

RESEARCH ARTICLE

Relational aspects and care-based support in Zero-Deforestation Commitments

Adelina Chandra^{1,2*}, Janina Grabs³, Eva-Marie Meemken¹, Rachael D. Garrett^{1,4}

1 Department of Environmental Systems Science, ETH Zürich, Zürich, Switzerland, **2** Trase, Global Canopy, Oxford, United Kingdom, **3** Department of Social Sciences, University of Basel, Basel, Switzerland, **4** Department of Geography and Conservation Research Institute, University of Cambridge, Cambridge, United Kingdom

* adelinachandra@gmail.com



Abstract

A rising number of companies have made zero-deforestation commitments (ZDCs) to decouple deforestation from their supply chains, encapsulated in No Deforestation, No Peat, and No Exploitation (NDPE) commitments. These interventions are designed by powerful downstream supply chain actors, typically without the involvement of the upstream-level non-industrial producers who are affected both directly and indirectly. This study draws on bottom-up perspectives from oil palm smallholders, cooperatives, and other local stakeholders in Indonesia to explore the state of company-community relationships and the implementation and expectations of corporate ZDCs. Through an analysis of 28 focus group discussions and 25 expert interviews in two provinces in Sumatra, Indonesia, our findings reveal significant gaps in procedural equity, highlighting inadequate mechanisms for voicing concerns, insufficient procedures for meaningful participation, and a lack of attention to expected implementation procedures. Most importantly, we uncover the critical need to recognise historical and ongoing relationships between communities and companies when designing corporate sustainability policies. Recognising equity as an evolving concept that ideally should be shaped by contextual realities, our study advocates for the integration of relational aspects and care-based support into ZDCs, complementing the current understanding of equity.

OPEN ACCESS

Citation: Chandra A, Grabs J, Meemken E-M, Garrett RD (2026) Relational aspects and care-based support in Zero-Deforestation Commitments. PLOS Sustain Transform 5(5): e0000235. <https://doi.org/10.1371/journal.pstr.0000235>

Editor: Daniel Miller, University of Notre Dame Keough School of Global Affairs, UNITED STATES OF AMERICA

Received: March 24, 2025

Accepted: March 20, 2026

Published: May 8, 2026

Peer Review History: PLOS recognizes the benefits of transparency in the peer review process; therefore, we enable the publication of all of the content of peer review and author responses alongside final, published articles. The editorial history of this article is available here: <https://doi.org/10.1371/journal.pstr.0000235>

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Author summary

We explore how Zero Deforestation Commitments (ZDCs) are perceived and implemented at the local level in Indonesia, focusing on the interactions between communities and corporations. Through 28 focus groups and 25 expert interviews, we uncover shortfalls in procedural equity related to ZDCs, including poor community feedback mechanisms, limited meaningful participation, and insensitivity towards the local communities' expectations of ZDCs. This study

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Data availability statement: All relevant data are within the manuscript and its [Supporting Information](#) files.

Funding: This work was supported by the Swiss National Science Foundation (SNF; <https://www.snf.ch/en>) (Grant #100017_192373 to RG and JG; AC and JG were funded through this award) and by the European Union through the European Research Council (ERC; <https://erc.europa.eu>) under the project FORESTPOLICY (Grant #949932 to RG). The views and opinions expressed are solely those of the authors and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority is responsible for them. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing interests: The authors have declared that no competing interests exist.

emphasizes the necessity to view equity not just as a policy checklist but as a dynamic, evolving concept deeply influenced by local contexts and historical relationships. By advocating for the integration of relational and care-based perspectives into ZDCs, we enrich the current understanding of equity, urging sustainability actors to foster deeper, more meaningful engagements in the landscapes where they operate.

1. Introduction

Agricultural production has expanded at the expense of the world's remaining forests [1–5]. This is particularly evident in the palm oil sector, where both large and smaller-scale farming practices increasingly threaten tropical forests [6–9]. Heightened public pressure on commodity supply chains with high deforestation risk has prompted the adoption of stricter policies targeting forest-risk commodities, including voluntary Zero-Deforestation Commitments (ZDCs) and mandatory trade regulations such as the EU Deforestation Regulation (EUDR), affecting all supply chain actors engaging with the export markets [10–15,17]. While these measures are primarily designed to address deforestation issues, they often fail to adequately consider equity in their design and implementation. This oversight is especially evident for commodities like cocoa and palm oil, where extensive smallholder involvement requires policies that address the diverse needs and constraints of these producers [16–19]. From both ethical and empirical standpoints, it is imperative to implement ZDCs in equitable ways by enhancing the inclusion and minimising the potential socioeconomic risks of actors affected by ZDCs [20]. This study aims to shed light on bottom-up perspectives from smallholders, cooperatives, and other local stakeholders regarding the state of corporate ZDC implementation and what equitable ZDCs entail [20,21].

Companies with ZDCs in the palm oil sector typically require their suppliers to cease forest and peatland conversion to palm plantations, and may also have additional requirements such as restrictions on burning, the pursuit of land legality, or certification with sustainability standards [20]. However, smallholders often face different challenges in meeting such requirements that typically result in low participation rates in sustainable supply chain initiatives [22–24]. Smallholders' ability to meet new requirements by buyers is shaped by their adaptive capacities—defined as any capability or resources enabling producers to swiftly adjust to shifts in market conditions and expectations, such as education, knowledge, technology, legal status, financial assets, or social capital [25,20]. A lack of these capacities may lead companies to cease sourcing from producers unable to comply with the policy requirements. Such a practice would endanger smallholders' access to international markets, potentially exacerbating rural poverty and income inequality [20,26]. This in turn undermines the stability of supply in deforestation-risk supply chains, which have numerous smallholder producers [7].

Moreover, smallholder participation in sustainable supply chain initiatives is often passive, through co-option or consultations which neglect power imbalances [27].

Participation in conservation-related efforts is more likely if smallholders see direct benefits, which may enhance their capacity and buy-in to comply with ZDCs encouraging behavioural change to support long-term conservation success [21,26,28,29]. Despite the importance of these processes, empirical evidence on smallholders' perceptions of ZDCs and their ability to participate in their implementation is limited [23].

We address this research gap by examining various dimensions of equity [20,21] in ZDC implementation that have received less attention in existing studies of ZDCs: procedural equity, relational aspects, and ideas of care. The first pillar of this work focuses on taking stock of equity in existing community relationships with ZDC firms. The second pillar examines the actual and perceived alignment of the ZDC policies with community expectations. Our analysis is structured around two research questions: 1) How do non-industrial producers or suppliers perceive their relationships with companies? and 2) How are non-industrial producers' perceptions addressed within the processes to ensure equity in ZDCs, and what would they suggest to improve the process?

Our case study in Sumatra, Indonesia—home to a large number of smallholder actors in the palm oil supply chain who collectively manage 81% (4.8 million hectares) of Indonesia's smallholder oil palm area [7]—provides a relevant context to study what equitable supply chain policy initiatives might entail. We collected data through 28 focus group discussions with 210 participants and 25 semi-structured interviews in over 70 villages across Aceh and South Sumatra provinces, which remain hotspot areas for oil palm expansions and deforestation [30]. Employing an abductive approach, we combined deductive and inductive methods to assess the alignment between theoretical equity elements and empirical findings [31]. We explore the elements of equity in the next section.

2. The equity lens and care

We focus on equity—i.e., “equal treatment according to particular metrics of ‘fairness’ or ‘justice’” [70]—to address ways in which to mitigate the socioeconomic marginalisation and vulnerabilities of smallholder groups in supply chain initiatives [32]. Although equity is an essentially contested concept, four components are commonly identified in the literature, and we illustrate these in Fig 1 (Friedmand et al., 2018, Shyamsundar et al., 2022). Equity in institutions and decision-making, also known as procedural equity or input equity, broadly defines equity in how decisions are made and who is involved [21,29,32,33]. Equity in access (also known as contextual equity or access equity) concerns how various actors can participate in specific interventions (i.e., access the ZDC interventions), and it underscores the importance of social, economic, and political contexts that can determine the distribution of outcomes [25,20]. Distributive equity or output equity refers to the fairness of outcomes; who bears the costs and benefits [29,32,33]. A fourth, less studied aspect of equity, especially in the context of policy interventions, is that of acknowledging and aligning with the ontologies and rights of different communities, especially marginalised groups, known as recognitional equity [34]. These concepts are interconnected: Procedural equity informs necessary steps for access equity, while access equity provides the foundation for distributive equity. Recognitional equity underpins developing the right procedural approaches, and acknowledging distributive equity shortfalls. We illustrate the interaction between these equity elements and effectiveness following the policy processes in Fig 1. As further elaborated in the next section, we expand the theorisation of recognitional equity and the interactions between equity components by integrating concepts from the “ethics of care”.

2.1. Equity in ZDCs

In the context of ZDCs, conservation goals are often prioritised over access and recognitional equity, presenting a challenge in ensuring smallholder inclusion [20,35,36]. For instance, a study found that over half of the companies with low-quality ZDCs fail to include smallholder support in their commitments [15]. This lack of support is further evidenced by Chandra et al. [37] (in review, n.d.), who analysed primary survey data of 1,541 non-industrial farmers in the palm oil sector. The study finds no equity in access, as indicated by low levels of knowledge dissemination and capacity-building training. Palm oil mills have also been reported to show a lack of commitment towards

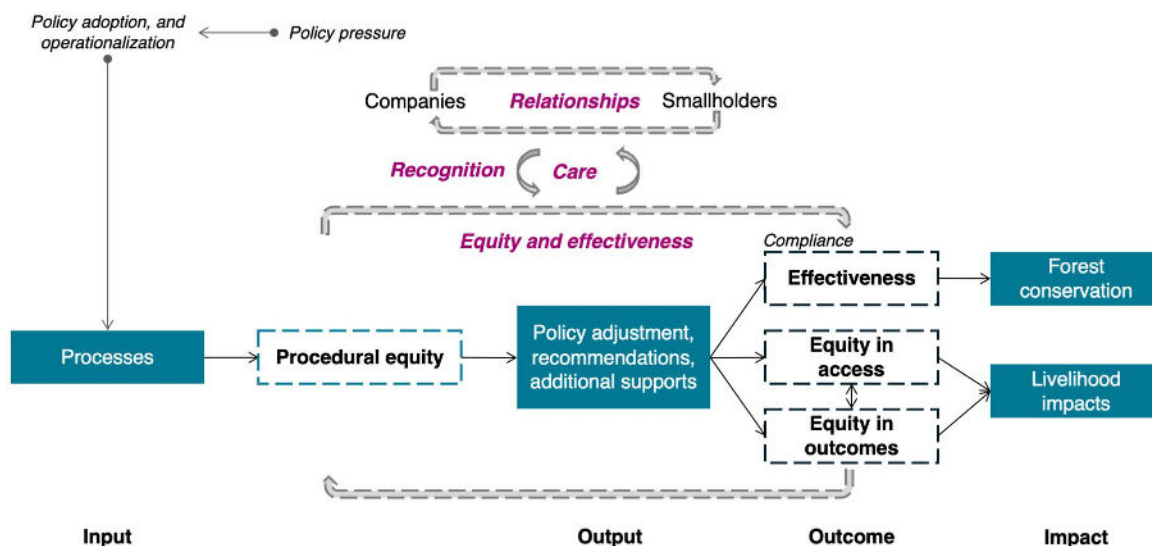


Fig 1. The conceptual framework illustrates the effectiveness, equity, and care in forest-focused supply chain policies. The top of the framework shows the relationships between companies and smallholders and the bottom part shows simplified equity elements within the policy processes. The feedback loop between relationships and policy processes illustrates their continuous interaction, emphasising 'care' to describe the ongoing interplay between these two aspects.

<https://doi.org/10.1371/journal.pstr.0000235.g001>

supporting capacity building for smallholders [18]. Similarly, in the cocoa sector, capacity-building efforts offered by companies are primarily focused on productivity gains, with only a select few providing training on agroforestry or forest conservation [16].

Additionally, the same studies show that ZDCs rarely have a positive impact on equity in outcomes. In the palm oil sector, there is no significant price and revenue differentiation between those selling to ZDC-affiliated mills and their counterparts [37]. In the cocoa sector, even though some companies pay a certification premium, they still fall short of providing farmers with prices that enable living incomes which is necessary considering that over third-quarter of Ghanaian and Ivorian cocoa farmers earn less than a living income [16,38]. Often, the most vulnerable, indirect suppliers and those located in communities admitted into protected areas, are excluded [16]. The cases of formalization in Ghana's timber sector and climate-smart cocoa governance in Côte d'Ivoire and Ghana illustrate the complexities of top-down initiatives, which often undermine existing local rights and fail to address smallholder realities, thus exacerbating equity issues rather than resolving them [39,40]. While the Roundtable on Sustainable Palm Oil (RSPO) certification, one of the approaches for implementing ZDCs, had marginal positive effects on poverty alleviation and village well-being in villages with primarily market-based livelihoods prior to certification, subsistence-based villages did not experience the same improvements, raising further concerns about distributional equity [41]. More broadly, findings from ZDCs reveal a persistent lack of progress in addressing equity concerns. These findings collectively suggest that equity in access and equity in outcomes are, at best, very marginal, if not absent.

To address these issues, Grabs et al. [20] suggest the need to combine stringent rules with widespread capacity building, co-production of implementation mechanisms, and support for affected non-industrial producers to enhance access equity. Chandra et al. [17] advocate for strengthening traceability, compliance support, and transparency for smallholders, and aligning supply chain policies with local contexts, which are influenced by existing power asymmetries. These asymmetries may allow elites to capture benefits and further marginalise weaker actors, limiting their participation in resource protection initiatives [42–45].

Given the interconnectedness of the equity elements, the literature suggests that procedural equity lays the foundation for achieving access and distributive equity [21,34]. Procedural equity also closely interacts with recognitional equity, as fair and inclusive decision-making processes depend on acknowledging and respecting diverse values, identities, and rights of affected groups. However, it remains underexplored in the context of ZDCs, though it has been addressed within the broader scope of corporate sustainability literature (e.g., third-party certifications) [46–48]. For example, multi-stakeholder initiatives such as the Round Table on Responsible Soy Association (RTRS), which includes zero-deforestation criteria, have faced criticism for consolidating power and restricting wider participation, thus, reinforcing existing power imbalances that marginalize vulnerable groups such as local communities and indirect suppliers [42,49]. Similarly, McDermott et al. [33] note that the EUDR, like other ZDCs, is inherently driven by the interests of commodity import regions, which have given limited input or voice to Global South governments and communities in regards to these commodities. Berning L, Garrett RD, Sotirov M. [50] confirm that, in the actual policy development process, Global South voices were largely ignored, losing out to more powerful advocacy coalitions.

2.2. Lack of focus on relationships and care

Achieving procedural equity involves including the affected groups in the decision-making processes for corporate-initiated policies [42,46]. This requires providing opportunities for smallholders—often impacted by such policies—to participate in shaping them [29]. Ideally, equity in processes should ensure equal and transparent treatment and provide opportunities for all actors to voice their concerns [21,47,48]. The literature points to four essential components of procedural equity: i) mechanisms for raising concerns, ii) transparency, iii) participation in policy adjustments, and iv) equal treatment in processes [21,25,47,48]. In the context of ZDCs, procedural equity has been theorised around the co-production of rules and implementation procedures which align most with the third component (i.e., participation in policy adjustments) [20].

However, policy processes are influenced by historical, social and political contexts that can support or hinder the development of the policies and implementation. Most policies take place in the space of material struggles over competing ‘rights’—such as those of workers, affected communities, or the environment [51]. All sustainability policies in some ways restrict certain freedoms which may not align with the views of affected communities on what normatively “good” behaviors are or be framed under justifications that align with community world views. Policies will therefore have unique equity dimensions stemming from the ongoing relationships between those making and implementing the policy and the communities that are impacted. This makes all policy equity impacts ‘relational’. The recognitional element of equity calls for “acknowledging and respecting diverse participants and their lived experiences” [52]. But given its subjectivity, how can relational equity be addressed? To conceptualise this we integrate insights from the ethics of care literature [53–56]. The ethics of care is defined as “a theory that associates moral action with meeting the needs, fostering the capabilities, and alleviating the pain and suffering of individuals in attentive, responsive, and respectful ways” [54]. Incorporating care ethics into corporate strategies demands recognition of both relational aspects and moral responsibilities, which encourages firms to consider not only who is geographically and temporally close but also those with whom they have established relationships, and those in urgent need including their suppliers and local communities [54,57]. This perspective enriches equity frameworks in company-supplier relations by focusing on the connections and care-based dynamics, as illustrated in Fig 1.

To understand these multiple dimensions of equity in the case of oil palm ZDCs in Indonesia we took an abductive approach based on 25 expert interviews and 28 focus group discussions in Aceh and South Sumatra provinces in Sumatra, Indonesia. Our sample included a diverse group of smallholders as well as local government officials integral to the palm oil supply chain in Indonesia. Each interview is uniquely coded with ‘I’ and a number (e.g., I-1). Our coding framework for analysis had originally focused on the themes of participation, access and outcomes related to community interactions with ZDCs and their implementation approaches. However, we noticed that communities often mentioned historical relationships and care related concepts. In particular, without our prompting, a number of communities used the

terms “care” (*peduli*), “pay attention to/take into account” (*memperhatikan*), and “help/support/aid” (*membantu* in Bahasa Indonesia) in our focus group discussions. Importantly, these terms were used by participants themselves (rather than introduced through our translation choices), indicating that the language of care and attentiveness emerged from participants’ own ways of describing relationships. We therefore group these terms under “care” because, in the Indonesian context, they capture expectations that powerful actors show moral concern, be attentive and responsive to community needs, and provide tangible support (see further on care in general and Indonesian context [56,58]). Participants further elaborated these ideas by referring to lack of company support, moral concern toward local wellbeing, and attentiveness toward local farmers (see Table B in [S1 File](#) for an overview). In line with our abductive approach (i.e., a form of inference that seeks the most plausible explanation from the data and allows for iterative review and reconsideration of the data itself [31]), these recurring themes prompted us to refine our analytical focus. This process inspired us to integrate these ideas into [Fig 1](#) and guided our analysis of the results along these lines.

3. Results

3.1. Producers’ perceptions of corporate-community relations: distrust and lack of care

Our analysis suggests that past relationships between communities and companies influence perceptions of equity and the ways corporate initiatives should be implemented to promote equity. The palm oil industry has a long history of employing complex land acquisition strategies that range from establishing cooperative relationships with local communities to deploying measures that often result in loss of land access for these communities [59–62]. Unresolved land grievances are a major source of conflict in rural communities that rely on land for their livelihoods [61].

While there were a few instances of smallholders reporting positive relationships with companies, most FGDs indicated persistent tension between companies and communities. Across the 28 FGDs (four with extension officers affiliated with the regency’s government), only three described their relationships with companies as positive, 6 as negative and 19 as mixed, with most of the mixed cases (15) leaning negative (see Table B in [S1 File](#)). These were primarily driven by conflicts over land and the misuse of personal information.

Farmers expressed frustration with unfulfilled promises regarding land ownership, reporting that companies retain their land certificates or fail to issue promised land titles. For instance, one interviewee highlighted that *“the community should have received land certificates at the end of the [cooperative] contract period, but to date, only some community members have received certificates of ownership for their plantation”* (I-19). Adding to the sense of dispossession, another member of the community mentioned the loss of their customary connection (in Indonesian known as ‘adat’) to the land: *“It can be said that the customary forest is where our parents lived; we used to call it ‘lebuk,’ which means custom. Now, we are surrounded by company lands”* (I-2). These remarks illustrate the results of corporate practices on land use disparities, legal ownerships, and cultural connections.

Additionally, concerns about privacy and the misuse of personal data further exacerbate community-company tensions. Farmers were asked to provide personal details under the pretence of receiving subsidies. A focus group participant expressed the following statement: *“[The company said] ‘For any oil palm farmer, we [company representatives] will measure some data, and then we will bring you fertiliser and some loans. No matter what, we will help.’ Then they did the survey, gathered the data, and my suspicions became real.”* The misuse of farmers’ information became apparent when the collected family card data, along with the identity cards supposedly needed for receiving fertilisers, were used to extend the company’s Hak Guna Usaha (HGU) or concession permit without any consent (I-2, with a similar case reported by I-1).

Despite legal obligations requiring companies to secure written consent from local communities for land concessions, this requirement is often not met. The misuse of personal data, initially claimed for subsidies, to falsely secure consent, damages trust and further strains relationships with the communities [18,62,63]. Similar issues have been reported in Malaysia [61], other regions in Indonesia [61,64,65], Myanmar [66], and the implementation of ZDCs in Liberia’s oil palm sector [19], involving both rural and indigenous communities.

Meanwhile, government interventions have been deemed ineffective and seen to prioritise land allocation for companies over rural community livelihoods as seen in the following statement: *“And companies, by the government, were given so much HGUs [concessions], but [there has been] no partnership with locals to achieve a better result”* (I-36). Additionally, there is a lack of partnerships offered to non-industrial suppliers as expressed in this statement *“They [companies] take the results [fruits] of our oil palm plantations for them [their mills], but they never provide guidance or how to manage oil palm properly. That’s the problem too, [for example] there’s a factory here without a plantation, [this factory] relies on [the supply from the] community’s plantations, but it never collaborates with the community”* (I-13). These issues are also consistent with previous studies documenting ongoing land conflicts and exploitative practices within the palm oil sector, with corporations often employing strategies to persuade local leaders, coerce communities into land agreements, or sponsor election candidates [60,67–69]. Land claim issues affect not only independent smallholders but also those under partnerships with companies managing thousands of hectares, such as in plasma areas [61]. Unresolved claims can turn into prolonged disputes and even violence [61,62]. As described by Berenschot et al. [59], these ‘informal’ networks between companies and political leaders provide companies with privileges and regulatory favours, especially in securing land for plantation expansions.

In one case, some NGOs have attempted to help but decided to step back because the situation got politicised as articulated here: *“There is no certificate (land titles). There was already an NGO [helping us], but it hasn’t continued until now, because of politics, [...] leaving the community frightened”* (I-17). These strategies contribute to social dislocation, heightening insecurities among communities and undermining trust in any companies, thus hindering new efforts to engage with local communities [60,62,67].

We find that communities used the language of “care” to describe the lack of attention, urging the companies they supply and those nearby to be more attentive to their needs, especially the suppliers and local communities in vulnerable conditions, as captured in this statement: *“So actually our biggest hope is that the companies [...] actually care [for/in bahasa: peduli] the farmers here”* (I-2). The idea of an ethic of care can also be found in the views of one government official: *“The [rural] communities must be protected because they are vulnerable to poverty and others. That’s why we must guard and assist the community so that they are empowered”* (I-49). A brief summary of how care was conveyed across group discussions is provided in Table B in [S1 File](#).

The historical relationship of mistrust and perceived lack of care colours communities’ perceptions of ZDCs and corporate efforts to limit deforestation and planting on peatland. Respondents frequently highlighted the incongruity between company demands on suppliers to stop deforesting and their own practices, which continued to exploit forests and marginal peatlands. For instance, one interviewee said: *“Yes, I have heard of that [NDPE]. [a company] was next door, they also set up lands that were not to be disturbed, inside the forest there were how many hectares that were not to be disturbed, it was supposed to be restored but in reality, it was all cleared for palm oil.”* (I-50) Another emphasized: *“A company should give an example first [... but] they [companies] just do whatever [they want]. [For instance] Everyone can read [the sign on] the roadside at the end of this bridge, some people want to build kiosks on the roadside of this big river [in peat areas]. It can be read that it is forbidden to plant from the direction of the river. Meanwhile, [the company, with NDPE] planted on the edge of the river [where] people want to build a kiosk, so I laughed [expressing disbelief]”* (I-36).

3.2. How are supplier concerns addressed: lack of procedural equity in practice

Reflecting on past interactions with companies, including experiences during RSPO certification, CSR activities, and conflicts, communities stressed the importance of transparency for maintaining effective communication and partnerships, alongside the need for regular contact with companies and the possibility of raising concerns (see **Table A** in [S1 File](#)). Yet, in practice, the mechanisms for communities to raise concerns about business practices, environmental, or other issues are lacking. Such gaps are reflected by the absence of annual meetings or active public representatives appointed by

companies, creating difficulties in establishing effective communication with companies. These concerns are expressed in FGDs by a farmer: “... now we are confused about where to convey [our concerns]” (I-2).

Additionally, the adoption of sustainable practices is often hindered by large upfront costs and lack of capital, which compete with the immediate financial needs of households [70,71], which was also expressed in this statement: “What is clear is that the rules are stricter, so we are taught again to be orderly with the rules, be it state rules or international rules because the problem of oil palm cultivation, one of them, is just like the cost of it all, it can’t be free. The rules sometimes bind us to our productivity, right? The quality. It’s just that, here the quality is maintained but now the price can’t go up either” (I-10).

This persistent failure in communication between communities and companies, marked by often ineffective or absent procedures, leads to frustration and a sense of neglect within the communities, undermining any expectation of mutual benefits or reciprocity. Consequently, this may diminish the community’s willingness to engage cooperatively with the company, as they feel their concerns and needs are routinely ignored. In some cases, smallholders may have other viable alternatives, for instance, they can sell to informal local traders.

To better enable dialogue between communities and companies, some groups suggested developing a public relations committee or forum composed of community members and firm representatives. These recommendations are articulated by one interviewee: “Even though we have some company’s public relations representatives, it’s like there’s no function. Maybe in the future, if there’s an ideal way for the community to be heard, the complaints of the community for the company could be formed in public relations, with representatives from the community, so it really functions. That’s what we want.” (I-17). Further expanding on this idea, another interviewee suggested, “The representative of the community should organise an annual gathering event for the village... [The representative] summarises complaints and addresses them in the company policy” (I-2). Additionally, “Opening a communication door [through a forum] could capture [...] and resolve all problems in the forum. [...] This way, the community is assisted, not just being an audience.” (I-2).

Such two-way communication could not only help to resolve existing company-community disputes and rebuild trust, it could also help address one of the main perceived difficulties of actually addressing deforestation, namely the lack of knowledge amongst communities surrounding official forest boundaries and areas that are off-limits for being cleared: “The community received no info/socialisation which one is HP forest which one is APL [areas allocated for land uses other than forests, that can be used for plantations], and which is customary forest if there is one.” (I-1) Another interviewee stressed: “For this forest issue, the government should socialise with the community both through print media and environmental socialisation, for example, the application of boundaries... That is sometimes a weakness in socialisation in the community and the determination of which forest boundaries are forest boundaries. That’s what we feel is lacking.” (I-2)

4. Discussion

4.1. Integrating relational and care perspective to improve the implementation of ZDCs

Our study addresses a major knowledge gap around communities’ perceptions of evolving private sector efforts to implement policies that address deforestation and exploitation. The results, which highlight the long history of inequitable treatment and mistrust, underscore the importance of acknowledging and restoring trust and improving past relationships. These findings indicate historical inequities in company-community relationships have been largely neglected, while new private sector initiatives such as ZDCs are introduced in an ahistorical manner. Despite the introduction of grievance mechanisms in some corporate initiatives, these often present barriers such as lack of accessibility and transparency, and most importantly, they frequently fail to resolve community grievances in a comprehensive and sensitive manner [59,72,73]. For ZDCs to be truly transformative, they must mend existing relationships and remedy past harms in a way that resonates with the affected communities; otherwise, they risk perpetuating mistrust and undermining the objectives of ZDCs. In different contexts, the importance of businesses rectifying past harms with stakeholder communities has been

highlighted using the concept of restorative justice [74–76]. We highlight here that such steps are particularly relevant for supply chain relationships that rely on deep collaboration between buyers and suppliers to achieve environmental or social outcomes.

A better understanding of the ongoing history of company-community relations through greater care- and equity-centred engagement is a prerequisite to implementing sustainability policies. This resonates with recent calls for firms to take social entanglements more seriously and for them to “make kin” or “yarn” with local communities [77–79]. These processes focus on the interconnections between entities, drawing us to better recognise how we are interconnected, as a basis for building mutual trust. While gaining practice in decolonial scholarship and organisational engagement with traditional cultures [80,81], this relational view remains underrepresented in the current theory of equity in ZDCs or sustainability initiatives more broadly.

Furthermore, we emphasise the necessity of evolving from a simplistic view of inclusion towards a more nuanced understanding that fosters meaningful engagement, rather than mere presence or tokenistic participation. In this context, the relational care approach is instrumental, as it helps us to reimagine inclusion. This approach avoids the pitfalls of tokenism, which can sometimes be presented as inclusion but actually places participants at a disadvantage (i.e., being included on terms that marginalise rather than support community well-being improvements) [82]. This mirrors the broader challenges identified in participatory natural resource management, where a global meta-analysis revealed mixed outcomes: while over half of the cases showed improved forest conditions and livelihood benefits, only a few achieved synergies among conservation, livelihood benefits, and community rights, often disproportionately favoring elites [83]. Empowering local governance through formalised organisations and participatory rule-making has been proven to enhance both conservation and livelihood outcomes [83,84].

Better relationship management between ZDC firms and producers is crucial both for ethical and instrumental reasons. Ethically, considering the diverse impacts of ZDCs on smallholders, it is paramount that they have the opportunity to participate in shaping the implementation of these commitments [29] rather than being treated only as an audience. To ensure that all voices are heard and valued, the forum should be structured in non-hierarchical and consensual ways. Communities are often unable to communicate their concerns or are dismissed as “too emotional” [85]. However, it is important to acknowledge that these farmers bring valuable perspectives shaped by their unique demographic backgrounds and life experiences. In a participatory agroforestry project in Tanzania, the integration of local knowledge led to increased adoption of practices and higher tree survival [86]. Such knowledge integration requires a deeper understanding and recognition of diverse local knowledge, values and practices that are essential for developing context-specific solutions that align with local challenges [87].

Despite the recognised importance of participatory processes, actual smallholder-related engagement remains limited in the context of ZDCs [16,30], possibly due to several challenges: companies are still advancing towards full traceability, which often does not reach third-party plantations; there is a predominant focus on broad, often time-bound conservation goals that may overlook the nuanced needs of diverse smallholder groups; and the substantial time, effort, and financial investment required to include smallholders [16,20,36,37]. However, enhancing participatory practices not only addresses these gaps but could also strengthen the conservation objectives by fostering deeper cooperation and trust between companies and communities.

4.2. Broader implications for the EUDR and private sector sustainability initiatives

Past studies focusing on improving the equity of ZDCs have focused on designing ZDC programs and implementation to support smallholders, developing transparent grievance systems, and disclosing complaint handling progress [15]. The results of this study expand the frame of policy implications to highlight the critical role of relationship management, not just policy design. The following recommendations apply not only to ZDCs but to EUDR and private sector sustainability initiatives more broadly.

Recommendation 1: Assess community needs and acknowledge historical relations with communities: To establish and restore relationships with communities, company efforts should begin with ensuring Free, Prior, and Informed Consent (FPIC) is in place, guaranteeing participation that is free from coercion, intimidation, or manipulation—a safeguard for community trust and respect [60,61]. But this is just the start. Companies must go much farther than just gaining consent, given the massive inequities in knowledge and power relations. Recognition equity demands that corporate actors should pursue a genuine commitment to supplier care. This entails deliberately investing in understanding how historical relations, past grievances, and experiences of exclusion shape current perceptions of companies, as well as recognising the diverse realities and challenges faced by smallholders and what they actually need and want from their relations with their land and with companies [20]. This process can be supported through collaboration with researchers and civil society organisations, who can help document historical relations, identify equity risks, and facilitate context-sensitive learning while maintaining ethical safeguards. Such understanding is a prerequisite for meaningful engagement and cannot be assumed or standardised across contexts.

In light of the EUDR, companies are now required to enhance traceability, a key component in many corporate ZDCs, which includes a focus on verifying suppliers' plantation details [88]. Such requirements in traceability necessitate handling extensive data, which may contain sensitive information and require cooperation with non-industrial suppliers. While data can be a powerful tool for evaluation and development, it also raises significant concerns regarding potential misuse, privacy breaches, and issues of monetisation [89]. Addressing historical grievances, exploitation, and building trust, therefore, are critical steps not only to alleviate farmers' concerns about how their personal information is managed but also to enable them to use the data.

Recommendation 2: Integrate understanding of community needs into policy design: With better understanding of the socioeconomic context and the importance of equity for supply chain sustainability, companies can pursue improved supply chain policy designs and implementation mechanisms that lead to great potential synergies between effectiveness and equity. For example, policies could integrate more context specific capacity building activities and integrate many more opportunities for feedback in the design and adaptation of policies. To enhance this, three strategies were recommended by farmers we spoke with: establishing a forum with equitable representation of marginalised groups, adopting a consultative approach, and appointing an independent community representative to enhance engagement, all pursued in a non-hierarchical manner. Training programs focused on Good Agricultural Practices (GAP), though proven to improve yield and income, are less effective and attractive without adequate materials and proper supervision [71,90,91]. Really investing in community needs, going beyond standard industry practices, can in turn build greater trust and understanding between companies and communities, improved farm income and resilience, and greater farmer agency.

Recommendation 3: Align dissemination approaches with local worldviews: Companies' communications of their policies should align with communities' worldviews and appeal to concepts and benefits that resonate with them, or else they will continue to be met with distrust. For example, in the context of Indonesia, an on-going field experiment aims to test whether training with community engagement components provided for independent oil palm smallholders integrated in the implementation of corporate NDPE policy can reduce deforestation while benefiting farmers [92]. This experiment combines GAP training and financial literacy with an additional norm-based NDPE training designed to activate farmers' altruistic values and encourage social norms for conservation. Such design aligning policy dissemination with local norms could potentially strengthen farmers' intrinsic motivation to conserve forests, thus leading to deforestation reduction and stronger responsible farming behaviour.

Recommendation 4: Integrate community relations in a coordinated jurisdictional approach via collaboration with governments: While individual corporate efforts to address relational dynamics and care are imperative, they hold even greater potential when integrated with broader, coordinated approaches [93,94]. Our discussions with government representatives highlighted the opportunity to strengthen ZDC efforts by transitioning to jurisdictional or landscape-based approaches (JA) involving governmental collaboration. However, as one interviewee pointed out, *"the implementation [of*

JA] is still somewhat lacking." (I-49). The government can further play a key role in this effort to help clarify forest boundaries and land title provision considering the knowledge gap on these issues (see Table A in [S1 File](#)), which will address existing confusion about the land designation. Challenges related to duration, scale, continuity, and collaboration exist, as articulated in this comment: *"There was training [and fire watch tower building as part of landscape program] for the community, but there is currently no continuation of these activities"* (I-44). Still, a focus on continuous implementation and scaling up initiatives can provide greater geographical coverage and unlock broader effectiveness and equity impacts [\[93\]](#).

5. Conclusion

In the broader context of global sustainability, zero-deforestation commitments and policies targeted at supply chains have emerged as a popular approach advocated by environmental NGOs and lobbyists to address concerns about commodity-driven deforestation. Yet, social NGOs and an increasing number of academic papers have pointed to a lack of attention to equity as a crucial flaw of existing zero-deforestation commitments and policies, including the new EUDR. Many such policies are designed by powerful downstream supply chain actors and lack the perspectives of upstream-level farmers who are directly impacted by these policies [\[33\]](#). Moreover, there is increasing evidence that they may actually exacerbate already precarious livelihoods [\[16,38\]](#). This study picks up where these calls leave off by calling more attention to company-community relationships in the implementation and expectations of corporate ZDCs, highlighting the importance of recognitional equity, and the ethics of care. We describe the interplay between relationships and the policy processes with a feedback loop that serves as a mechanism for capturing and responding to community needs, thus ensuring continuous engagement that affects the equity of supply chain policies. Such engagement is not only a procedural necessity and a moral responsibility but also strategically beneficial for driving both the equity and effectiveness of corporate policy implementation. This relational and care approach will likely increase farmers' buy-in to corporate policy initiatives and supporting corporate compliance.

This study offers insights from smallholder perspectives, emphasising the imperative to embed care within supply chain policies. It is grounded in diverse bottom-up perspectives from interviews and focus group discussions with non-industrial producers, cooperatives, and government entities. This approach contrasts with existing studies that primarily reflect corporate viewpoints.

Yet, it only begins to tap into the broad array of care principles [\[54,55,95\]](#), leaving ample room to explore how these principles can be practically incorporated and measured across various contexts. Moreover, the geographic scope of this study is limited to areas with a large proportion of smallholders in the sectors, thus constraining our understanding to contexts where smallholders are less prevalent such as in Kalimantan or frontier areas in Papua. Future research should expand this inquiry to include comparative studies that span diverse regions, exploring the interaction between bottom-up and top-down perspectives comprehensively. Furthermore, there exists room to investigate how insights derived from other relevant cases and grassroots contexts [\[83,87\]](#) can be systematically integrated into broader-scale initiatives, such as jurisdictional or landscape approaches [\[96\]](#). This could provide a more holistic view of how localised insights might influence and enhance global sustainability frameworks, ensuring that smallholder voices are not only heard but actively shape policy outcomes.

Finally, to reduce the broader deforestation footprint and protect standing forests, non-industrial producers must be encouraged to optimise the use of their current farms and understand the ecological impacts of deforestation on their well-being [\[41,46\]](#). Achieving these goals should foster the development of more inclusive pathways. Given the diversity of the production landscape and actors, further research can expand on studies integrating bottom-up perspectives in other commodity sectors [\[36,46,87\]](#) and explore more in detail the interlinkage between care ethics and equity. To address and mitigate persistent inequities, an ongoing, interactive, and adaptive approach is essential. Rather than limiting our view, this should broaden our understanding of equity as an evolving concept, informed by real-world circumstances.

6. Materials and methods

To explore bottom-up perspectives of equitable ZDCs, we draw from qualitative analysis to answer our research questions from 28 focus group discussions (FGDs) and 25 semi-structured interviews. This manuscript is developed from a chapter of Chandra's doctoral dissertation [30]. Data were collected in 2021/2022 in two major palm oil-producing provinces in Indonesia: Aceh and South Sumatra. We selected these provinces because Sumatra hosts the highest concentration of palm oil mills and non-industrial producers, with approximately 81% of Indonesia's smallholder oil palm land located on the island in 2019 [7]. Aceh and South Sumatra represent contrasting but highly relevant contexts for ZDC implementation. Aceh contains extensive remaining forest and peatland areas and is a priority area for corporate ZDC implementation, whereas South Sumatra has experienced high rates of forest and peatland conversion linked to oil palm expansion and subsequent restoration and conservation efforts [97,98]. Both provinces host large numbers of smallholder farmers operating alongside industrial plantations and mills, making them particularly suitable for examining bottom-up perspectives on equitable ZDC implementation.

Within these provinces, we purposively chose seven focus regencies including Aceh Singkil, Aceh Selatan, Aceh Barat Daya, Nagan Raya, Musi Banyuasin, Banyuasin, and Ogan Komering Ilir. These regencies host a mix of industrial and non-industrial palm oil plantations and various palm oil mills, some of which have adopted ZDC policies, while others have not. We selected 70 villages (see Fig 2) based on pre-matching analysis, randomisation, and further logistical and political consideration (e.g., existing conflict, accessibility see details in S1 File). Within these villages, we organised Focus Group Discussions (FGDs) and interviewed relevant stakeholders.

FGDs serve to elicit information beyond individual interviews by initiating group discussions, capturing group dynamics, and facilitating collective reflections and shared views [100]. The FGDs were guided by a topic guide (see Interview guide

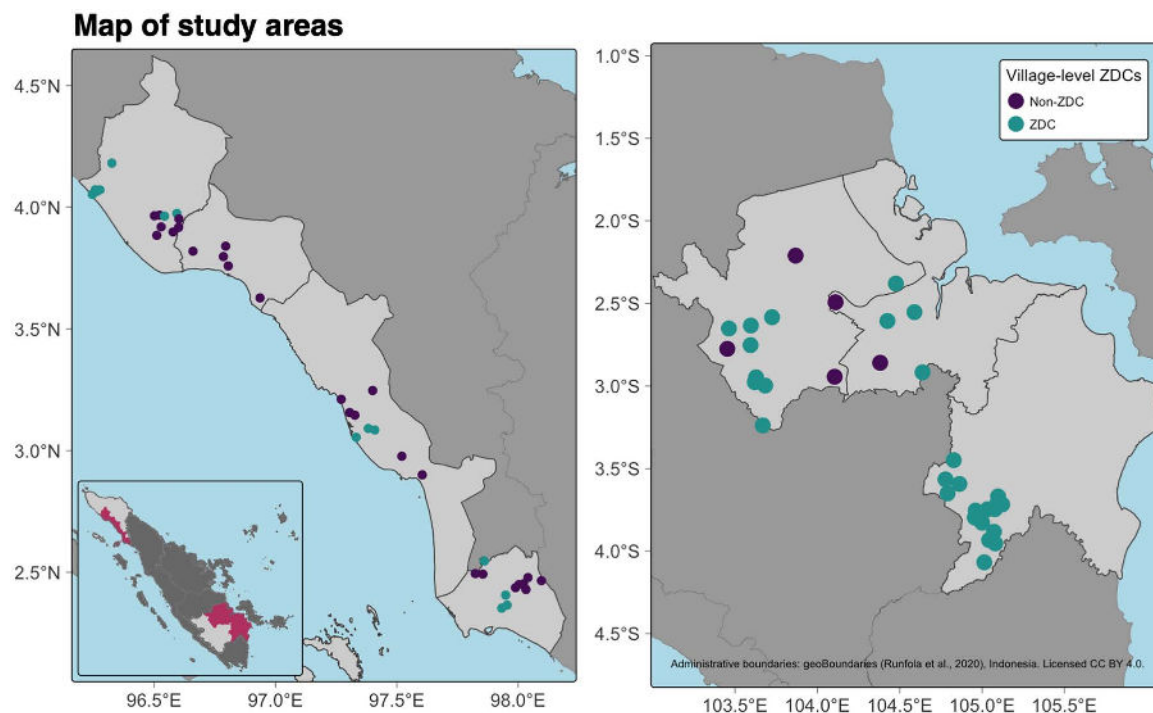


Fig 2. Overview of the study area presents maps of village locations in Aceh (left) and South Sumatra (right). Source: [15], Administrative boundaries are from geoBoundaries, Indonesia (ISO: IDN), ADM2, CC BY 4.0. <https://www.geoboundaries.org/> [99].

<https://doi.org/10.1371/journal.pstr.0000235.g002>

in Appendix), initially prepared in English and translated into Bahasa Indonesia. The FGDs were facilitated by the main researcher together with one of three research assistants, working in pairs. Although no formal training was conducted, the research assistants had prior experience facilitating FGDs in rural communities, and the team aligned on the topic guide, roles, and facilitation approach before fieldwork. We initiated the discussion with questions on community norms and values related to forests, progressing to explore how farmers perceive equitable ZDCs. Given the lack of ZDC exposure, we used terms like ‘sustainability initiatives’ familiar to the participants, to bridge any conceptual gaps.

We conducted 28 FGDs with farmer groups, extension officers (referred to as Government in [Table 1](#)), cooperatives, and women’s groups, averaging eight participants (see [Table 1](#)), which typically took place in community centres or local leaders’ homes and were led by the main investigator. Due to the voluntary nature of the discussions, some FGDs were attended by more than ten people, necessitating the division of the group with assistance from research assistants. Furthermore, verbal consent was obtained and audio-recorded at the start. The discussions were subsequently documented, transcribed in Bahasa Indonesia, and translated into English.

Ethical approval for this study was obtained from ETH Zurich, Switzerland and IPB University, Indonesia. Due to concerns about fraud in some study areas, we obtained audio-recorded verbal consent instead of written informed consent, in accordance with the ethics guidelines.

In addition, we conducted 25 semi-structured interviews [[101](#)] with relevant stakeholders (i.e., village-, district-, and provincial-level government officials as well as local NGOs). We purposively interviewed groups and individuals who could provide insights into the supply chain and ZDC policies. At the village level, exposure to ZDCs may manifest as the implementation of certification programs, sustainable production initiatives, company-imposed restrictions or rules, or jurisdictional approaches. As previously noted, we transcribed the interviews in Bahasa Indonesia and translated them into English.

We took an abductive approach where we iteratively reviewed the data and literature on equity in forest-focused supply chain policies to arrive at our final results [[31](#)]. First, we reviewed the data and extracted open codes from the data. Second, we identified key themes based on the pattern of the open codes and aligned them with the existing literature and our research questions. Third, we organised the codes and themes around the conceptual framework, as explained in section 2. Fourth, we then conducted a deeper analysis reflected from the data and integrated the empirical findings into the conceptual framework, refining and extending the theory of equity in ZDCs. As previously mentioned, each interview is uniquely coded with ‘I’ and a number (e.g., I-1).

Table 1. Focus group discussions details. We organized a total of 28 FGDs with 210 participants and 25 semi-structured interviews in over 70 villages across two provinces.

Type	Total Discussions	FGD details
Cooperatives	4	Discussion participants were members and managers of the cooperatives. The discussions were attended by four to seven people in one discussion, with an average of 5 people.
Government (Extension Officers)	4	To capture the view of government representatives, we held discussions among agricultural extension officers and typically also farmers. The discussions were participated by six to ten people participated per discussion, with an average of 7 people.
Smallholders	12	On average, 8 producers participated in a discussion.
Women’s group	8	FGDs with women, of which 5 groups are in the form of formal female groups. On average, the discussions were attended by 8 people.

<https://doi.org/10.1371/journal.pstr.0000235.t001>

Supporting information

S1 File. Table of contents of Supplementary Information. A Village selection and interview sampling. B Interview guide. C Codes and themes. D. At-a-glance summary of findings. E. Authors' positionality statements. References. (PDF)

Acknowledgments

We sincerely thank our study participants, research assistants, local collaborators, and colleagues for their invaluable contributions to this project. Our five-month fieldwork in Indonesia was supported generously by funding from the Swiss National Science Foundation (SNF) and the European Union. AC and JG received funding through SNF Grant #100017_192373, awarded to RG and JG. RG's work was supported by the European Union (ERC, FORESTPOLICY, #949932). However, the views and opinions expressed are solely those of the authors and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority is responsible for them.

Author contributions

Conceptualization: Adelina Chandra, Janina Grabs, Eva-Marie Meemken, Rachael D. Garrett.

Data curation: Adelina Chandra.

Formal analysis: Adelina Chandra, Janina Grabs.

Funding acquisition: Janina Grabs, Rachael D. Garrett.

Investigation: Adelina Chandra, Janina Grabs, Eva-Marie Meemken, Rachael D. Garrett.

Methodology: Adelina Chandra, Janina Grabs, Eva-Marie Meemken, Rachael D. Garrett.

Visualization: Adelina Chandra.

Writing – original draft: Adelina Chandra.

Writing – review & editing: Adelina Chandra, Janina Grabs, Eva-Marie Meemken, Rachael D. Garrett.

References

1. Busch J, Ferretti-Gallon K. What Drives Deforestation and What Stops It? A Meta-Analysis. *Review of Environmental Economics and Policy*. 2017;11(1):3–23. <https://doi.org/10.1093/reep/rew013>
2. Curtis PG, Slay CM, Harris NL, Tyukavina A, Hansen MC. Classifying drivers of global forest loss. *Science*. 2018;361(6407):1108–11. <https://doi.org/10.1126/science.aau3445> PMID: 30213911
3. Hosonuma N, Herold M, De Sy V, De Fries RS, Brockhaus M, Verchot L, et al. An assessment of deforestation and forest degradation drivers in developing countries. *Environ Res Lett*. 2012;7(4):044009. <https://doi.org/10.1088/1748-9326/7/4/044009>
4. Pendrill F, Persson UM, Godar J, Kastner T. Deforestation displaced: trade in forest-risk commodities and the prospects for a global forest transition. *Environ Res Lett*. 2019;14(5):055003. <https://doi.org/10.1088/1748-9326/ab0d41>
5. Pendrill F, Gardner TA, Meyfroidt P, Persson UM, Adams J, Azevedo T, et al. Disentangling the numbers behind agriculture-driven tropical deforestation. *Science*. 2022;377(6611):eabm9267. <https://doi.org/10.1126/science.abm9267> PMID: 36074840
6. Austin KG, Schwantes A, Gu Y, Kasibhatla PS. What causes deforestation in Indonesia?. *Environmental Research Letters*. 2019;14(2):024007. <https://doi.org/10.1088/1748-9326/aaf6db>
7. Gaveau DLA, Locatelli B, Salim MAH, Manurung T, Descals A, et al. Slowing deforestation in Indonesia follows declining oil palm expansion and lower oil prices. *PLoS One*. 2022;17(3):e0266178. <https://doi.org/10.1371/journal.pone.0266178> PMID: 35349594
8. Lee JSH, Aboud S, Ghazoul J, Barus B, Obidzinski K, Koh LP. Environmental Impacts of Large-Scale Oil Palm Enterprises Exceed that of Small-holdings in Indonesia. *Conservation Letters*. 2013;7(1):25–33. <https://doi.org/10.1111/conl.12039>
9. Schoneveld GC, Ekowati D, Andrianto A, van der Haar S. Modeling peat- and forestland conversion by oil palm smallholders in Indonesian Borneo. *Environ Res Lett*. 2019;14(1):014006. <https://doi.org/10.1088/1748-9326/aaf044>

10. Berning L, Sotirov M. Hardening corporate accountability in commodity supply chains under the European Union Deforestation Regulation. *Regulation & Governance*. 2023;17(4):870–90. <https://doi.org/10.1111/rego.12540>
11. Donofrio S, Maguire P. Commitments in-Country: Palm, & Commitments that Count in Indonesia, 2020. Supply Change. 2020;(February 2020).
12. EU Commission. Parliament adopts new law to fight global deforestation. European Parliament. <https://www.europarl.europa.eu/news/en/press-room/20230414IPR80129/parliament-adopts-new-law-to-fight-global-deforestation> 2023.
13. Garrett RD, Levy S, Carlson KM, Gardner TA, Godar J, Clapp J, et al. Criteria for effective zero-deforestation commitments. *Global Environmental Change*. 2019;54:135–47. <https://doi.org/10.1016/j.gloenvcha.2018.11.003>
14. Lambin EF, Gibbs HK, Heilmayr R, Carlson KM, Fleck LC, Garrett RD, et al. The role of supply-chain initiatives in reducing deforestation. *Nature Clim Change*. 2018;8(2):109–16. <https://doi.org/10.1038/s41558-017-0061-1>
15. Rothrock P, Weatherer L. Targeting zero deforestation: Company progress on commitments that count. *Forest Trends, Ceres*. 2019.
16. Addoah T, Lyons-White J, Cammelli F, Kouakou KMP, Carodenuto S, Thompson WJ, et al. Is the implementation of cocoa companies' forest policies on track to effectively and equitably address deforestation in West Africa?. *Sustainable Development*. 2025. <https://doi.org/10.1002/sd.3380>
17. Chandra A, Garrett RD, Carlson KM, Heilmayr R, Stigler M, Benedict JJ, et al. How well does the implementation of corporate zero-deforestation commitments in Indonesia align with aims to halt deforestation and include smallholders?. *Environ Res Lett*. 2024;19(4):044054. <https://doi.org/10.1088/1748-9326/ad33d1>
18. Eggen M, Heilmayr R, Anderson P, Armson R, Austin K, Azmi R, et al. Smallholder participation in zero-deforestation supply chain initiatives in the Indonesian palm oil sector: Challenges, opportunities, and limitations. *Elementa: Science of the Anthropocene*. 2024;12(1):00099. <https://doi.org/10.1525/elementa.2023.00099>
19. Lyons-White J, Zodia PA, Mikolo Yobo C, Carlon SC, Ewers RM, Knight AT. Challenges for implementing zero deforestation commitments in a highly forested country: Perspectives from Liberia's palm oil sector. *World Development*. 2025;185:106803. <https://doi.org/10.1016/j.worlddev.2024.106803>
20. Grabs J, Cammelli F, Levy SA, Garrett RD. Designing effective and equitable zero-deforestation supply chain policies. *Global Environmental Change*. 2021;70:102357. <https://doi.org/10.1016/j.gloenvcha.2021.102357>
21. McDermott M, Mahanty S, Schreckenberger K. Examining equity: A multidimensional framework for assessing equity in payments for ecosystem services. *Environmental Science & Policy*. 2013;33:416–27. <https://doi.org/10.1016/j.envsci.2012.10.006>
22. Apriani E, Kim Y-S, Fisher LA, Baral H. Non-state certification of smallholders for sustainable palm oil in Sumatra, Indonesia. *Land Use Policy*. 2020;99:105112. <https://doi.org/10.1016/j.landusepol.2020.105112>
23. de Vos RE, Suwarno A, Slingerland M, van der Meer PJ, Lucey JM. Pre-certification conditions of independent oil palm smallholders in Indonesia. Assessing prospects for RSPO certification. *Land Use Policy*. 2023;130:106660. <https://doi.org/10.1016/j.landusepol.2023.106660>
24. Hutabarat S, Slingerland M, Dries L. Explaining the “Certification Gap” for Different Types of Oil Palm Smallholders in Riau Province, Indonesia. *The Journal of Environment & Development*. 2019;28(3):253–81. <https://doi.org/10.1177/1070496519854505>
25. Brown K. Exploring equity and sustainable development in the new carbon economy. *Climate Policy*. 2003;3:S41–56. <https://doi.org/10.1016/j.clipol.2003.10.004>
26. Garrett RD, Levy SA, Gollnow F, Hodel L, Rueda X. Have food supply chain policies improved forest conservation and rural livelihoods? A systematic review. *Environ Res Lett*. 2021;16(3):033002. <https://doi.org/10.1088/1748-9326/abe0ed>
27. Brown K. Innovations for conservation and development. *Geographical Journal*. 2002;168(1):6–17. <https://doi.org/10.1111/1475-4959.00034>
28. Bremer LL, Farley KA, Lopez-Carr D. What factors influence participation in payment for ecosystem services programs? An evaluation of Ecuador's SocioPáramo program. *Land Use Policy*. 2014;36:122–33. <https://doi.org/10.1016/j.landusepol.2013.08.002>
29. Klein C, McKinnon MC, Wright BT, Possingham HP, Halpern BS. Social equity and the probability of success of biodiversity conservation. *Global Environmental Change*. 2015;35:299–306. <https://doi.org/10.1016/j.gloenvcha.2015.09.007>
30. Chandra A. How can zero-deforestation commitments meet conservation goals without compromising the inclusion of smallholders in the Indonesian palm oil sector?. *ETH Zurich*. 2024.
31. van Hulst M, Visser EL. Abductive analysis in qualitative research. *Public Administration Review*. 2024;85(2):567–80. <https://doi.org/10.1111/puar.13856>
32. McDermott CL. Certification and equity: Applying an “equity framework” to compare certification schemes across product sectors and scales. *Environmental Science & Policy*. 2013;33:428–37. <https://doi.org/10.1016/j.envsci.2012.06.008>
33. McDermott CL, Addoah T, Agyarko-Kwarteng T, Asare R, Assanvo A, Bastos Lima M, et al. Equity in Unilateral Value Chain Policies: A Monitoring Framework for the EUDR and Beyond. In: 2025. <https://doi.org/10.2139/ssrn.5101131>
34. Schreckenberger K, Mace GM, Poudyal M. Ecosystem services and poverty alleviation: Trade-offs and management. Routledge. 2018.
35. Lyons-White J, Pollard EHB, Catalano AS, Knight AT. Rethinking zero deforestation beyond 2020 to more equitably and effectively conserve tropical forests. *One Earth*. 2020;3(6):714–26. <https://doi.org/10.1016/j.oneear.2020.11.007>
36. McDermott CL, Montana J, Bennett A, Gueiros C, Hamilton R, Hirons M, et al. Transforming land use governance: Global targets without equity miss the mark. *Env Pol Gov*. 2022;33(3):245–57. <https://doi.org/10.1002/et.2027>

37. Chandra A, Grabs J, Meemken EM, Hidayat NK, Dharmawan AH, Mardiyansih DI, Garrett RD. Limited reach of zero-deforestation commitments to Indonesian oil palm smallholders. Forthcoming.
38. van Vliet JA, Slingerland MA, Waarts YR, Giller KE. A living income for cocoa producers in Côte d'Ivoire and Ghana?. *Frontiers in Sustainable Food Systems*. 2021;5. <https://doi.org/10.3389/fsufs.2021.732831>
39. Hirons M, McDermott C, Asare R, Morel A, Robinson E, Mason J, et al. Illegality and inequity in Ghana's cocoa-forest landscape: How formalization can undermine farmers control and benefits from trees on their farms. *Land Use Policy*. 2018;76:405–13. <https://doi.org/10.1016/j.landusepol.2018.02.014>
40. Maguire-Rajpaul VA, Sandbrook C, McDermott C, Hirons MA. Climate-smart cocoa governance risks entrenching old hegemonies in Côte d'Ivoire and Ghana: a multiple environmentality analysis. *Geoforum*. 2022;130:78–91. <https://doi.org/10.1016/j.geoforum.2021.09.015>
41. Santika T, Wilson KA, Law EA, St John FAV, Carlson KM, Gibbs H, et al. Impact of palm oil sustainability certification on village well-being and poverty in Indonesia. *Nat Sustain*. 2020;4(2):109–19. <https://doi.org/10.1038/s41893-020-00630-1>
42. Bastos Lima MG, Persson UM. Commodity-centric landscape governance as a double-edged sword: The case of soy and the cerrado working group in Brazil. *Frontiers in Forests and Global Change*. 2020;3. <https://doi.org/10.3389/ffgc.2020.00027>
43. Cisneros E, Kis-Katos K, Nuryartono N. Palm oil and the politics of deforestation in Indonesia. *Journal of Environmental Economics and Management*. 2021;108:102453. <https://doi.org/10.1016/j.jeem.2021.102453>
44. Larson KL, Lach D. Participants and non-participants of place-based groups: an assessment of attitudes and implications for public participation in water resource management. *J Environ Manage*. 2008;88(4):817–30. <https://doi.org/10.1016/j.jenvman.2007.04.008> PMID: 17561328
45. Reed MS, Vella S, Challies E, de Vente J, Frewer L, Hohenwallner-Ries D, et al. A theory of participation: what makes stakeholder and public engagement in environmental management work?. *Restoration Ecology*. 2017;26(S1). <https://doi.org/10.1111/rec.12541>
46. Garrett RD, Grabs J, Cammelli F, Gollnow F, Levy SA. Should payments for environmental services be used to implement zero-deforestation supply chain policies? The case of soy in the Brazilian Cerrado. *World Development*. 2022;152:105814. <https://doi.org/10.1016/j.worlddev.2022.105814>
47. Ruano-Chamorro C, Gurney GG, Cinner JE. Advancing procedural justice in conservation. *CONSERVATION LETTERS*. 2021;15(3). <https://doi.org/10.1111/conl.12861>
48. Thorpe J. Procedural Justice in Value Chains Through Public–private Partnerships. *World Development*. 2018;103:162–75. <https://doi.org/10.1016/j.worlddev.2017.10.004>
49. Elgert L. Certified discourse? The politics of developing soy certification standards. *Geoforum*. 2012;43(2):295–304. <https://doi.org/10.1016/j.geoforum.2011.08.008>
50. Berning L, Garrett RD, Sotirov M. How Does the European Union's Pluralistic Institutional System Influence Policy Change? The Case of the European Union Regulation on Deforestation-Free Products. *Sustainable Development*. 2025;34(S1):1362–78. <https://doi.org/10.1002/sd.70236>
51. Gleeson B, Low N. *Justice, Society and Nature: An Exploration of Political Ecology*. 0 ed. Routledge. <https://doi.org/10.4324/9780203006689>
52. Méndez-Barrientos LE, Shah SH, Roque AD, MacClements V, Stern AK. Assessing environmental justice contributions in research and public policy: an applied framework and methodology. *Journal of Environmental Policy & Planning*. 2024;26(2):188–204. <https://doi.org/10.1080/1523908x.2024.2321183>
53. André K, Pache A-C. From Caring Entrepreneur to Caring Enterprise: Addressing the Ethical Challenges of Scaling up Social Enterprises. *J Bus Ethics*. 2014;133(4):659–75. <https://doi.org/10.1007/s10551-014-2445-8>
54. Engster D. Care Ethics and Stakeholder Theory. In M. Hamington & M. Sander-Staudt (Eds.), *Applying Care Ethics to Business*. 2011;93–110. Springer Netherlands. https://doi.org/10.1007/978-90-481-9307-3_5
55. Engster D. Care Ethics, Dependency, and Vulnerability. *Ethics and Social Welfare*. 2019;13(2):100–14. <https://doi.org/10.1080/17496535.2018.1533029>
56. Tronto JC, Fisher B. Toward a feminist theory of caring. *Circles of care*. SUNY Press. 1990. 36–54.
57. Burton BK, Dunn CP. Feminist Ethics as Moral Grounding for Stakeholder Theory. *Bus Ethics Q*. 1996;6(2):133–47. <https://doi.org/10.2307/3857619>
58. Jakimow T, Dewi KH, Siahaan AY. The Ethics of Social Care in Indonesia: Women's Perspectives on Care in Politics, Development and Policy*. *Asian Studies Review*. 2019;43(2):276–94. <https://doi.org/10.1080/10357823.2019.1586830>
59. Berenschot W, Dhiaulhaq AA, Hospes O, Adriana R, Poetry E. Anti-Corporate Activism and Collusion: The Contentious Politics of Palm Oil Expansion in Indonesia. *Geoforum*. 2022;131:39–49. <https://doi.org/10.1016/j.geoforum.2022.03.002>
60. Colchester M. Promised land: Palm oil and land acquisition in Indonesia: implications for local communities and indigenous peoples. Sawit Watch, Forest Peoples Programme, editors. Perkumpulan Sawit Watch; Forest Peoples Programme. 2006.
61. Cramb R, McCarthy JF. *The Oil Palm Complex: Smallholders, Agribusiness and the State in Indonesia and Malaysia*. NUS Press. 2016.
62. Li TM. After the land grab: Infrastructural violence and the "Mafia System" in Indonesia's oil palm plantation zones. *Geoforum*. 2018;96:328–37. <https://doi.org/10.1016/j.geoforum.2017.10.012>
63. Li TM. Commons, co-ops, and corporations: assembling Indonesia's twenty-first century land reform. *The Journal of Peasant Studies*. 2021;48(3):613–39. <https://doi.org/10.1080/03066150.2021.1890718>

64. Conant J, Madan G. No consent: Astra Agro Lestari's land grab in Central and West Sulawesi, Indonesia. 2022.
65. Jong HN. Palm oil firm Digoel Agri said to clear Papuan forest without Indigenous consent. Mongabay Environmental News. 2021.
66. Woods KM. Smaller-scale land grabs and accumulation from below: Violence, coercion and consent in spatially uneven agrarian change in Shan State, Myanmar. *World Development*. 2020;127:104780. <https://doi.org/10.1016/j.worlddev.2019.104780>
67. Li TM. Intergenerational displacement in Indonesia's oil palm plantation zone. *The Journal of Peasant Studies*. 2017;44(6):1158–76. <https://doi.org/10.1080/03066150.2017.1308353>
68. Li TM. Securing oil palm smallholder livelihoods without more deforestation in Indonesia. *Nat Sustain*. 2024;7(4):387–93. <https://doi.org/10.1038/s41893-024-01279-w>
69. McCarthy JF, Vel JAC, Affif S. Trajectories of land acquisition and enclosure: development schemes, virtual land grabs, and green acquisitions in Indonesia's Outer Islands. *Journal of Peasant Studies*. 2012;39(2):521–49. <https://doi.org/10.1080/03066150.2012.671768>
70. Meyfroidt P, Roy Chowdhury R, de Bremond A, Ellis EC, Erb K-H, Filatova T, et al. Middle-range theories of land system change. *Global Environmental Change*. 2018;53:52–67. <https://doi.org/10.1016/j.gloenvcha.2018.08.006>
71. Piñeiro V, Arias J, Dürr J, Elverdin P, Ibáñez AM, Kinengyere A, et al. A scoping review on incentives for adoption of sustainable agricultural practices and their outcomes. *Nat Sustain*. 2020;3(10):809–20. <https://doi.org/10.1038/s41893-020-00617-y>
72. Mei L, Newing H, Almás Smith O, Colchester M, McInnes A. Identifying the Human Rights Impacts of Palm Oil. Forest Peoples Programme. 2022. <https://globalcanopy.org/wp-content/uploads/2022/08/FPP-Palm-Oil-Report-FINAL52.pdf>
73. Wielga M, Harrison J. Assessing the Effectiveness of Non-State-Based Grievance Mechanisms in Providing Access to Remedy for Rightsholders: A Case Study of the Roundtable on Sustainable Palm Oil. *Bus and hum rights j*. 2021;6(1):67–92. <https://doi.org/10.1017/bhj.2020.33>
74. Nadeem M. Corporate Governance and Supplemental Environmental Projects: A Restorative Justice Approach. *J Bus Ethics*. 2020;173(2):261–80. <https://doi.org/10.1007/s10551-020-04561-x>
75. Schormair MJL, Gerlach LM. Corporate Remediation of Human Rights Violations: A Restorative Justice Framework. *J Bus Ethics*. 2019;167(3):475–93. <https://doi.org/10.1007/s10551-019-04147-2>
76. Vives-Gabriel J, Schrempf-Stirling J, Coraiola DM. Dealing with Organizational Legacies of Irresponsibility. *AMP*. 2024;38(3):286–303. <https://doi.org/10.5465/amp.2022.0126>
77. Haraway D. Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin. *Environmental Humanities*. 2015;6(1):159–65. <https://doi.org/10.1215/22011919-3615934>
78. Povey R, Page S, Trudgett M. Getting it Right: Safeguarding a Respected Space for Indigenous Oral Histories and Truth Telling. *The Oral History Review*. 2023;50(2):223–41. <https://doi.org/10.1080/00940798.2023.2234419>
79. Rosiek JL, Snyder J, Pratt SL. The New Materialisms and Indigenous Theories of Non-Human Agency: Making the Case for Respectful Anti-Colonial Engagement. *Qualitative Inquiry*. 2019;26(3–4):331–46. <https://doi.org/10.1177/1077800419830135>
80. McGregor D. Mino-mnaamodzawin: Achieving Indigenous Environmental Justice in Canada. *Environment and Society*. 2018;9:7–24.
81. Verhaeghe E, Ramcilovic-Suominen S. Transformation or more of the same? The EU's deforestation-free products regulation through a radical transformation lens. *Environmental Science & Policy*. 2024;158:103807. <https://doi.org/10.1016/j.envsci.2024.103807>
82. Hickey S. Thinking About the Politics of Inclusive Development: Towards a Relational Approach. *SSRN Electronic Journal*. 2013. <https://doi.org/10.2139/ssrn.2425235>
83. Hajjar R, Oldekop JA, Cronkleton P, Newton P, Russell AJM, Zhou W. A global analysis of the social and environmental outcomes of community forests. *Nat Sustain*. 2020;4(3):216–24. <https://doi.org/10.1038/s41893-020-00633-y>
84. Fischer HW, Chhatre A, Duddu A, Pradhan N, Agrawal A. Community forest governance and synergies among carbon, biodiversity and livelihoods. *Nat Clim Chang*. 2023;13(12):1340–7. <https://doi.org/10.1038/s41558-023-01863-6>
85. Cheyns E. Making “minority voices” heard in transnational roundtables: the role of local NGOs in reintroducing justice and attachments. *Agric Hum Values*. 2014;31(3):439–53. <https://doi.org/10.1007/s10460-014-9505-7>
86. Johansson K-E, Axelsson R, Kimanzu N, Sassi S, Bwana E, Otsyina R. The Pattern and Process of Adoption and Scaling up: Variation in Project Outcome Reveals the Importance of Multilevel Collaboration in Agroforestry Development. *Sustainability*. 2013;5(12):5195–224. <https://doi.org/10.3390/su5125195>
87. Jacobi J, Mathez-Stiefel S-L, Gambon H, Rist S, Altieri M. Whose Knowledge, Whose Development? Use and Role of Local and External Knowledge in Agroforestry Projects in Bolivia. *Environ Manage*. 2017;59(3):464–76. <https://doi.org/10.1007/s00267-016-0805-0> PMID: 28040828
88. European Commission. European Commission Deforestation Regulation. https://environment.ec.europa.eu/publications/frequently-asked-questions-deforestation-regulation_en. 2023.
89. Meemken E-M, Becker-Reshef I, Klerkx L, Kloppenburg S, Wegner JD, Finger R. Digital innovations for monitoring sustainability in food systems. *Nat Food*. 2024;5(8):656–60. <https://doi.org/10.1038/s43016-024-01018-6> PMID: 39147913
90. Euler M, Hoffmann MP, Fathoni Z, Schwarze S. Exploring yield gaps in smallholder oil palm production systems in eastern Sumatra, Indonesia. *Agricultural Systems*. 2016;146:111–9. <https://doi.org/10.1016/j.agsy.2016.04.007>

91. Wonde KM, Tsehay AS, Lemma SE. Training at farmers training centers and its impact on crop productivity and households' income in Ethiopia: A propensity score matching (PSM) analysis. *Heliyon*. 2022;8(7):e09837. <https://doi.org/10.1016/j.heliyon.2022.e09837> PMID: [35815142](https://pubmed.ncbi.nlm.nih.gov/35815142/)
92. Lyons-White J, Chandra A, Grabs J, Cammelli F, Wheeler C, Ekaputri AD, et al. A field experiment to reduce deforestation while benefiting the livelihoods of Indonesian smallholder oil palm farmers. 2024. <https://doi.org/10.17605/OSF.IO/32WVM>
93. Macdonald K, Diprose R, Grabs J, Schleifer P, Alger JB. Jurisdictional Approaches to Sustainable Commodity Governance. 2023. <https://doi.org/10.57671/SGSCDP-2304>
94. Zhunusova E, Ahimbisibwe V, Sen LTH, Sadeghi A, Toledo-Aceves T, Kabwe G, et al. Potential impacts of the proposed EU regulation on deforestation-free supply chains on smallholders, indigenous peoples, and local communities in producer countries outside the EU. *Forest Policy and Economics*. 2022;143:102817. <https://doi.org/10.1016/j.forpol.2022.102817>
95. Robinson F. Global care ethics: beyond distribution, beyond justice. *Journal of Global Ethics*. 2013;9(2):131–43. <https://doi.org/10.1080/17449626.2013.818466>
96. Macdonald K, Diprose R, Grabs J, Schleifer P, Alger J, Bahrudin, et al. Jurisdictional approaches to sustainable agro-commodity governance: The state of knowledge and future research directions. *Earth System Governance*. 2024;22:100227. <https://doi.org/10.1016/j.esg.2024.100227>
97. Musim Mas. Landscape intervention in the orangutan capital. Musim Mas Blogs. <https://www.musimmas.com/resources/blogs/landscape-intervention-in-the-orangutan-capital/> 2024.
98. Purnomo H, Okarda B, Dewayani AA, Ali M, Achdiawan R, Kartodihardjo H, et al. Reducing forest and land fires through good palm oil value chain governance. *Forest Policy and Economics*. 2018;91:94–106. <https://doi.org/10.1016/j.forpol.2017.12.014>
99. Runfola D, Anderson A, Baier H, Crittenden M, Dowker E, Fuhrig S, et al. geoBoundaries: A global database of political administrative boundaries. *PLoS One*. 2020;15(4):e0231866. <https://doi.org/10.1371/journal.pone.0231866> PMID: [32330167](https://pubmed.ncbi.nlm.nih.gov/32330167/)
100. Flick U. An introduction to qualitative research. 5 ed. Sage. 2014.
101. Knott E, Rao AH, Summers K, Teeger C. Interviews in the social sciences. *Nat Rev Methods Primers*. 2022;2(1). <https://doi.org/10.1038/s43586-022-00150-6>