sector actors. We also draw on insights acquired from attending high-level meetings for zero-deforestation initiatives in Colombia to evaluate the context for advancing the zero-deforestation agenda among multiple stakeholders (see Supplementary Material). Following other studies (Carodenuto 2019; Tapasco et al., 2019), these insights were deemed sufficient to gather the perceptions of how the zero-deforestation governance agenda is unfolding, as ZDAs and many other initiatives are still in the early phases of rule-setting and implementation and cannot yet be evaluated.

4. Results

Firstly, we present and categorize the multi-stakeholder initiatives that address deforestation in Colombia. Secondly, we describe the public-private partnerships that have emerged from these initiatives at multiple levels to scale up impact. Thirdly, we identify the problem, political, and policy streams that have led to the rise of the zero-deforestation agenda in Colombia's public policies, and describe how the convergence of these streams is producing synergies between the different domains of zero-deforestation policies.

4.1. Multi-stakeholder zero-deforestation initiatives in Colombia

We identified 42 multi-stakeholder initiatives since 2009 that directly or indirectly address deforestation in Colombia (Table S1), 36 of which were currently active. These initiatives were identified at

multiple levels in the REDD+ ($n = 24$) and sustainable supply chain ($n = 18$) domains, with varying degrees of state involvement. Multi-stakeholder initiatives can be categorized as *pledges* ($n = 13$)—commitments to reduce deforestation or emissions; *alliances* ($n = 6$)—strategic coalition of diverse actors with a common goal; *projects* ($n = 19$)—actionable agenda toward achieving goals, typically with clear responsibilities defined for each actor; or *finance* ($n = 4$)—financial support to build capacity or pursue other initiatives (see Supplementary Material). At the local level, at least 37 additional REDD+ projects have been identified in Colombia (Simonet et al., 2018) but were not included in our database due to the limited information available. While our final list of zero-deforestation initiatives may not be exhaustive, we document the most significant and representative initiatives in terms of publicity, ambition, scope, and funding.

Ten multi-stakeholder initiatives were explicit zero-deforestation pledges (Table 1). The remaining 32 REDD+ and supply chain initiatives support zero-deforestation pledges directly, through their own targets of reduced deforestation or emissions, or indirectly, through sustainable production goals and/or institutional capacity building (e.g., land use governance, enforcement). For instance, five such initiatives—all REDD+—aim to improve the management and enforcement of protected areas and their buffer zones. Most multi-stakeholder interventions were composed of government and civil society actors ($n = 26$). Only one initiative, the Consumer Goods Forum pledge, was considered strictly private sector-led. The remaining 15 initiatives were hybrid, involving the GoC, businesses, and civil society organizations. The central GoC leads or participates in 83% of multi-stakeholder zero-deforestation initiatives in the country ($n = 35$).

The majority of initiatives focus solely on implementation ($n = 19$) or agenda setting ($n = 7$), while others address multiple governance activities ($n = 16$) (Fig. S1). Initiatives rely on one or more of the following policy mechanisms: *command-and-control measures* (e.g., land use planning or zoning, standard setting), *knowledge transfer* (e.g., institutional capacity building, technical assistance for farmers), *incentives* (e.g., payment for ecosystem services, sustainable production credits), *sanctions* (e.g., law enforcement, fines), or *partnerships* (Fig. 1). Forty percent of zero-deforestation initiatives were at least partially motivated by peace building ($n = 17$). Initiatives also displayed strong regional overlap, with 29% being implemented exclusively in the Amazon ($n = 12$). Most of these were part of the REDD+ domain ($n = 11$), meaning 46% of REDD+ projects we identified in the country are focused on the Amazon. Funding information was only available for project-type initiatives. These initiatives had a median overall budget of 6.2 and 20 million USD at the local ($n = 8$) and sub-national ($n = 11$) levels, respectively (see Supplementary Material). This is likely a conservative estimate given that co-financing information was not available for all initiatives. Funding was mostly received through multi-lateral support from the European Union, bilateral support (i.e., USAID, GIZ—German Corporation for International Cooperation), and inter-governmental organizations (i.e., UN-GEF, UNDP, World Bank).

4.2. Public-private partnerships to scale up zero-deforestation pledges

4.2.1. Global level

Companies from the Consumer Goods Forum source commodities like dairy and palm oil from Colombia, including multi-national companies (e.g., Nestlé, Unilever) and Colombian manufacturers and retailers (e.g., Grupo Éxito, Nutresa). The GoC is a signatory of the NYDF and a member of the TFA2020² and engages these global transnational networks from a high level in the government. In Colombia, TFA relies on convening power to assist the implementation of public-private zero-deforestation agreements in the palm oil, cattle, and cocoa sectors. By

² https://www.tfa2020.org/wp-content/uploads/2017/11/TFA-2020-Colombian-Alliance-Concept_Objectives_ENG.pdf

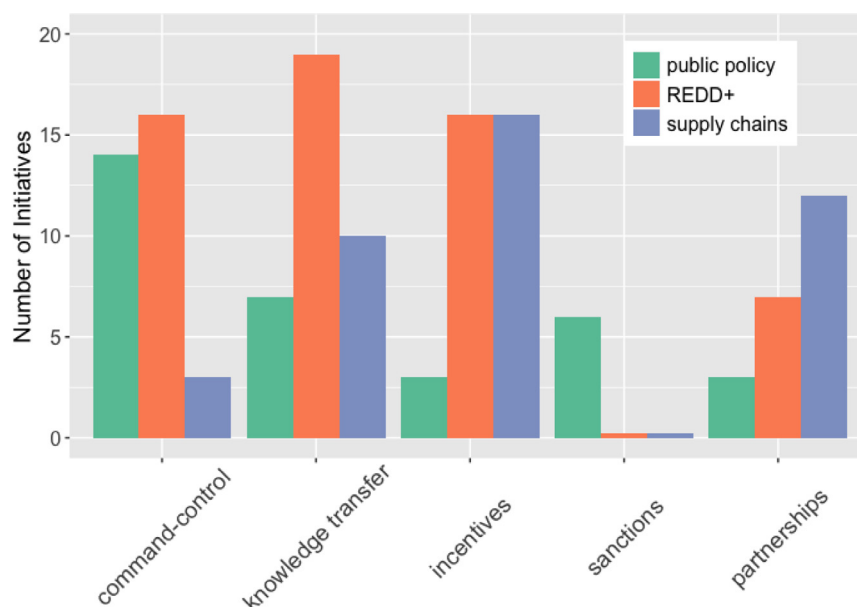


Fig. 1. Policy mechanisms utilized in zero-deforestation governance domains: public policy ($n = 22$), REDD+ ($n = 24$), and supply chain initiatives ($n = 18$). Note: most initiatives rely on multiple strategies (see Table S1).

engaging national governments and large multi-national corporations with global supply chains, TFA has considerable potential to support the up-scaling of national initiatives, especially given its concentration of forest-risk commodity supply chains (Garrett et al., 2019; Ludwig, 2018). In developing the ZDA in the national cocoa sector, the GoC also works closely with the Food and Land Use coalition (FOLU) and the Cocoa & Forests Initiative (of the World Cocoa Foundation), which began as a partnership between the governments of Côte d'Ivoire and Ghana and 34 leading cocoa and chocolate companies. In 2018, Colombia joined as the first member from Latin America (<https://www.worldcocoaoundation.org/initiative/cocoa-forests-initiative/>).

4.2.2. National (sector) level

In the sustainable supply chain domain, four zero gross deforestation pledges were made at the national level in the oil palm, beef, dairy, and cocoa sectors¹. These pledges are being led by the GoC with support from TFA and have resulted in the signing of public-private zero-deforestation agreements between producers, manufacturers, traders,

NGOs, and the GoC. A fifth national zero-deforestation agreement in the timber sector is being developed that will build on the existing Intersectoral Pact for Legal Timber (PIML) signed in 2009 and with more than 70 public-private actors involved by 2019. These agreements represent important sector-led strategies to reach Colombia's goal of zero gross deforestation in the entire country by 2030, outlined in its REDD+ national strategy (EICDGB, 2018).

The commodity ZDAs are public-private partnerships that will ultimately rely on market differentiation for deforestation-free products. Private-sector members of the cocoa ZDA in Colombia represent more than 85% of total chocolate production in the country, bringing important scaling power to the agreement. The eight palm oil producer groups (25 mills total) that have signed the agreement represent ~35% of Colombia's production. Most of these mills are vertically integrated in downstream processing, manufacturing, and trading, creating further opportunities for scaling (Furumo et al., 2019). The largest retailer in Colombia, *Grupo Éxito*, is also a member of the palm oil agreement and will include deforestation-free palm oil in their *Éxito*-branded products

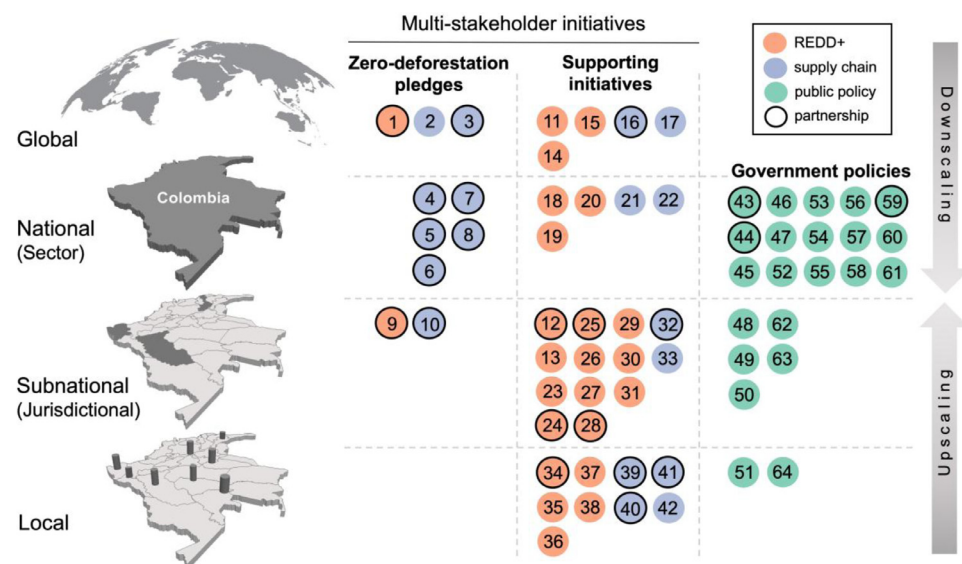


Fig. 2. Schematic of zero-deforestation initiatives in Colombia ($n = 64$) according to policy domain and level of intervention (levels indicated by shaded regions on maps). Ten pledges are supported by a range of REDD+ (red), supply chain initiatives (blue), and public policies (green). Initiatives that use partnerships as a policy mechanism are outlined in black. ID numbers correspond to initiatives in Tables S1 and S2 of Supplementary Material.

as a first step toward compliance. Further scaling potential for the palm oil ZDA can be realized through existing certification systems like the Roundtable on Sustainable Palm Oil (RSPO), which is permitted as a means of showing compliance under the agreement. Twenty percent of Colombian palm oil is RSPO-certified, including most producers in the agreement. The Sustainable Trade Platform (Table S1) is already creating more market opportunities and demand for RSPO-certified production through trade agreements with Europe—the main importer of Colombian palm oil. The beef and dairy agreements have less short-term scalability than the other sectors, due to the fragmented nature of cattle supply chains and obsolete animal traceability systems in Colombia. Nonetheless, they hold great long-term potential for scaling zero-deforestation impacts given the size of the national herd and the pressure cattle ranching puts on forests.

4.2.3. Subnational (jurisdictional) level

The GoC pledge for zero net deforestation in the Colombian Amazon became enshrined in the *Amazon Vision* program, an umbrella project initially supported by the REDD Early Movers program for forest conservation initiatives in the region focusing on low-emissions rural development. A critical pillar of *Amazon Vision* strives for sustainable agricultural supply chains through on-farm capacity building of best management practices (e.g., agroforestry, silvopastoral), transforming supply chains through value-added products, and the production and marketing of new forest-based products (e.g., non-timber forest products). These activities are pursued through zero-deforestation agreements with associations of producers in remote communities, and productive alliances with processing companies that can transform and market sustainable products. Extension services and green credit lines are being developed to support these efforts. Thus far, productive alliances have been established in dairy, rubber, and açai fruit value chains.

An example of experimental business models being successfully scaled up in the region is *Pacto Caquetá*, a multi-stakeholder partnership between dairy farmers/processors, regional and central government, and restaurants (USAID, 2017). The pact was established by the Caquetá Committee of Cattle Ranchers in 2013 to eliminate deforestation associated with ranching by building capacity on farms and transforming the dairy value chain. It now includes more than 40 members (www.pactocaqueta.com.co). Under the pact, producers are required to maintain at least 10% of their farms under forest cover and implement silvopastoral ranching. In return, they receive technical assistance to improve the quality of their milk and marketing advantages for cheese branded as *Queso del Caquetá* (<https://www.quesodelcaqueta.co/>). Colombian chef Mark Rausch also supported the initiative by offering “Anti-deforestation pizza” in his restaurants in Bogotá and Medellín (Semana Sostenible 2016). In December of 2018, high-quality cheese produced through the pact received an “appellation of origin” designation from the European Union, which is expected to increase exports (European Commission 2018). Finally, the Pact established the “Cheese Route” (*Ruta del Queso*)—a gastro-tourism experience of the sustainable dairy farms in Caquetá (USAID, 2017). The project was expected to be implemented on 1500 farms by 2019 (PID Amazonía 2018).

Jurisdictional REDD+ initiatives are also playing an important role in downscaling global and national directives while upscaling experimental, territory-based policy solutions. The government of Caquetá is a member of the Governors Climate and Forest Task Force and is pursuing a pledge to reduce deforestation by 80% in the department by 2030. Targeting the cattle sector, the national government coordinated the signing of a public-private zero-deforestation agreement between the regional government of Caquetá and a group of local ranchers and slaughterhouses in the jurisdiction. These subnational partnerships reinforce the national-level cattle ZDAs. Similarly, the BioCarbon Fund initiative *Orinoco Sustainable Integrated Landscapes Program*, which is implemented in the eastern savanna biome of the country, also has the goal of low-emission rural development implemented through

jurisdictional public-private supply chain ZDAs.

4.2.4. Local (project) level

Forest-related initiatives implemented at the local or project level in Colombia have primarily occurred through the REDD+ domain or as bi/multi-lateral peace building initiatives. USAID has been particularly active in Colombia at the project level by building public-private partnerships to leverage finance and expertise for sustainable development in rural areas. The USAID Land and Rural Development Program (2013–2020) leveraged 67.5 million USD in public and private funding for sustainable rural development in areas affected by the armed conflict. This and related projects have partnered with national chocolate maker *Casa Luker* to establish smallholder cocoa farms in the Caribbean (<http://colombialrdp.org/>) and Pacific (<https://partnerships.usaid.gov/partnership/chocolate-tumaco-casa-luker-partnership>) regions of Colombia. These partnerships support the GoC vision of the cocoa sector as a national peacebuilding strategy and high-value alternative to illicit crops that also contributes to reforestation goals under the Paris agreement and Bonn Challenge (20 × 20 Initiative).

4.3. Policy window for the zero-deforestation agenda

4.3.1. Problem stream

The central government of Colombia has always been challenged by governing the rural polity due to the rugged geography and marked cultural identity between regions. Much of the country's wealth, development, and institutional capacity has historically been concentrated in the interior Andes region (Etter and van Wyngaarden, 2000). The peace deal with the FARC brought an opportunity for the government to re-establish its presence in the countryside and expand control in the territory through rural development. This has also brought new environmental challenges. Rebel groups have historically relied on forest cover for their clandestine operations and enforced its protection (Álvarez 2003), leading to forest recovery in some rebel-controlled territories (Sánchez-Guervo et al., 2013; but see Negret et al., 2019). Nearly 8 million Colombians have been internally displaced due to the armed conflict, most fleeing the countryside for urban centers (UNHCR). In the current post-conflict era, the displaced are now able to return to the countryside under the prospect of a land restitution process outlined in the peace deal, reintroducing population pressure on forests.

With the power vacuum in former guerilla territories, new criminal actors are also contesting for claims to land, further accelerating the pace of deforestation through illegal activities (Negret et al., 2019). The area under coca plants, the raw ingredient for cocaine production, increased from 96,000 to 171,000 hectares over 2015–2017 (UNODC). Small clearings for coca have given way to larger clearings for cattle ranching through land speculation in the post-conflict period, particularly in protected areas (Murillo-Sandoval et al., 2020). Forest clearing as a rent-seeking strategy by large landholders and agro-industrial actors is widespread on the Colombian Amazon frontier (González et al. 2018). Colombia is therefore at a crossroads: increasing peace and stability attract investments to previously inaccessible rural areas, but also increase the threat of deforestation and biodiversity loss as infrastructure opens up new areas to exploitation (Clerici et al., 2016; Baptiste et al., 2017; Salazar et al., 2018).

4.3.2. Political stream

As peace was being negotiated by the Colombian government, a strong domestic zero-deforestation agenda was also building momentum (Table 2). Activity can be traced back to the national pledge made at the UNFCCC 15th Conference of the Parties (COP) in 2009 to eliminate deforestation in the country's portion of the Amazon biome by 2020. The ambitious pledge triggered an influx of international co-operation to help Colombia meet this goal, largely through REDD+

Table 2
Major public policies supporting Colombia's zero-deforestation pledges (Spanish names or acronyms in *italics*). Policies are grouped into strategies that set the national agenda, and initiatives that build institutional capacity. ID numbers reflect initiatives in Fig. 2. For a complete list of zero-deforestation public policies refer to Table S2.

ID	Public Policy	Description	Policy mechanism	Level	Year established
National Strategies					
43	National green growth strategy <i>ECDBG</i>	Sectoral strategy for short, medium, and long-term low-emissions development.	command-and-control; partnerships	national, sector	2011
45	Integral Strategy for Controlling Deforestation and Managing Forests <i>ECDBG</i>	Outlines integral development strategies in different regions of Colombia based on community interests and needs. The strategy constitutes the REDD+ national strategy, known as "Bosques Territorios de Vida", and sets the goal of zero-deforestation at the national level by 2030.	command-and-control; knowledge transfer	national	2017
46	Program for illicit crop substitution <i>PNIS</i>	Payments for voluntary eradication of coca crops, as well as technical assistance for licit crop substitutes (e.g., cacao, coffee, rubber). Includes forest conservation criteria during substitution process.	incentives	national	2017
47	Operation Artemis <i>Operación Artemisa</i>	Military-style law enforcement to intervene illegal actors during deforestation events in the territory.	command-and-control; sanctions	national	2019
48	Environmental Bubbles <i>Burbujas Ambientales</i>	Regional nodes to coordinate an inter-institutional effort to battle deforestation along with the armed forces and attorney general's office. Establishes a first-response battalion to follow up on deforestation events, illegal mining and logging, and wildlife trafficking, and apprehend perpetrators. Bubbles are currently established in the departments of Caquetá, Putumayo, Guaviare, Meta, Vaupés, Guainía, Norte de Santander, Cauca, Huila, and Chocó.	command-and-control; sanctions	subnational	2016
50	Greenbelt Initiative <i>Cinturón Verde</i>	Increase connectivity among protected areas in the Colombian Amazon by restoring 9.2 million hectares of forest along the frontier from Brazil to Ecuador.	command-and-control	subnational	2018
51	Forests for Peace <i>Bosques de Paz</i>	Program aims to restore ecosystems in conflict areas through community development, productive projects, and environmental education.	knowledge transfer; incentives	local/project	2017
52	National climate change law				
54	National forest monitoring system <i>SMBYC</i>	Puts national climate strategy into effect with coordination and financial mechanisms for reducing emissions.	command-and-control; knowledge transfer	national; subnational	2018
55	Intersectoral Commission on Controlling Deforestation <i>CICOD</i>	Establishes Colombia's first national forest monitoring system, responsible for creating forest reference levels and monitoring deforestation for REDD+, zero-deforestation agreements, and other national projects.	command-and-control; knowledge transfer	national	2017
56	Agricultural frontier <i>Frontera agrícola</i>	High-level coalition of development sector ministries, national military, police, and attorney general's office to lead a concerted effort against illegal deforestation.	command-and-control; sanctions; partnerships	national, sector	2017
60	Payment for Ecosystem Services Act	Delineation of Colombia's first national agricultural frontier, envisaged in the Peace Accords.	command-and-control	national, sector	2018
61	National carbon tax	Establishes a Payment for Ecosystem Services act and other national conservation incentives.	incentives	national	2017
62	Intergenerational Pact for Life of the Colombian Amazon <i>PIVAC</i>	Establishes national carbon tax (approximately 5 USD per ton of carbon dioxide). Colombian Supreme Court sentence that gives citizen rights to the Amazon biome in Colombia, and legally requires the government to intervene by controlling deforestation.	sanctions command-and-control	national subnational	2016 2018
63	Zoning of Amazon forest reserve <i>Zonificación y ordenamiento de la Reserva Forestal de la Amazonia</i>	Implementation of national Forest Reserve (Law 2, 1959) in the departments of Caquetá, Guaviare, and Huila. Forest zoning includes three conservation/sustainable production land cover classes based on bio-physical conditions of land cover.	command-and-control	subnational	2013
64	Carbon offset program	Establishes carbon offset program ("no causation") which enables companies and other emitters to avoid paying carbon tax only by offsetting emissions through a national forestry offset program (i.e., REDD+).	incentives	local/project	2017

readiness funds and results-based payments. Domestic public policy on deforestation and climate change progressed rapidly over the same period. In 2011, the government launched an institutional strategy for political action on climate change with the aim of formulating, coordinating, and executing climate policy at different scales (CONPES 3700, 2011). Put forth by the highest socioeconomic and development authorities in the government, the strategy set the national climate agenda and made important strides in institutionalizing mitigation and adaptation measures with socioeconomic development priorities. The strategy provided the basis for the national climate change law (Law 1931, 2018), which includes two key mitigation strategies: REDD+ and the Colombian Strategy for Low Carbon Development—a component of the national development plan that aims to decouple economic growth from GHG emissions in productive sectors.

Colombia finalized its REDD+ national strategy in 2013, embracing a stepwise subnational approach to readiness and implementation due to the stark variations between regions. The nested REDD+ strategy aims to scale subnational pilot projects to the national level, combining elements of both centralized and decentralized models (Kashwan and Holahan 2014). This also enabled the government to prioritize the Amazon and Pacific regions, which together contain about 75% of the nation's forests and deforestation (SMBYC, 2019). Colombia's REDD+ national strategy relies on bottom-up stakeholder input to identify sustainable development opportunities in forested regions that are representative of community interests (<http://bosquesterritoriosdevida.com/>). The low carbon development strategy requires government ministries to create comprehensive mitigation action plans for the major economic sectors (agriculture, transportation, mining), which are then linked to the development of national mitigation strategies in accordance with NDCs under the Paris agreement. Emissions reductions from deforestation are required in each sectoral action plan—39% reduction against baseline—thus requiring collective engagement from all ministries in this effort (Lütkehermöller et al., 2018). The “territorialization” or down-scaling of national strategies is achieved through the creation of comprehensive territorial action plans that engage public and private actors in a participatory process at the department, municipality, district, and city level (MADS 2013; MADS 2016).

4.3.3. Policy stream

As domestic climate policy strengthened behind international support in the political stream, and the looming peace agreement brought attention to territorial land-use policies in the problem stream, advancements in institutional capacity for forest monitoring and new finance mechanisms created opportunities for policy alternatives. REDD+ readiness funds and early subnational projects like *Amazon Vision* helped deliver national-scale, near real-time forest monitoring tools. These became institutionalized in the national institute for meteorological studies through the creation of the national forest and carbon monitoring system (SMBYC) used to establish forest reference baseline

levels, map deforestation, and calculate emissions under NDCs (Decree 1655, 2017). The national government was then able to establish an early alerts system for deforestation events and report reliable annual deforestation statistics. This newfound oversight capacity encouraged further outside investment in REDD+, jurisdictional, and supply chain projects, and enables the GoC to track sub/non-state contributions to national targets of zero deforestation and emissions reduction.

Financial instruments were also created by the national climate change law to finance climate action at sub-national levels (Table 2). With a system of transferrable carbon quotas, it established a market-based offset model for mitigation, allowing actors to purchase credits originating from projects in Colombia. The offset program supports a national carbon tax passed in 2016 to help fund the transition to a low-emissions economy, and ultimately finances more zero-deforestation projects in the country. Five percent of the carbon tax also supports the enforcement of protected areas in perpetuity through the *Heritage Colombia* initiative (MADS 2018). Finally, a payment for ecosystem services act (Decree 870, 2017) supports compensation of voluntary emissions reductions through market-based carbon certification programs.

To implement the REDD+ national strategy in the context of the peace accords, the central government created the Intersectoral Commission on Controlling Deforestation (Decree 1257, 2017). This coordinating body brings together development ministries with the Ministry of Defense and the Attorney General's office to address illegal activities contributing to deforestation. A major accomplishment of this commission was delineation of the national agricultural frontier in Colombia (Resolution 261, 2018), providing an important intersectoral planning tool and institutional protection of forested areas. Closing the agricultural frontier was a major tenant of the rural land reform built into the peace accord (Suárez et al. 2018). In 2019, the new administration adopted a law enforcement strategy (*Operation Artemis*) based on military field operations to crackdown on illicit deforestation activities. Finally, a policy of “land titling without forest clearing” was introduced to remove perverse incentives for colonists to clear forests for land titles on frontiers (Decree 902, 2018) (see Supplementary Material).

4.3.4. Convergence of streams

Implementing the peace accords is a complex process of land reform and rural development requiring prolonged public support. Costs are projected at \$44 billion USD over the initial 2017–2031 period (Controlaría). To access external sources of finance, the government effectively coupled the implementation of the peace deal with political momentum around multilateral climate governance. International co-operation funds for climate action such as REDD+ represent large pools of finance that could leverage the sustainable rural development initiatives of the peace deal. The event that best represented the coupling of the three streams—problem, politics, and policy—was the signing of

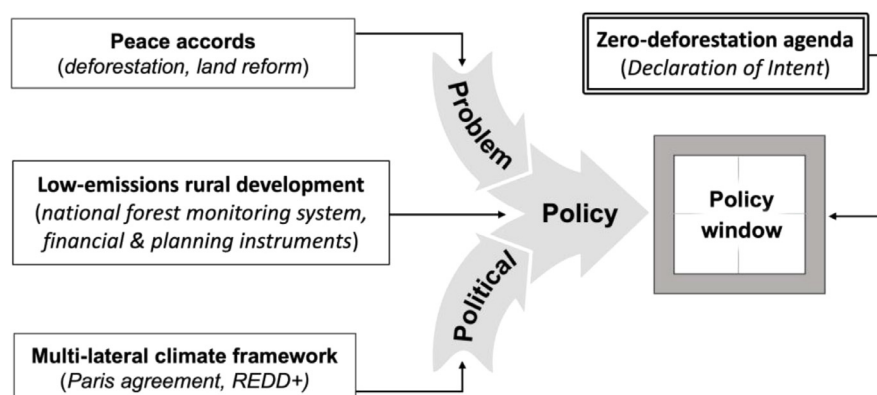


Fig. 3. Diagram of the problem, political, and policy streams that converged to open a policy window and set zero-deforestation on the national agenda in Colombia.

the Joint Declaration of Intent between Colombia and donor countries Norway, United Kingdom, and Germany (Fig. 3). Norway was both a major REDD donor and a neutral third party in the peace negotiations. Under the Joint Declaration, the donor countries pledged to support up to \$300 million USD in performance-based funding for reducing deforestation in the Colombian Amazon. The Joint Declaration also supported Colombia's green growth strategy and the development of public-private zero-deforestation agreements in at least four major commodity sectors¹. These milestones became the ZDAs orchestrated by the GoC in palm oil, beef, dairy, and cocoa supply chains. The funds were dispersed through the "Sustainable Colombia" fund established to finance the peace process. The funds assisted in REDD+ readiness and thus helped finance the development of new national forest monitoring tools to track progress on the ZDAs, other REDD+ and supply chain initiatives, and Colombia's NDCs. In December 2019, the Joint Declaration was renewed until 2025, providing an additional 366 million USD of performance-based (260 million USD) and policy-based (106 million USD) funding.³

5. Discussion

5.1. Policy window: peace building through forests

Ending deforestation is central to Colombia's strategies for both peace building and reducing national emissions under the Paris agreement. Areas of conflict and forest carbon biomass overlap considerably in Colombia (Castro-Nunez et al. 2017) and peace building was an important motivation for many of the REDD+ projects. Chief among these, the GoC's zero-deforestation pledge that led to the creation of *Amazon Vision* was based on these long-term goals in the Amazon. Peace building also features prominently in the national cocoa sector ZDA as a crop alternative to coca production that assists reforestation efforts. The dual prospect of peace and slowing deforestation has placed high expectations on the peace accord, creating a potent public focusing event in the problem stream and providing the GoC an opportunity to introduce institutional reforms. Policy windows are most compelling when policy alternatives are coupled to both national sentiment and political/institutional openings, which REDD+ created in the political and policy streams. The Colombian government seized a policy window by framing the opportunity for peace within the context of protecting Colombia's rich natural endowment of forests and biodiversity, thus adding an ecological dimension to the socio-political discourse on peace. With the Declaration of Intent, this framing set zero-deforestation firmly on the national agenda and established linkages between the three governance domains—public policy, REDD+, and supply chain initiatives.

In other settings, the extent to which issues in the problem stream can become national focusing events to trigger adoption of zero-deforestation policies remains an open question. In Southeast Asia, health issues related to poor air quality from fire-related deforestation events have provided a focusing event for transboundary cooperation and policy alternatives (Varkkey 2014; Huay Lee et al. 2016). Nonetheless, the priorities and political will of governments are critical in setting and maintaining zero-deforestation on the national agenda. In Brazil, the Bolsonaro administration has reversed decades of progress on declining deforestation in the Amazon by relaxing environmental laws and encouraging agro-industrial development. The August 2019 fires in the region were a clear focusing event but, lacking political will, these events have fallen short of opening a policy window. In Colombia, the Duque administration had set weaker targets for reducing deforestation in the 2018–2022 national development plan, sending mixed signals to industries. In response to criticism, the administration announced more

ambitious targets at the COP 25 in Madrid³. Future research should consider how multi-stakeholder zero-deforestation initiatives persist through regime changes, and to what extent polycentric governance insulates against changing political agendas.

5.2. The importance of national governments

In the emerging polycentric regulatory landscape of forest and climate governance, national governments often get overlooked among the groundswell of sub/non-state initiatives (Jordan and Huitema 2014a). Indeed slow progress or inaction at multilateral and national levels is partially responsible for the rise of transnational governance. Yet in Colombia the government plays a critical role in establishing conditions for the uptake and coordination of zero-deforestation initiatives. Hybrid REDD+ and supply chain initiatives like TFA and NYDF rely on convening power of diverse actors but have limited directionality given the multitude and partial overlap of motivations, commitments, scales, and monitoring platforms (Ludwig 2018). Directionality is stronger at the national level where sub/non-state initiatives can be grounded in national priorities and leveraged with public policy (Nepstad et al., 2013). By creating an enabling policy environment and providing directionality among initiatives, the GoC bridges gaps between both *classical government policy* and *metagovernance* roles, respectively (Visseren-Hamakers and Glasbergen, 2007).

The GoC provides directionality in the zero-deforestation policy ecosystem via: (1) agenda-setting with pledges, and (2) orchestrating through public-private partnerships. Our findings indicate that zero-deforestation initiatives often beget more initiatives. Pledges play an important role in catalyzing further activity in support of targets. The ten zero-deforestation pledges in Colombia are supported by multi-stakeholder initiatives that have sprouted up around these pledges, advancing implementation directly through nested commitments, or indirectly by improving territorial planning, institutional capacity, and on-the-ground technical assistance. The catalyst effect of pledges is even more compelling when tied to government-led commitments. Most of the REDD+ and supply chain initiatives targeting the Colombian Amazon were established in response to the GoC pledge made in 2009 to end deforestation in the region. The GoC targeted the region early in the REDD+ readiness phase. The Amazon being an iconic biome likely helped garner more urgency and broader recognition from the international community (Nolte et al., 2017). Public pledges signal to the international community an intention by a government to undertake institutional reform to reduce and monitor deforestation. When political will begins to manifest in public policies that create an enabling environment for other nonstate initiatives, public zero-deforestation pledges create the positive feedback loop observed in Colombia. For example, the national forest monitoring system delivered major advancements in institutional capacity, allowing the GoC to access new streams of results-based finance. Moreover, government commitments enhance access to external finance and expertise. Several multi-stakeholder initiatives we identified are global programs that include Colombia among other frontrunners to establish pilot projects – e.g., the BioCarbon Fund, REDD Early Movers, FOLU, and UNDP's initiative *From Commitment to Action* (FC2A). Similarly, Brazil was selected in 2012 as one of three countries along with Colombia to participate in the REDD Early Movers program due to an ambitious government pledge to reduce deforestation in the Amazon (Fransen 2009), and an effective national forest monitoring system in place (Assunção et al., 2013).

5.3. Orchestrating zero-deforestation activity through partnerships

Public-private partnerships emerged at multiple levels in response to pledges. Andonova (2017) argues that partnerships are an experimental governance instrument that responds to a political window of opportunity, much like we observed in Colombia. The formation of

³ <https://www.regjeringen.no/contentassets/c8ce0675a70744a2a96314adbea0a971/jdi-original-eng.pdf>

partnerships is influenced by political conditions within institutions (i.e., principals), but can be prompted by external turbulence (e.g., focusing events) and opportunities (e.g., REDD+) to align with non-state actors (i.e., agents) (Andonova 2017). Partnerships can thus be a metagovernance strategy for governments to orchestrate actors and initiatives toward national zero-deforestation goals. In Colombia, the climate change and zero-deforestation agenda from NDC and REDD+ created favorable institutional conditions. Public-private partnerships allowed the GoC to leverage nonstate expertise and financing to pursue projects, while preserving sovereignty over transnational domains by influencing the identity of initiatives and keeping them aligned with national priorities. The centralized monitoring of zero-deforestation initiatives is another means for the GoC to exert control over partnerships. As soft, often non-binding instruments, public-private partnerships are ideal for businesses to pursue zero-deforestation in their supply chains and allow them to share risk with governments. This is particularly attractive for companies operating in high forest risk commodity sectors where NGO watchdogs are denouncing lagged progress on commitments.

The zero-deforestation agreements signed in the palm oil, cattle, and cocoa sectors of Colombia are an exemplary use of public-private partnerships as an experimental instrument. These partnerships integrate all three zero-deforestation governance domains to create novel multi-stakeholder structures that are: propelled by REDD+, articulated by public policy, and implemented as supply chain initiatives. The only analog of a forest conservation initiative targeting an entire commodity sector at the national level is the Cocoa & Forests Initiative in Côte d'Ivoire and Ghana, a zero-deforestation agenda in the cocoa sector set at the country level but implemented in subnational regions of REDD+ importance (Carodenuto, 2019). The commodity ZDAs in Colombia also set unambiguous time bound targets of “gross” deforestation (i.e., forest regrowth does not offset loss). In these partnerships, the GoC convenes actors and monitors progress, companies implement the commitment along their supply chains, and NGOs provide technical support and expertise for both rule setting and implementation. If successful, these multi-stakeholder ZDAs could provide a model for advancing zero-deforestation commodity production in other countries.

5.4. Challenges and limitations

Despite advances in the Colombian zero-deforestation agenda, significant barriers impede hybrid governance strategies from unlocking transformative change. Illegality is the biggest challenge facing the GoC and multi-stakeholder alliances. Public-private partnerships and other supply chain initiatives have limited ability to engage the actors behind illegal deforestation. An intractable driver in the post-conflict period has been land grabbing (*acaparamiento de tierras*) through cattle ranching (*praderización*), by which forests are cleared and few symbolic cattle are put in place to stake claim until possession can be legalized through formal land titling (Arenas 2018). Legal drivers of deforestation such as infrastructure expansion fuel this trend by increasing land speculation (González et al. 2018). In 2018, the GoC estimated that 48% of deforestation in the country was caused by land grabbing (Semana Sostenible 2018). REDD+ and supply chain initiatives are only able to target cattle rearing as a production system. Law enforcement strategies like *Operation Artemis* may also have limited potential in addressing this issue as those clearing forests are often not the perpetrators, but contracted campesinos. Land grabbing concentrates land ownership and can occur through legal or illegal means, perpetrated by armed groups, large domestic landholders, corrupt actors, and multinational corporations (Oxfam International 2013; Hurtado 2018).

Illegality is thus closely linked to conflicts over rural land tenure. The most recent national agricultural census found that 70% of farmers and ranchers operate on less than 5 hectares of land, representing 2% of the national rural area; conversely, 0.2% of producers maintain at least 1000 hectares representing 74% of the rural area (Oxfam International,

2017). Failure in the land market and thereby land concentration through land grabbing fuels further speculation and forest clearing on the frontier (Armenteras et al., 2019). While many subnational and project-level zero-deforestation initiatives target communities, weak rural reform and government policies that favor agro-industrial interests (e.g., Law 1776, 2016 - ZIDRES) could exacerbate land concentration and risk marginalizing smallholders (Guereña, 2017). Without land titles, smallholders are unable to access credit to finance green ventures and may be less inclined to invest in their properties.

Weak enforcement capacity also remains a challenge. While near real-time monitoring capabilities have progressed, enforcement of environmental regulations is still handled by understaffed and underfunded regional environmental authorities. For instance, just three of these agencies are tasked with regulating the 40+ million hectares of forest in the Amazon. One agency has two technicians responsible for 15 million hectares of forest in three departments. The consequences of weak enforcement are evident in the timber sector: 47% of the timber produced and sold in Colombia is illegal, representing 10% of national deforestation (EIA 2019). As publicly funded entities, regional environmental authorities rely on property taxes for their budgets, but higher property values (i.e., well-funded corporations) occur in more populated interior and coastal regions where deforestation is less concerning.

Navigating the complex zero-deforestation policy ecosystem also carries high transaction costs. Public zero-deforestation policy in Colombia is well articulated on paper through laws, national strategies, and sectoral/territorial plans, but stakeholders are challenged by an overly complex land use planning system with limited continuity and coherence for rural land planning (Suarez et al., 2018). Effective implementation and scaling in the zero-deforestation policy ecosystem will require further coordination between the central and sub-national governments, as identified in the Colombian livestock sector (Tapasco et al., 2019). To achieve long-term change, zero-deforestation initiatives must become sufficiently institutionalized such that they continue after the project lifespan when funding or political support has expired. Project permanence depends on adoption or absorption by an established local institution (e.g., NGO, government) to ensure the continuation of goals. This could also include the institutionalization of supporting policies. For instance, new lines of government-sponsored green credit could allow current projects to extend beyond the timeline of donor funding, such as low-interest loans for farmers and ranchers that stipulate zero-deforestation conditions.

6. Conclusion

In tropical developing nations seeking to balance rural development with emissions reductions, a complex policy ecosystem is emerging at the intersection between climate and forest governance domains. This brings new opportunities for multi-stakeholder engagement and policy synergies, but results in a more fragmented governance landscape that lacks directionality. A new model is needed that links top-down, multilateral directives with the bottom-up groundswell of subnational and non state actions. Zero-deforestation aspirations in territories and along supply chains offer new opportunities for public and private collaboration. Under the zero-deforestation banner, governments can align domestic public policies for reducing emissions with the proliferation of REDD+ projects and supply chain initiatives seeking to eliminate deforestation.

The sequencing, actors, and interactions occurring in the zero-deforestation policy ecosystem in Colombia could provide a model for other tropical nations. Colombia demonstrates how zero-deforestation can be set on the national agenda when focusing events capture national attention. With political support, zero-deforestation goals can then be pursued through international cooperation that builds domestic institutional capacity while respecting national priorities. Zero-deforestation pledges attract a supporting cast of subnational and non state

actors whose goals are aligned. Without national-level leadership and directionality, disparate zero-deforestation initiatives have limited scaling potential in a fragmented policy ecosystem and may have difficulty gaining traction in the absence of a domestic enabling environment. The Colombian government is using public-private partnerships at multiple levels to engage diverse stakeholders, experiment with new business models, and scale up impacts. Following this example, proactive governments can create a race to the top for companies pursuing zero-deforestation pledges.

A well-structured zero-deforestation governance landscape is taking shape in Colombia, but barriers still impede public and private pledges in the country. Sanctions and law enforcement remain crucial to controlling the current surge in post-conflict deforestation from illegal actors rushing to claim lands, while a mix of command-and-control strategies and incentive-based supply chain initiatives can have longer-term impacts by closing the agricultural frontier and accelerating adoption of sustainable production practices linked to market opportunities.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.gloenvcha.2020.102055](https://doi.org/10.1016/j.gloenvcha.2020.102055).

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