



Food and Agriculture
Organization of the
United Nations

Zero deforestation initiatives and their impacts on commodity supply chains

Discussion paper prepared for the 57th Session of the FAO Advisory Committee on Sustainable Forest-based Industries



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Food and Agriculture Organization of the United Nations

Rome, 2017

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Acknowledgments

The valuable contributions to this paper by the following persons are gratefully acknowledged: the members of the Steering Committee of the Advisory Committee on Sustainable Forest-based Industries, Chris Elliott (Climate and Land Use Alliance), Daniel Zarin (Climate and Land Use Alliance), Eric Swanson (Forest Trends), Francesco Tubiello (FAO), Gary Dunning (The Forests Dialogue), Hans Smit (SNV), Heiner von Lüpke (GIZ), Jukka Tissari (FAO), Marco Boscolo (FAO), María José Sáenz Sanchez (FAO), Matthew Reddy (World Business Council for Sustainable Development), Moriz Vohrer (Gold Standard), Richard McNally (SNV), Rodney Taylor (WWF), Susan Braatz (FAO), Thaís Linhares-Juvenal (FAO) and Uta Jungermann (World Business Council for Sustainable Development).

Acronyms

ACSI	Advisory Committee on Sustainable Forest-based Industries
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FLEGT	Forest Law Enforcement, Governance and Trade
FSC	Forest Stewardship Council
GEF	Global Environment Fund
GRSB	Global Roundtable for Sustainable Beef
INDC	Intended nationally determined contribution
NGO	non-governmental organization
PEFC	Programme for the Endorsement of Forest Certification
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RSPO	Roundtable on Sustainable Palm Oil
RTRS	Round Table on Responsible Soy
US	United States of America

1 Introduction

In view of the still alarmingly high rates of deforestation in many parts of the world, the global community is increasingly taking action to reduce the loss of forests. The 2014 New York Declaration on Forests aims to halve natural forest loss globally by 2020 and reach zero natural forest loss by 2030 [1]. Since then, the international community has made available significant funds for work on zero deforestation, especially through the Global Environment Fund (GEF) [3]. The most significant commitment, however, is the Sustainable Development Goals, adopted in 2015, in which countries commit, among other things, to halting deforestation by 2020. Other important relevant processes include Forest Law Enforcement, Governance and Trade (FLEGT), the processes around the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change, including REDD+ (a mechanism for reducing emissions from deforestation and forest degradation) and the intended nationally determined contributions (INDCs) of the Paris Agreement on climate change. All these initiatives, in one way or another, set goals and targets for governments to reduce deforestation.

In addition, an increasing number of private companies are voluntarily committing to eliminating deforestation from their supply chains. Companies have long been working to integrate supply chains, not only with a view to improving procurement efficiency but also to enhance environmental and social impacts, for example through responsible sourcing and green supply chains [4]. Similarly, companies have long been engaged in voluntary certification schemes, such as those of the Forest Stewardship Council (FSC), the Roundtable on Sustainable Palm Oil (RSPO), Naturland, and Rainforest Alliance Certified Coffee Farms (see Annex 1); the zero-deforestation movement leans in a similar direction [5]. Certification and procurement standards are a key strategy for companies to eliminate deforestation from their supply chains, particularly for downstream companies, which account for most zero-deforestation pledges [6].

Companies act because fierce campaigning by non-governmental organizations (NGOs) has created reputational risks in being associated with deforestation [7–10]. Moreover, there are regulatory risks in working with land uses because the policy environment is prone to interference from governments aiming to implement national or international targets [7,8,10,11]. In addition, using natural resources sustainably may reduce the operational risk of eventually depleting the production base [7,8,10,12].

Government-led momentum around INDCs and REDD+ provides a context for companies' zero-deforestation work. Definitions, standards and mechanisms for target-setting are important issues for efforts to reduce deforestation, both at the national scale and for supply chains [13]. Company action to reduce deforestation ultimately contributes to government targets under INDCs and REDD+. By the same token, some governmental policies and measures to reduce deforestation may prompt changes to supply chains. In most places, however, the private and public sectors continue to work independently, and a lost opportunity for bringing zero deforestation to scale has been widely diagnosed [11,14–16]. This paper chiefly looks into companies' approaches to eliminating deforestation from their supply chains.

Zero-deforestation pledges have reached an impressive scale. The New York Declaration on Forests was endorsed by 36 national governments, 53 companies and 54 civil-society organizations. The Consumer Goods Forum represents 400 companies across 70 countries, which collectively employ nearly 10 million people and have sales of more than US\$3 trillion. Its Tropical Forest Alliance 2020 includes many of the same companies, as well as governments and civil-society organizations. The

Soft Commodities Compact (between the Banking and Environment Initiative, WWF and the Consumer Goods Forum) accounts for approximately 50% of global trade finance.

Despite much early action, however, it remains to be seen whether companies can meet their pledges and whether zero deforestation can create impact on the ground. Much momentum has been built, and hundreds of companies have made pledges (Figure 1). Nevertheless, there is little information on which to judge progress because many pledges refer to 2020 or 2030 only and many companies have not yet reported publicly on progress [2,6,20]. Even if companies comply with their commitments, large-scale impact on the ground may require the engagement of governments to safeguard and mainstream progress [8]. To date, positive examples of effective collaboration between companies and governments are few (and largely limited to one country – Brazil) [11,15]. The downside to the tremendous momentum around zero deforestation is the risk of awful future disappointment if the movement fails to deliver progress.

For the zero-deforestation movement to succeed, clarity is needed on the zero-deforestation concept and the best way to operationalize pledges and bring zero deforestation to scale. This report aims to provide insight into the current momentum around zero-deforestation initiatives and its implications for the forest industries. It follows up on a recommendation from the 56th session of the Advisory Committee on Sustainable Forest-based Industries (ACSF) requesting FAO to “help facilitate understanding and agreement on definition of ‘deforestation-free’ and implications for forest products value chains” [21].

Chapter 2 of the report shows that there is confusion on the definitions that underlie zero-deforestation commitments. Chapter 3 explains that procuring certified commodities is the common proxy for eliminating deforestation from supply chains, despite concerns about its adequacy. Chapter 4 discusses how zero deforestation affects companies across the supply chains, and how private-sector players nonetheless do not always coordinate effectively. Chapter 5 sets out how the zero-deforestation movement has focused on certain commodities and geographies over others. Chapter 6 describes how comprehensive supply-chain management makes zero deforestation feasible and safeguards its benefits. Chapter 7 discusses the potential contribution of governments in bringing zero deforestation to the landscape scale, and Chapter 8 draws conclusions and Chapter 9 describes the implications of zero-deforestation initiatives for forest product value chains.

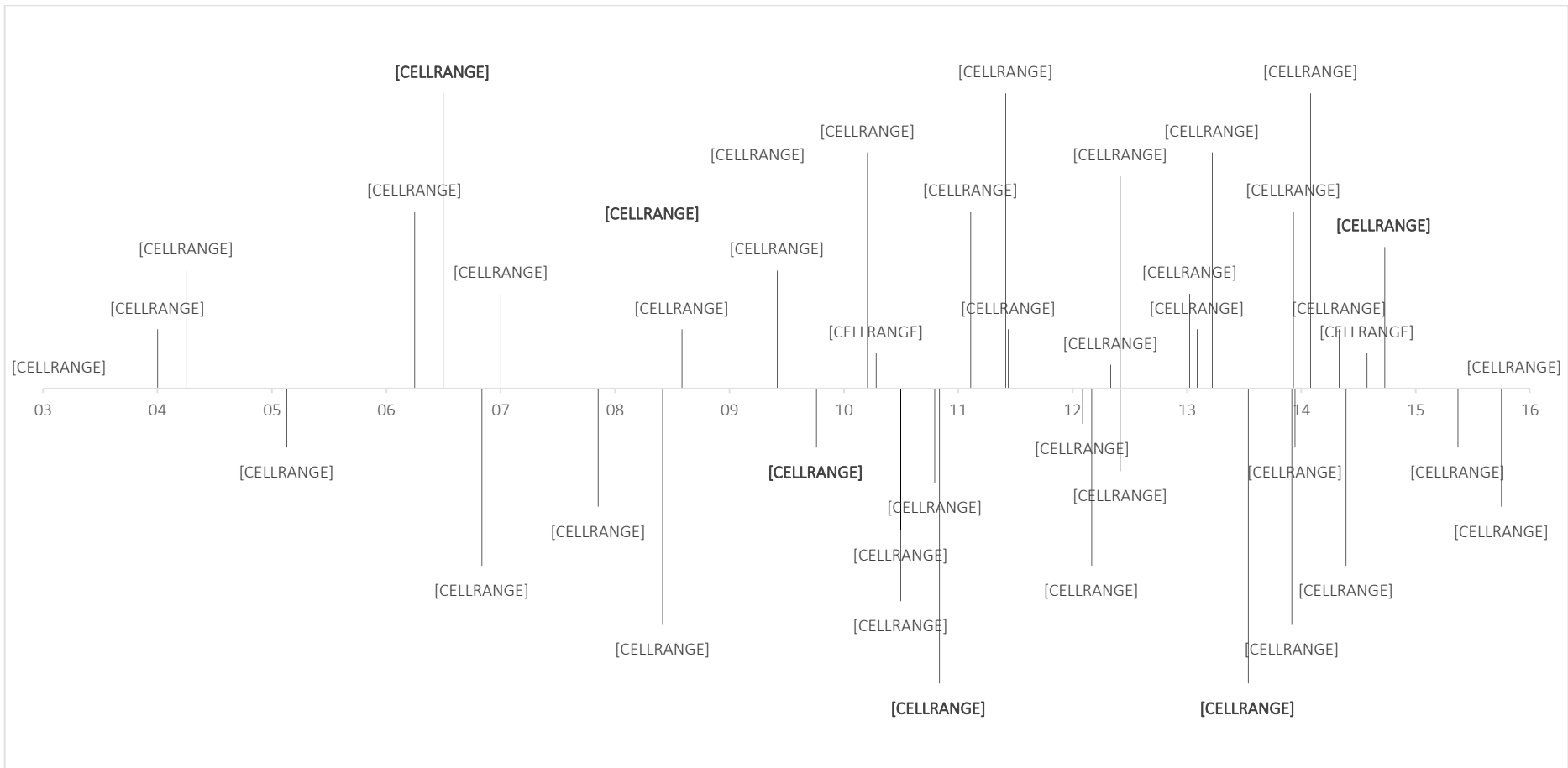


Figure 1: A zero-deforestation timeline

2 Definitions and their implications for the feasibility and stringency of zero-deforestation commitments

'Deforestation free', *'zero deforestation'*, *'zero gross deforestation'* and *'zero net deforestation'* are related but distinct terms, and they are often used interchangeably [22]. Imprecise definitions create confusion between those who commit to pledges and those who aim to assess or implement them. The terminology, therefore, has massive implications for the stringency and feasibility of pledges [22,23]. Ultimately, a lack of clear, agreed definitions compromises the zero-deforestation movement [11,14,22].

'Deforestation free' and *'zero deforestation'* are inherently ambiguous terms. They imply a modifier to the word deforestation, and context is needed to understand whether they refer to *'gross'*, *'net'*, both, or something else [13].

'Zero gross deforestation' means an end to the conversion of all existing forestland and therefore gives no weight to compensatory gains in forest cover made elsewhere. This definition still requires clarification on what *'forest'* is in terms of its reference timeframe, reference area, origin, legality, morphology, structure, ecosystem value and other characteristics. Nonetheless, The Forests Dialogue called it "the least ambiguous term" and interpreted several company commitments to refer to gross deforestation [13]. Benchmark data on Amazon deforestation are based mostly on information from Brazil's National Institute for Space Research, which publishes estimates of gross deforestation [22].

'Zero net deforestation' means no change to the total forested area, and therefore new forests compensate for converted forests. In understanding *'zero net deforestation'*, the definition of *'forests'* is an important parameter that needs specification. The crux of the definition is the kinds of new forests that are good enough to compensate for lost forest area and, hence, what is *'acceptable deforestation'*. For example, plantations replacing natural forests might or might not count because they are less biodiverse and store less carbon. Deforestation that occurred a long time ago might or might not be permissible. These finer points are important for securing the environmental benefits of zero net deforestation; in addition to WWF, the Banking and Environment Initiative and the Consumer Goods Forum use this concept [19]. Global benchmark data on forest trends are based mostly on FAO's Global Forest Resources Assessment, which uses net deforestation as a key variable [24].

Both zero gross deforestation and zero net deforestation have received substantial criticism. Criticism of zero gross deforestation is premised on the fact that it does not allow flexibility in land-use planning [13]. Forests would need to remain, irrespective of development needs, which are often greatest among forest-dwelling indigenous peoples and local communities. Economic imperatives might trump inflexible zero gross deforestation commitments [11]. Critiques of zero net deforestation focus on the fact that replacement forests are often not equivalent to cleared vegetation in terms of their conservation value, carbon stock or other ecosystem services [11,13].

Zero net deforestation enjoys most momentum among recent pledges, and it is an established concept. FAO's Forest Resources Assessment takes into account gains in forest cover from timber plantations in calculating net deforestation [24]. The Consumer Goods Forum, its Tropical Forest Alliance 2020, and the Soft Commodities Compact all formulate their targets in terms of zero net deforestation. The Forests Dialogue concludes that "the economic heft of the [Consumer Goods Forum] (whose member companies have combined sales of over \$3.3 trillion), WWF's size and

reputation, and the support of 67 countries plus the European Commission make a strong case that zero net deforestation is the variation with the most backing.” [13]

Although the distinction between net and gross deforestation has received much attention, other definitional aspects may be equally important (Figure 2). Most of the zero deforestation pledges treated in this paper refer to supply chains, but expected engagement from governments refers to the landscape level (see chapter 7). Although fully eliminating all deforestation is close to impossible, in practice, verification schemes provide details on what is ‘acceptable deforestation’.

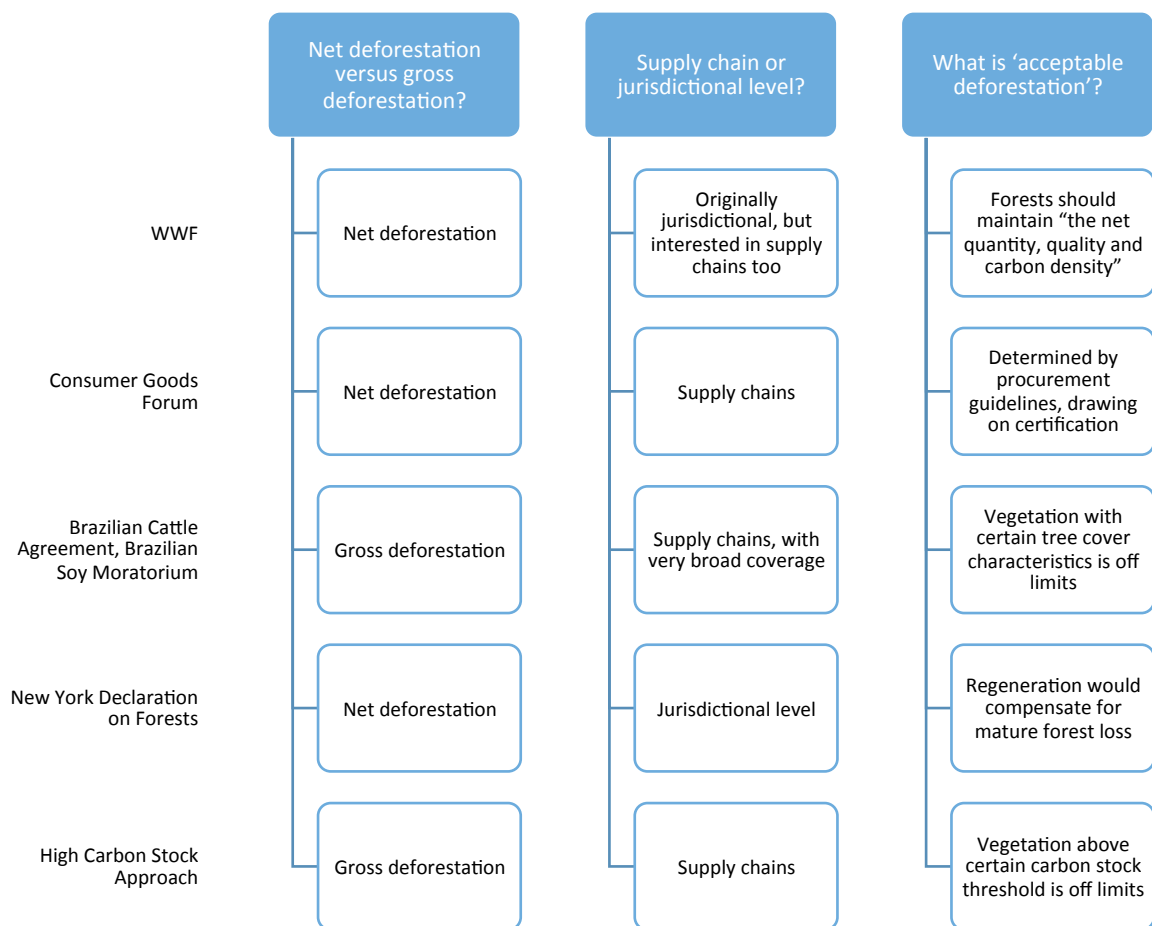


Figure 2: Overview of definitional issues in several zero-deforestation initiatives

The zero-deforestation pledges of companies largely refer to individual commodities within their supply chains, not to broader landscapes. WWF’s original proposal for zero net deforestation refers to a landscape level [25]. Through the Consumer Goods Forum, companies have aligned themselves with WWF but, crucially, their pledges are operationalized at a different reference scale, namely supply chains [17,26–28]. The Brazilian Cattle Agreement, the Brazilian Soy Moratorium and the Indonesia Palm Oil Pledge stand out because their broad participation almost equates to full coverage [12]. Mostly, however, companies pick individual forest-risk commodities to tackle [8,29,30]. Depending on the reference scale, pledges can have very different implications for the potential to shift pressure to different geographical areas, different companies and different commodities [11,12]. There have been frequent calls for zero-deforestation initiatives to work with governments and at the landscape level [5,8,15,31].

According to WWF, new forests should only be counted where they maintain “the net quantity, quality and carbon density” of the converted forests [33]. Cut-off dates (for when land was originally forested) determine when it is permissible to include specific lands as new forests [34]. Whether planted forests are also to be counted as forests determines whether cutting down primary forest to establish plantations is permissible [18]. Timber legality is a key issue in United States of America (US) and European Union (EU) timber import regulations, and there are dedicated certification standards [18]. Forest structure and its carbon storage has received attention as a useful proxy and basis for new ‘high carbon stock’ standards developed specifically for zero deforestation [11,35–37]. Broad agreement seems to exist that forests with high conservation value are off-limits for conversion under zero-deforestation initiatives [38–40].

Technically, much of the confusion relates to the definition of ‘forest’, as well as to the reference timeframe, reference area, origin, legality, structure, and conservation value. The use of different forest definitions according to context is commonplace (Table 1); the ‘right’ definition for zero deforestation is under discussion. Its origin, legality, structure and conservation value determines ‘acceptable deforestation’. Much attention is dedicated to whether pledges refer to company areas or to broader landscapes in which companies operate because there could otherwise be opportunities to cherry-pick areas [11]. Similarly, the time point of conversion is a key parameter in most certification standards and may determine whether the production base of individual companies can or cannot comply [34]. These and other highly technical issues all have a bearing on what zero deforestation means.

Table 1: Parameters in the forest definitions used in several international contexts

Parameter	United Nations Framework Convention on Climate Change	Convention on Biological Diversity	FAO’s Forest Resources Assessment
Minimum area	0.05-1.0 ha	0.5 ha	0.5 ha
Minimum height	2–5 m	5 m	5 m
Minimum crown cover	10–30%	10%	10%
Minimum time since conversion	Not available	Not available	~10 years
Minimum strip width	Not available	Not available	20 m
Other parameters covered in definition	Young stands, temporarily unstocked areas	Young stands, non-forest land uses	Young stands, non-forest land uses, temporarily unstocked areas, agroforestry

Source: based on [41]

Procuring certified goods is a convenient way for manufacturers and retailers far from production systems to implement zero-deforestation pledges [2,6]. In such cases, the definitions underlying certification schemes indirectly form the basis for companies’ zero-deforestation pledges. Some zero-deforestation pledges are also based on bespoke performance indicators directly reflecting deforestation processes, particularly if producers or processors take on pledges themselves.

Contentious definitions reveal that ‘zero deforestation’ means different things to different actors. WWF approaches zero deforestation by looking, quite broadly, at the net quantity, quality and carbon density of forests, recognizing that the conversion of forests at one site may contribute to the sustainable development and conservation of the wider landscape [33]. Greenpeace is developing its own approach to verifying zero-deforestation commitments, using high carbon stock

in combination with several other indicators [35,42]. For both WWF and Greenpeace, the protection of biodiversity is a key concern, as is effective collaboration with local communities. The Consumer Goods Forum has drawn up procurement guidelines that effectively equate zero deforestation with the procurement of certified products [26–28]. In fact, Forest Trends diagnoses, while “companies might be influenced by the same campaigns and stakeholders, no two commitments are alike” [6].

Although it is conceptually appealing, a single universal definition of deforestation may be impractical. With regards to sustainable forest management, FAO has called a globally agreed definition “impractical beyond a very general level because of the huge diversity of forest types, conditions and socioeconomic contexts worldwide”; only limited agreement could be reached in the Non-legally Binding Instrument on All Types of Forests of the United Nations Forum on Forests [43,44]. Although agreement on universal definitions may not be desirable, more transparent and detailed definitions could add clarity to zero-deforestation pledges.

Key points

- There is confusion on definitions, with major implications for the feasibility and stringency of zero-deforestation commitments.
- Pledges refer to net or gross deforestation, to supply chains or landscapes, and to some level of ‘acceptable deforestation’.
- Companies’ zero-deforestation initiatives usually refer to their supply chains, while governments often look at the landscape level.
- Most momentum is around zero net deforestation, which means no change to the total forested area, with new forests compensating for converted forests.
- Operationalizing zero net deforestation requires defining ‘acceptable deforestation’ – that is, what types of standing forests are off-limits for conversion, and what types of new forests can compensate for converted forests.
- To verify zero-deforestation commitments, company pledges often refer to standard agricultural and forest certification schemes, which imply definitions of ‘acceptable deforestation’.

3 Certification: a common proxy for eliminating deforestation

Certification is important evidence for the verification of zero-deforestation pledges, with Forest Trends finding that four in five pledges rely on certification [6]. The Consumer Goods Forum published procurement guidelines for soy, pulp, paper and packing, and palm oil, which identify several certification schemes as sufficient to verify a low risk of contributing to deforestation and therefore which help “to achieve zero net deforestation” [26–28].

Voluntary certification schemes for forest-risk commodities address deforestation (Figure 3). A review of eight major agriculture certification schemes by the Rainforest Alliance found that all schemes included criteria prohibiting forest clearance [5,34], the key differences relating to the types of forests affected, the cut-off date for non-conversion, and the requirements around remedial measures. The Forests Dialogue looked at three major forest certification schemes as possible evidence of no-deforestation and concluded that all the standards spoke to the issue of timber from forest land converted to other vegetation [13].






				
<p>RSPO</p> <ul style="list-style-type: none"> prohibits conversion of primary forests but not of other forest types 	<p>RTRS</p> <ul style="list-style-type: none"> prohibits the conversion of both primary and secondary forests, using a narrow definition of forests 	<p>FSC</p> <ul style="list-style-type: none"> prohibits forest conversion in all but exceptional cases 	<p>PEFC</p> <ul style="list-style-type: none"> endorses national standards that regulate forest conversion 	<p>GRSB</p> <ul style="list-style-type: none"> calls for the protection of native forests but does not issue certificates

Figure 3: Voluntary certification schemes for forest-risk commodities and deforestation

The FSC’s Forest Management Certification prohibits forest conversion in all but exceptional cases. It prohibits the conversion of natural forests to plantations and of natural forests or plantations to other land uses. There are exceptions if the activity affects a very limited portion of the area, will produce clear long-term conservation benefits, and does not directly or indirectly compromise high conservation values **Error! Reference source not found.**[38].

The Programme for the Endorsement of Forest Certification (PEFC) endorses national standards that regulate forest conversion. It does not prohibit the conversion of natural forests to plantations but requires conversion to take place only under “justified circumstances”, including legal compliance, the absence of negative environmental impacts, small scale, and positive socioeconomic impacts. Forest plantations created before 2011 are eligible regardless of such circumstances. The PEFC is a meta-standard that sets out requirements for national certification schemes, which may individually go beyond the minimum requirements. Among several national certification schemes in North America and Europe, the PEFC also endorses the Brazilian Forest Certification Programme, the Indonesian Forestry Certification Cooperation and other developing-country schemes [45].

RSPO certification prohibits the conversion of primary forests but not of other forest types. Plantations cannot be established on lands with primary forests, but secondary or degraded forests can be converted to plantations as long as plantings leave out high-conservation-value areas and avoid peatlands [39].

Certification by the Round Table on Responsible Soy (RTRS) prohibits the conversion of both primary and secondary forests, using a narrow definition of forests. The scheme excludes the conversion of 'native' forests, including both primary forest and disturbed and secondary vegetation. Any vegetation less than 10 metres in height can be converted as long as areas with high conservation value are avoided [40]. Most countries have much lower thresholds for the height of 'forests'; the high threshold here ensures that soy can be grown with little restriction in woodlands (e.g. the Brazilian cerrado woodlands).

The Global Roundtable for Sustainable Beef (GRSB)'s principles and criteria call for the protection of native forests. The scheme does not include indicators or means of verification, which would be required to underlie certification. Rather, the intention is that such indicators and related practices would be developed through regionally based processes.

A prerequisite for trading certified products is the traceability of the chain of custody. The FSC, PEFC, RSPO and RTRS standards all come with separate chain-of-custody certification standards, drawing on typical approaches for tracing products through complex supply chains, such as book-and-claim, mass balance, segregated, and identity preserved (Annex 2).

Not all certification standards are equally relevant to zero deforestation. The guidelines of the Consumer Goods Forum point to the major certification standards (FSC, PEFC, RSPO, etc.) and lesser-known standards alike as sufficient means of verification as if they all had largely similar requirements. The use of a variety of certificates defeats the idea of a universally applicable production standard, however. Even the well-known PEFC has attracted substantial criticism from NGOs by endorsing the Indonesian Forest Certification Cooperation. WWF questioned the decision and raised concerns in an open letter [46]. More bluntly, Greenpeace stated that "any sustainability claims based on these certification schemes is industry 'greenwash'" [47]. Not discriminating between different certification standards for forest-risk commodities ultimately undermines the credibility of zero deforestation as a whole.

Companies use three common options for implementing zero deforestation: certified procurement, direct area monitoring, and procurement from low-risk jurisdictions. Certified procurement is conceptually simple, and most companies consider certification as good evidence of zero deforestation. Procurement from low-risk jurisdictions may provide less assurance of zero deforestation, but it has recently gained momentum as a means of verifying compliance with zero deforestation. Direct area monitoring offers most control over the impacts of production on forest cover.

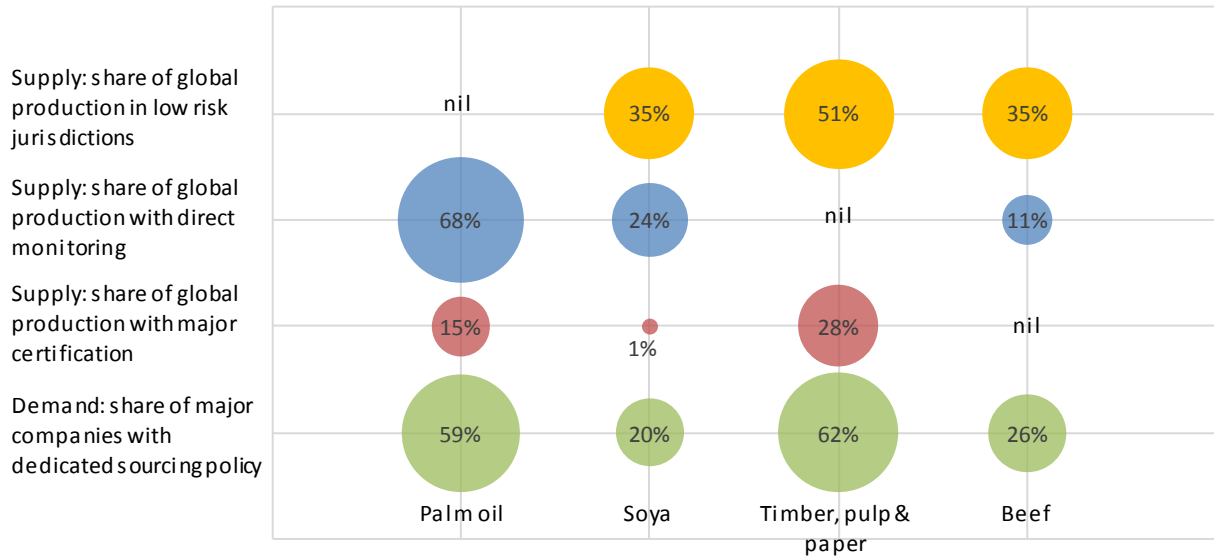


Figure 4: Supply of certified forest-risk commodities versus proxy of demand from major companies with zero-deforestation commitments

See Table 2 (page 23) for details on calculations and sources.

Procurement from low-risk jurisdictions allows companies to earmark products as zero-deforestation compliant based on origin. Clearly, the level of zero-deforestation assurance is lower than when relying on individual company-level certification. Nevertheless, subnational jurisdictions are increasingly engaged in pursuing environmental targets, including zero deforestation, and some NGOs provide schemes to verify such performance, akin to certificates [48–50]. Such preferential sourcing from low-risk jurisdictions closely links with governmental zero-deforestation action. It is conceptually similar to North American and European governmental action to regulate tropical timber imports under the EU FLEGT Action Plan, the EU Timber Regulation and the US Lacey Act [51–53].

Some zero-deforestation initiatives monitor production areas directly. The Indonesia Palm Oil Pledge, for example, committed a group of companies to avoiding high-carbon-stock areas for new plantations [54]. Although details of the verification scheme are under elaboration, they are likely to rely on area monitoring. Similarly, a group of manufacturers and their business associations set up the Brazilian Soy Moratorium and the Brazilian Cattle Agreement [55,56]. Participants agreed to only purchase from producers who did not deforest lands in Amazonia, and the purpose-designed verification scheme relied on the collection of remote sensing data. Using just one performance indicator – the eligibility of lands as per defined cut-off dates – made verification much simpler, more unambiguous and more encompassing than relying on certification schemes. Arguably, it was also much cruder and sidestepped the need to improve the business practices of producers.

A pilot initiative by Golden Agri Resources, Greenpeace and The Forest Trust has proposed the concept of high-carbon-stock forests to determine where forests must be preserved or can give way to plantations [35,37,42]. High-carbon-stock forest refers to vegetation with carbon storage above a certain threshold (e.g. 35 metric tonnes per hectare) [37]. The Sustainable Palm Oil Manifesto and the Indonesia Palm Oil Pledge have both taken up the basic concept, committing their signatories to protecting high-carbon-stock forests [36,57.] Arguably, monitoring high-carbon-stock forest tracks the outcomes of companies’ activities more immediately than could be done by relying on certification or other outputs of zero-deforestation pledges (Figure 5).

Agricultural and forest management certification standards are not in all cases considered sufficiently strict to effectively prohibit deforestation [11,13,58]. Rather than bypassing existing standards, though, there seems to be momentum to build on existing standards, such as through the addition of components addressing zero deforestation [32]. Common traceability systems involving chain-of-custody certification are not always considered sufficiently robust [5]. Most importantly, some feel that achieving positive outcomes and securing long-term societal impacts requires approaches going beyond the company level [5,16,31]. Work is ongoing to draw up new schemes for ascertaining zero deforestation at the landscape level [48,49].

Zero-deforestation initiatives generate results as outputs, outcomes and impacts [12]. Compliance with certification standards is in itself a useful output of zero-deforestation efforts. Conceptually, however, such efforts target improvements to company business practices as the zero-deforestation outcome. Even beyond the business practices of participating companies, zero-deforestation initiatives should achieve long-term societal impacts. NGOs offer support with certification and performance indicators, not least by participating in the roundtables that design the standards [38–40]. NGOs also propose tools and approaches for companies wishing to improve business practices, such as with respect to improved traceability [5], direct monitoring [35], legality [59,60] and even the provision of incentive payments [61]. Leading NGOs highlight the need to engage small producers [5,14,16] and governments [7,14,16], and working at the landscape level [5,31] in order to safeguard the positive impacts of zero-deforestation (Figure 5).

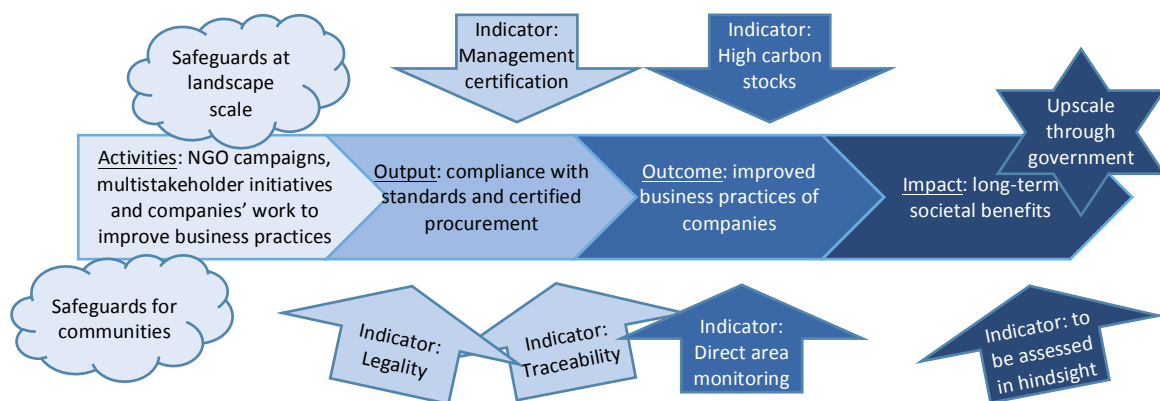


Figure 5: Simplified results hierarchy of zero-deforestation initiatives, including indicators at the output and outcome levels

Regardless of the specifics of individual performance indicators, companies take on pledges they can actually fulfil, and they tend to avoid disrupting their business practices. For example, the RTRS prohibits the conversion of ‘forest’ vegetation with a height of more than 10 metres, although most forest definitions use much lower height thresholds (around 5 metres) [24,40]. Soy farming occurs frequently in the Brazilian cerrado woodlands, which might be largely off-limits under typical forest definitions. The Consumer Goods Forum’s procurement guidelines for pulp, paper and packaging for palm oil and soy rely largely on third-party certification to verify compliance with zero-deforestation targets [26–28]. The use of major standards such as FSC, PEFC, RSPO and RTRS for zero deforestation has been portrayed as questionable [5,13,34,58], but the Consumer Goods Forum’s palm oil guidelines also permit “any other credible independent third-party mechanisms that verify low risk of sources that are unsustainable or contribute to deforestation” [28].

Zero-deforestation initiatives are often signposts of company action without always driving it. For the New York Declaration on Forests it was ascertained that companies usually set targets before endorsing pledges [2]. The Tropical Forests Dialogue has described the widely visible zero-deforestation initiatives as “attention-grabbing”, highlighting how they “make for great headlines” [11]. Regardless of such criticism, the Global Canopy Programme has found performance against sustainability indicators to be much better among companies that are members of the Consumer Goods Forum than among otherwise comparable companies, “suggesting significant progress is being made” [29].

Companies need to devise and commit to programmes for achieving compliance throughout the supply chain to make zero deforestation feasible and safeguard its benefits. Smaller producers face high barriers to obtaining certification because of the costs involved in improving business practices and because of the high cost of the certification process itself [5]. Local communities working with producers (e.g. as out-growers) are vulnerable to being left behind when shifting their production systems to comply with the procurement guidelines of international traders because processors and traders may turn elsewhere [5,8,16]. By the same token, producers that are unable or unwilling to comply with certification standards may sell their produce into other, less-demanding markets and thus sidestep attempts to promote sustainable production [11]. In summary, to guarantee environmental integrity and social inclusion, zero-deforestation initiatives must not only use appropriate definitions, they also need to come with well-designed programmes to safeguard environmental integrity and social inclusion [12].

Key points

- Procuring certified commodities is a common proxy for eliminating deforestation from supply chains, despite concerns about its adequacy.
- Companies commonly use one of three approaches for implementing zero deforestation: certified procurement, direct area monitoring, or procurement from low-risk jurisdictions.
- Procurement from low-risk jurisdictions allows companies to earmark products as zero-deforestation compliant, based on origin.
- Some zero-deforestation initiatives directly monitor production areas, including for conversion time points and ‘high carbon stock’ to identify ‘acceptable deforestation’.
- Mostly, companies consider certification under the leading schemes, in particular RSPO, FSC, PEFC and RTRS, as good evidence of zero deforestation, which may also include commodities originating from converted secondary forests, degraded forests, or forests with low height.
- Any of these implementation approaches to zero-deforestation commitments affects actors along the supply chain.

4 Supply-chain integration in zero-deforestation efforts

Companies have long worked to integrate their supply chains, with the objective (among others) of enhancing environmental and social sustainability in the sourcing and processing of raw materials. Supply-chain management traditionally focuses on the efficiency of sourcing inputs, as well as of the processing, manufacture and delivery of products, but heightened consumer awareness has led to demands that firms ensure sustainability throughout the supply chain [4]. Environmental and social sustainability indicators can relate to forests and deforestation. The Carbon Disclosure Project highlighted that three-quarters of reporting companies recognized at least one deforestation-linked supply-chain risk [10].

Mostly it is manufacturers or retailers who make zero-deforestation pledges, but this has implications across the supply chain for traders, processors and upstream producers [6,29], and most of the burden for complying with pledges is foisted on producers [11]. In a few cases, processors [55,56] and producers [37] have made zero-deforestation pledges. Many companies are vertically integrated and cover several supply-chain segments, and these have also made zero-deforestation pledges [15,29]. Position in the supply chain determines how companies participate in the zero-deforestation movement (Figure 6, Figure 7).

Manufacturers and retailers sell consumer goods and make zero-deforestation pledges to minimize business risk and distinguish from competitors. These companies have much exposure to consumers, and being associated with sustainability concerns by NGOs is therefore a major risk factor [7,8]. Manufacturers and retailers collaborate with NGOs through multistakeholder platforms to reduce this risk. Typically, manufacturers and retailers are downstream from producers and therefore need to rely on the procurement of certified products to implement zero-deforestation pledges [6].

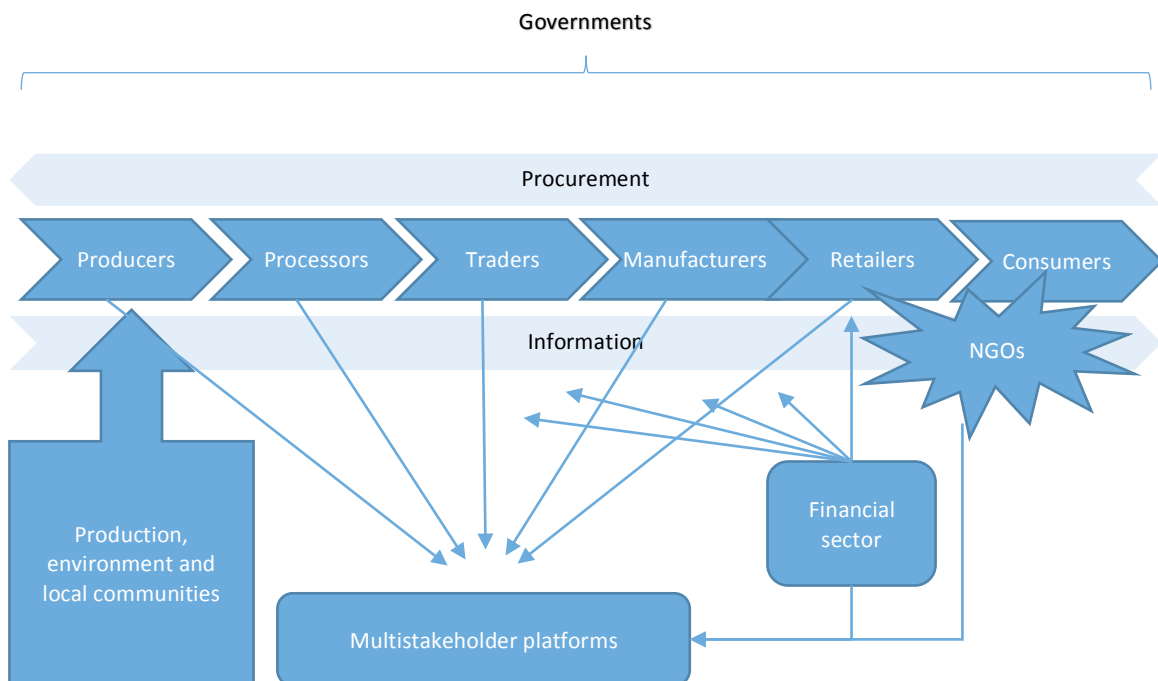


Figure 6: Idealized supply chain and other actors in zero-deforestation initiatives

Consumer-facing companies downstream in the supply chains take on most of the pledges: according to Forest Trends, consumer goods and services account for 79% of companies with

pledges [6]. Clearly, it is pressure from consumers and their consumption preferences that drives the zero-deforestation movement.

Producers and processors need to improve business practices and obtain certification to comply with the procurement guidelines of downstream traders and manufacturers. These companies do not typically have exposure to consumers and are thus less vulnerable to NGO criticism. Producers, however, control the means of production and therefore can change the way forests are treated [6].

Banks provide operating capital to producers, manufacturers and retailers. They directly finance producers and processors and provide trade finance and corporate finance to manufacturers and retailers [19]. Being implicated with unsustainable production and deforestation is a reputational risk factor for retail banks because they have consumer exposure; banks therefore assess business practices and available certification standards when lending [10]. The financial sector has long been considered a key entry point for the introduction of sustainability standards into business practices [62].

Consumers at the end of the supply chain may prefer labelled products and avoid companies associated with deforestation. Visible product labels enable them to distinguish between retail products, and they also receive information from NGOs about the means of production in the supply chains of retailers and manufacturers.

NGOs take multiple roles as ‘activists’, ‘advisers’ and ‘verifiers’ on zero deforestation [15]. As activists, NGOs pressure companies with unsustainable business practices by campaigning and keeping consumers informed. Organizations like Greenpeace and WWF have singled out individual companies or groups of companies, and their campaigns have ultimately led to pledges [63–68]. As advisers, NGOs have initiated and participated in multistakeholder initiatives alongside companies to develop zero-deforestation commitments. NGO support is important for initiatives such as the Consumer Goods Forum’s Tropical Forest Alliance 2020 and the Carbon Disclosure Project [7,69]; they provide technical support and lend their credibility to the zero-deforestation pledges. As verifiers, NGOs develop certification standards such as those of the FSC, the PEFC, the RSPO and the RTRS (often together with companies), certify individual companies, and collect information on industry trends [38–40,70].

Governments have a mandate to protect the environment and the interests of local communities, and they define the regulatory framework for companies. Where the governance environment allows it, therefore, governments could take an active role in coordinating and directing the sustainability efforts of companies. Regulation is also relevant because certification standards draw amply on legal compliance. Governments also pursue targets related to deforestation under international commitments. They fund some of the NGOs and multistakeholder initiatives working on certification and zero deforestation.

Local communities are connected to supply chains, either directly as dependent or independent small producers, or indirectly as neighbours of and labour for large producers. When companies update their business practices, local communities could easily be cut out because direct collaboration involves much management effort. Certification standards have provisions for local communities, and NGOs also monitor the social impacts of production.

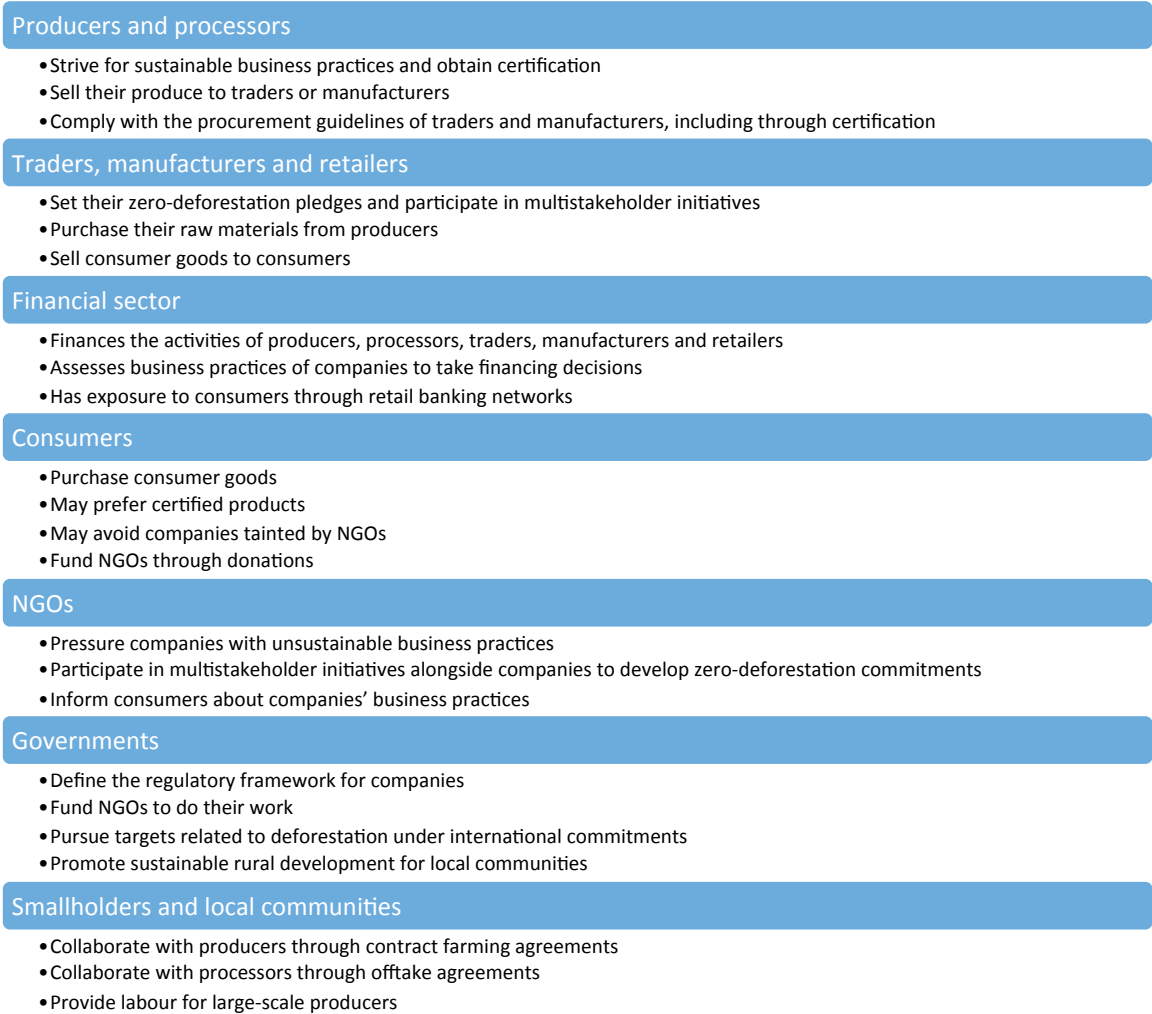


Figure 7: Actors directly or indirectly involved in zero-deforestation initiatives along supply chains for agricultural and forestry products

The nature of the zero-deforestation pledge depends on where companies are in the supply chain. Producers and processors (or vertically integrated companies) control production or at least have direct relationships with producers. They can therefore verify compliance with zero-deforestation pledges using bespoke performance indicators instead of universally relying on certification. The high-carbon-stock approach, the Indonesia Palm Oil Pledge, the Sustainable Palm Oil Manifesto, the Cattle Agreement and the Brazilian Soy Moratorium were all (co-)proposed by producers, processors or vertically integrated companies [37,55–57].

The procurement guidelines of the Consumer Goods Forum (mainly composed of manufacturers and retailers) propose a combination of certification standards as sufficient evidence of compliance with its zero-deforestation principles [26,27], and the procurement guidelines of individual companies are often structured similarly [71–73]. Such downstream companies cannot devise new performance indicators for zero deforestation because they are far removed from production systems and often have little information on their upstream suppliers. They must therefore rely on responsible procurement and the use of certification.

Zero-deforestation multistakeholder platforms help companies set common benchmarks with the competition. According to one count, 96% of the global trade in palm oil is covered by zero-

deforestation pledges [74]. According to another count, 62% and 59% of major companies with supply chains covering timber and palm oil, respectively, have deforestation commitments [29]. Only 20% and 26%, respectively, of companies with soy and beef supply chains have such commitments [29], but, at the level of producers and processors, one-third of the South American beef market is covered by the Brazilian Cattle Agreement, and the vast majority of soy producers are covered under the Brazilian Soy Moratorium [29,75]. The largest companies in these sectors jointly participate in the zero-deforestation movement, thus effectively creating a level playing field and eliminating considerations of competitive advantage.

As well as promoting sustainability, participation in multistakeholder platforms helps pre-empt publicity assaults by NGOs. The New York Declaration on Forests has a diverse set of signatories, including governments, companies and civil-society organizations. The Consumer Goods Forum is composed entirely of companies, but major NGOs participate in its Tropical Forest Alliance 2020 and Carbon Disclosure Project. Arguably, these are forums in which NGOs not only “stimulate companies to make commitments through campaigns” but also “provide solutions to ensure commitments are successfully implemented” [8].

NGO campaigns have led many companies to vow betterment and take on zero-deforestation pledges, with NGOs celebrating success [47,64,67,68,76–80]. Companies with tarnished reputations have much to gain from joining multistakeholder initiatives and working together with the NGOs. Moreover, companies that have already secured production areas have less need to acquire additional production areas.

Key points

- Zero deforestation affects actors along supply chains, which are not always effectively coordinated.
- Companies may compete for business through sustainability indicators of supply chains, and working towards zero deforestation can reduce the risk of criticism from activist NGOs.
- Producers and processors are mostly indirect participants in the zero-deforestation initiatives of downstream off-takers that procure zero-deforestation products. Nonetheless, it is producers who carry most of the burden for complying with zero-deforestation pledges.
- There is a risk of excluding small producers when supply chains reorient to comply with downstream zero-deforestation pledges.
- To safeguard positive impacts, companies need to run compliance programmes across their supply chains that involve small producers, local communities and other stakeholders.

5 Commodities and companies

The distribution of companies taking on deforestation pledges is skewed. Forest Trends diagnosed, for example, that endorsers of the New York Declaration on Forests are usually “headquartered in Europe and North America – worlds away from the planet’s tropical deforestation” [2]. According to Forest Trends, approximately 80% of companies endorsing the New York Declaration on Forests were headquartered there, while only approximately 20% were from Southeast Asia, where most deforestation occurs [2]. The environmental and social awareness of consumers may be greatest in the western world [8,11].

On the other hand, although European or North American companies, NGOs and consumers together drive much of the zero-deforestation movement, its topic of concern is tropical deforestation in developing countries. In particular, deforestation in the Amazon and Southeast Asia has received much attention.

In some regions, plateauing growth in forest-risk commodities has reduced the need to expand production area and makes zero deforestation attainable. In Brazil, Indonesia and Malaysia, production growth rates for oil palm, beef and soy have fallen from their high points of 10–15 years ago (production growth rates for forest products follow no clear pattern in either Brazil or Indonesia, Figure 9). The Climate and Land Use Alliance has observed a decoupling of commodity production from deforestation in the Brazilian Amazon [81]. Growth rates of oil palm have been falling in Indonesia and Malaysia, and growth rates of soy and beef production have declined in Brazil (Figure 8). The industries focused on forest-risk commodities in these countries may already be developed and require fewer new plantations. Depending on conversion cut-off dates, zero deforestation is attainable for oil palm in Indonesia and Malaysia and for soy and beef in Brazil. There are also new market entrants, however, such as several African countries that are aiming to increase their production areas [81,82]. Compliance with zero-deforestation pledges may be difficult in countries trying to develop new industries around palm oil and other forest-risk commodities.

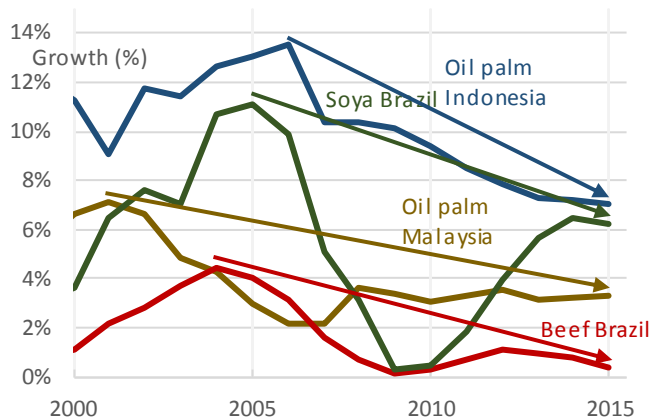


Figure 8: Growth rates of forest-risk commodities in major producer countries in 2000–2015 (5-year moving average) (source: FAOSTAT)

Brazil stands out among tropical forest countries. It is a producer of global significance for most of the forest-risk commodities (Table 2), but it also has strong NGOs, which have conducted important campaigns addressed to the Brazilian public [83,84]. Brazilian producers and processors have taken on zero-deforestation pledges [55,56].

Zero-deforestation initiatives revolve around four major forest-risk commodities: palm oil, soy, timber, pulp and paper, and beef, and NGO campaigns have focused on these commodities (see elsewhere in this report). Much analytical work has also used this breakdown (see elsewhere in this report), although sometimes pulp and paper has been separated from timber, packaging has been made explicit, biofuels have been treated separately, and beef and leather have been grouped together [8,9,29,85]. Some NGO campaigns and zero-deforestation pledges have also related to other commodities, such as steel [77,83].

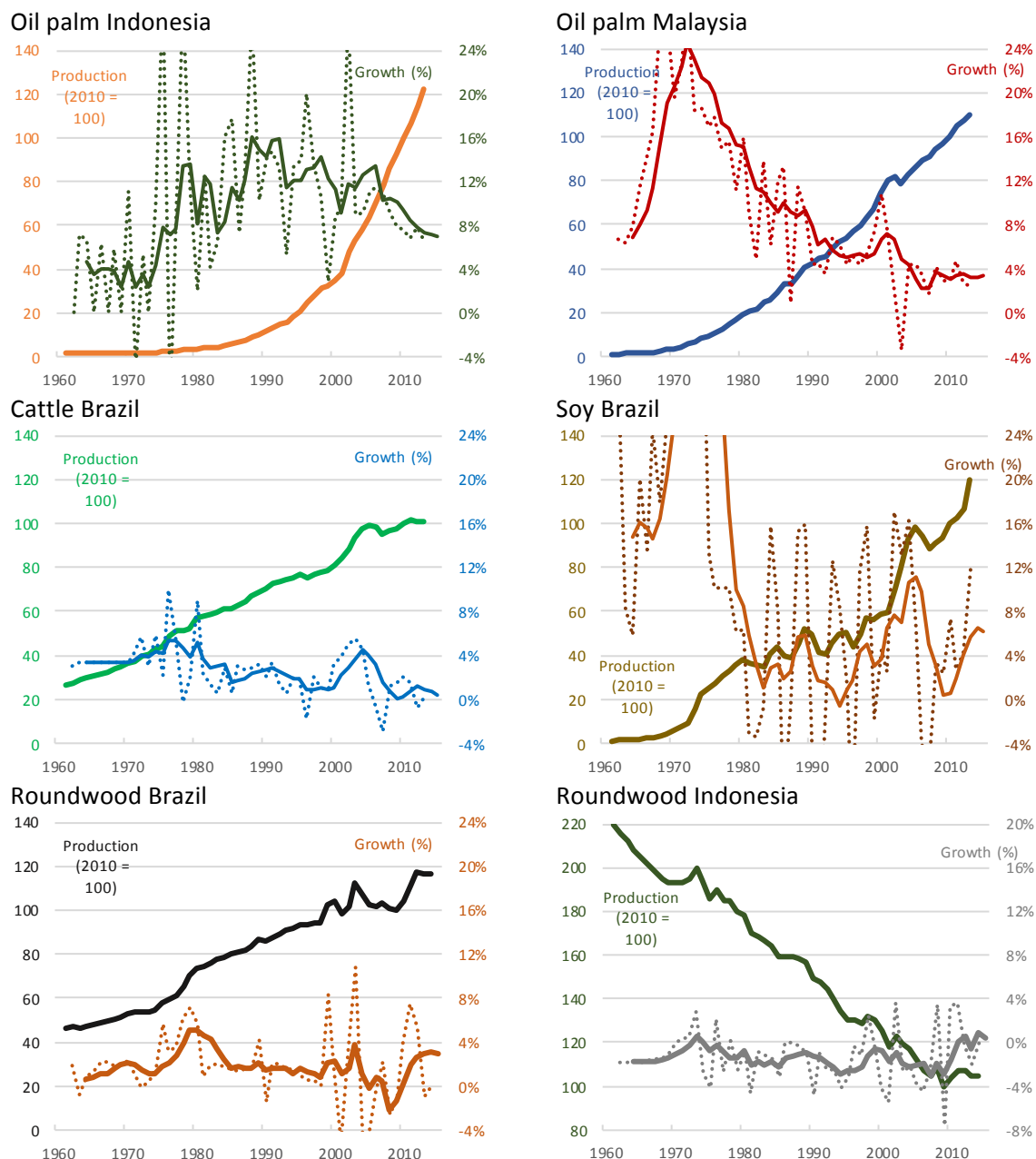


Figure 9: Production time series of forest-risk commodities in major tropical producer countries (Source: FAOSTAT)

Deforestation often results from complex interactions between the production systems of several forest-risk commodities. Forests are typically logged before conversion to plantations (for example for timber, pulp and paper, or palm oil) [86]. Soy and beef production are connected, because

former pastures are often converted to soybean fields and because many croplands produce fodder [86]. Attributing deforestation to individual forest-risk commodities is rarely straightforward.

Of the forest-risk commodities, palm oil arguably receives most attention in the zero-deforestation movement. Palm-oil exports from tropical countries amounted to US\$40.1 billion in 2011, with further growth projected [86]. The scale of deforestation is massive, with most oil-palm expansion occurring after the planned deforestation of lowland tropical forests. Such forests are often logged first and, as a driver of deforestation, palm oil is connected to timber and pulp and paper [86]. Indonesia and Malaysia account for 87% of global oil-palm production and exports [75]. Greenpeace has campaigned against palm-oil producers [67,79,87,88], who have reacted by engaging in certification and making zero-deforestation pledges that, according to one count, cover 96% of global trade [74]. The industry created the RSPO in 2005, and a significant part of global production is certified [39] (Table 2).

Table 2: Forest-risk commodities and the zero-deforestation movement

	Palm oil	Soy	Timber, pulp and paper	Beef
Top-three global producers [75]	Indonesia (48%), Malaysia (39%), Thailand (3%)	USA (35%), Brazil (27%), Argentina (19%)	EU27 (22%), USA (20%), Russia (9%)	USA (21%), Brazil (16%), EU27 (14%)
Export value from tropical countries in 2011 [86]	US\$40.1m	US\$48.9m	US\$34.6m	US\$10.8m (beef and leather)
Key tropical forest countries [86]	Indonesia, Malaysia	Brazil, Paraguay, Bolivia	Indonesia, Brazil, Cameroon, Ghana	Brazil, Paraguay, Argentina, Nicaragua, Colombia
Certification	Roundtable on Sustainable Palm Oil	Roundtable on Responsible Soy	Forest Stewardship Council/Programme for the Endorsement of Forest Certification	Global Roundtable for Sustainable Beef (not for certification)
Share of global production with direct monitoring [81,86,90,91]	68% (global market share = 59% Indonesia Palm Oil Pledge + 9% Sustainable Palm Oil Manifesto)	24% (global market share of Brazilian Soy Moratorium = 90% national market coverage x 27% Brazilian market share)	Approach not available	11% (global market share of Brazilian Cattle Agreement = 70% share of national exports x 16% Brazilian market share)
Share of global production with major certification [92]	15%	<1%	28% (industrial roundwood)	Certification not available
Share of global production in low-risk jurisdictions [75]	Not available	35% (global market share of Europe and North America)	29% (global market share of Europe and North America)	21% (global market share of Europe and North America)
Companies with dedicated sourcing policy in Forest 500 [89]	59%	<20%	62% (timber)	26% (beef and leather)

The zero-deforestation movement has neglected soy. Total exports from tropical countries amounted to US\$48.9 billion in 2011, just slightly less from than non-tropical countries [86]. Soy production has led to the deforestation and conversion of vast areas of cerrado woodlands, particularly in Brazil's arc of deforestation, where it accounted for close to one-fifth of Amazonian deforestation [75]. Soy is connected to cattle production, because former pastures are often converted to soybean fields [86]. Greenpeace and others have campaigned against international companies [78] and, in response, major producers agreed in 2006 to halt deforestation for soy. The resultant Brazilian Soy Moratorium has contributed greatly to reducing the conversion of forests to soybean fields [56,93]. Also founded in 2006, the RTRS promotes sustainable soy production and backs a certification scheme [40]; so far it has attracted only a negligible market share, however, and an overreliance on the Brazilian Soy Moratorium has been identified as a possible barrier [20]. The zero-deforestation push for soy has been portrayed as lagging behind that of other forest-risk commodities [6,29,91].

Timber and pulp and paper mostly originate in developed countries, and imports from developing countries are highly regulated; zero-deforestation corporate action is less critical, therefore, in this sector. In contrast to other forest-risk commodities, tropical countries have only a small market share of timber and pulp and paper [86], with exports amounting to US\$34.6 billion in 2011 (pulp and paper accounting for more than half the total). Nevertheless, recent action against well-known brands focused on fibre from tropical rainforests, notably in Indonesia [66,68,76,80,86]. The FSC was established in 1993, and certification schemes for forest management are now relative mature compared with those for other forest-risk commodities; nevertheless, only 2% of tropical forests are certified [94]. In addition to certification, there is strong governmental action in North America and Europe to regulate tropical timber imports under the EU FLEGT initiative, the EU Timber Regulation and the US Lacey Act [51–53].

Only a fraction of beef consumed in Europe and North America originates from developing countries, but the zero-deforestation movement has focused nonetheless on beef. Despite recent shifts, there are still almost as many cattle in non-tropical countries as there are in tropical countries, and related exports from tropical countries amounted to US\$10.8 billion in 2011, with strong growth projected [86]. The zero-deforestation movement focuses on the Amazon, where up to 75% of deforestation is linked to cattle production [75]. Another factor in beef production as a driver of deforestation is that many croplands are used to produce fodder and because former pastures can become croplands, and vice versa [86]. Environmentalists exposed the link between beef as a global commodity and tropical deforestation as early as in the 1980s [95]. More recently, campaigns by the Friends of the Earth and Greenpeace have led to the Brazilian Cattle Agreement, a voluntary procurement standard of the four major Brazilian meatpackers, which has shown success in reducing deforestation [55,64,84,96]. Some international fast-food companies have also taken action in the context of the zero-deforestation movement [1,97]. The industry created the GRSB, which, however, does not aim to certify production systems [98], and a global certification standard remains unavailable.

Zero-deforestation pledges have reached an impressive scale, accounting for large parts of international trade and the supply chains of major companies [6,20,74]. Such commitments will translate into much demand for certified commodities, but the supply of certified commodities has grown much more slowly. For example, only 15% of global palm-oil production is certified as sustainable, but 59% of major companies have dedicated sourcing policies. This does not necessarily mean an imbalance in supply and demand because major companies account for only part of international trade, and some of those companies may rely on indicators of zero deforestation other

than major certification schemes. Nonetheless, these numbers point to a risk that sustainable palm oil may be in short supply. For other forest-risk commodities, supply and demand proxies show similar and more severe mismatches; the Carbon Disclosure Project has flagged that half of the companies with commitments to source certified soy are yet to get any into their supply chains [10]. Company pledges often use 2020 as a reference date, and only then will their ability to meet pledges become clear.

Key points

- The zero deforestation movement has focused on certain commodities and geographies over others.
- Most of the zero-deforestation pledges are by consumer-facing companies in Europe and North America and are relevant for their suppliers.
- Zero-deforestation initiatives have focused on palm oil and have had some traction for timber, pulp and paper; they were less relevant for beef and have neglected soya.
- The supply of certified forest-risk commodities does not currently appear to match potential demand from companies aiming to comply with zero-deforestation pledges.

6 Ensuring long-term positive impacts

To have positive long-term impacts, zero-deforestation pledges need to be accompanied by programmes that ensure transparency, include local communities, and safeguard environmental impacts [8,14,32,81]. According to the Rainforest Alliance, “the goal is sustainability, not just halting deforestation” [14].

Zero-deforestation initiatives will only succeed if they engage producers as allies [11,14,58]. Careful collaboration between consumer-facing companies with zero-deforestation pledges and their upstream suppliers has been reported not only to be effective but also to reduce costs and business risks [15]; nonetheless, four of the major initiatives have been characterized as lacking detailed discussions of complexity and the costs and benefits for farmers [12]. Not securing buy-in from producers may compromise the environmental integrity of zero-deforestation pledges as producers turn elsewhere as a way of sidestepping attempts to promote sustainable production [8,11].

Environmental requirements, including for zero deforestation, place a heavy burden on producers. The fragmented nature of the zero-deforestation movement implies that producers face environmental requirements not only from governments but increasingly also from financial institutions and commodity buyers. Farmers in Mato Grosso, Brazil, for example, are said to face environmental requirements in at least eight contexts (the Agricultura Basso Carbono loan programme of Cadastro Ambiental Rural, the Brazilian Soy Moratorium, the Brazilian Cattle Agreement, the Municipality Black List, the RTRS, the Brazilian Forest Code, REDD+ and the initiatives of the Consumer Goods Forum) [99]. Governments impose regulations around licensing, and commodity buyers and financial institutions are keen to reduce reputational risks [100]. Working at a landscape level through preferential sourcing arrangements has been proposed as a way of reducing the number of requirements for producers [49,100].

Zero deforestation is often based on negative pledges: consumer-facing companies vow to cut certain (zero-deforestation non-compliant) parts from their supply chains, and producers are consequently forced to comply with shifting procurement standards or to look for alternative offtakers. Shifting procurement standards are intended to have knock-on effects in production systems, but they do not typically involve support, with producers having to make the necessary investments to improve business practices and obtain certification. A positive value proposition for producers is currently not available but would go a long way towards a broader sustainability solution, particularly if it covers both large and small producers [14,32,100].

The proliferation of zero-deforestation pledges creates uncertainty for both small and large producers. They may lose clients as downstream companies assume zero-deforestation pledges [8,11]. If certain lands become ineligible due to shifts in standards, the production base may reduce [7]. Producers may also have difficulty in attracting financing, depending on the environmental standards of financiers. The situation is exacerbated by ineffective supply-chain coordination and the variability of definitions and standards [11,12].

Small producers and local communities may be least able to manage such risks and uncertainties [8]. They are often connected to supply chains either directly as small dependent or independent producers or indirectly as neighbours or the labour supply of large producers. The contribution of such small producers to the supply of forest-risk commodities is significant in certain localities and for certain commodities (Figure 10). Large producers have achieved much of the success in reducing deforestation, however. In Brazil, for example, small producers have not yet been part of the push for lower deforestation [101]. Local communities are vulnerable to being cut out of the production

system when supply chains reorient to comply with the procurement guidelines of international traders. Small producers also face high barriers to obtaining certification because of the costs involved in improving business practices and of the certification process itself [5,8,16].

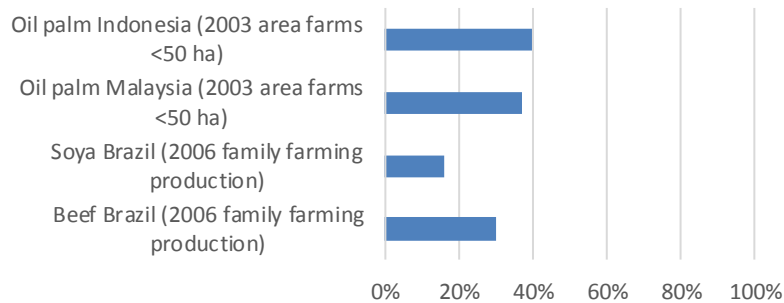


Figure 10: Estimates of the contribution of small producers to the production of forest-risk commodities (Source: [102–105])

Governments may have a role in unifying standards, coordinating work at the landscape level, and safeguarding social and environmental impacts. Working at a landscape level through governmental land-use planning would address several concerns about environmental integrity because production would no longer easily shift elsewhere. Governments are also in a position to regulate social and environmental standards as well as land tenure and could therefore protect small producers and local communities [5,8,14].

Key points

- Comprehensive supply-chain management for social and environmental impacts makes zero deforestation feasible and safeguards its benefits.
- Environmental requirements, including for zero deforestation, place a heavy burden on the producers of forest-risk commodities.
- The zero-deforestation movement introduces uncertainties into the business environment of producers of forest-risk commodities.
- Zero-deforestation initiatives can best succeed if they engage producers, because collaboration will enhance effectiveness and reduce risks involved in reorienting supply chains.
- To safeguard positive impacts and make zero deforestation feasible, comprehensive approaches to supply-chain management are needed.

7 From the supply chain to the landscape level

There is a call for government engagement to safeguard progress and to create wide-ranging and long-lasting impacts. Governments could protect the rights of smallholders that are otherwise in danger of being cut out when supply chains reorient [11], and they could clarify land tenure [8,11]. Governments could negotiate agreements with consumer markets to ensure preferential access to zero-deforestation products [8], and they could monitor jurisdictional progress towards zero deforestation [48,49].

Governmental development plans aim to reconcile environmental ambitions with other development objectives and are not always fully compatible with zero deforestation. Although trends and causality depend on context, deforestation, economic development and poverty reduction are interlinked [106]. Ruling out deforestation would severely constrain economic development options, particularly in countries with high forest cover [107].

Many jurisdictions have zero deforestation targets of their own: as many as 56 national and subnational governments, for example, are signatories to the New Declaration on Forests [1]. Close to 100 INDCs include references to the forest sector [108], and emerging REDD+ schemes often target subnational jurisdictions for emission reduction programmes [70]. Zero deforestation targets by governments and companies overlap – and yet are often isolated from each other [11].

Governments and companies, therefore, could collaborate more. A general lack of alignment has been diagnosed between governmental and company pledges, even when they overlap [11]. In some cases, company initiatives may counteract governmental targets. For example, the Government of Indonesia has strongly criticized the Indonesian Palm Oil Pledge, citing concerns about economic growth and possible adverse impacts, such as smallholders losing market access [109].

Conversely, private-sector engagement was a cornerstone of the Government of Brazil's strategy to reduce deforestation, including through the Brazilian Soy Moratorium [110,111]. Public–private partnerships for zero deforestation were successful in reducing Amazonian deforestation by 70% [100]. Recent research has shown that the transition to working at a landscape level was instrumental in reducing deforestation in the Brazilian Amazon. Although, in an early phase, supply-chain-based initiatives such as the Brazilian Cattle Agreement and the Brazilian Soy Moratorium were paramount, the geographical unit of intervention eventually became the county rather than the individual farm, with collaboration between the Central Bank, the Ministry of the Environment, local governments and the private sector [100,111].

Preferential sourcing from low-risk jurisdictions integrates government action with the zero-deforestation ambitions of companies. The Environmental Defense Fund has advocated setting up zero-deforestation zones, and the Earth Innovation Institute proposes territorial performance systems [31,49,100]. The concept foresees that the public and private sectors enter into broad agreements to work towards reducing deforestation within low-risk jurisdictions, including with the definition of performance metrics and financing. In a typical role allocation, producers would work to comply with regulations and reduce deforestation; commodity buyers would preferentially source forest-risk commodities from producers within the jurisdiction; financial institutions would provide preferential access to credit based on the lower reputational risk profiles of producers; and the local government would monitor performance at the jurisdictional level and work to ease licensing schemes. Producers that engage would enjoy many of the same benefits as certified producers in terms of access to markets and financing; commodity buyers would have access to forest-risk

commodities; financial institutions would be able to place loans with lower risk profiles; and the local governments would work towards their environmental targets [31,49,100] (Figure 11, Figure 12).

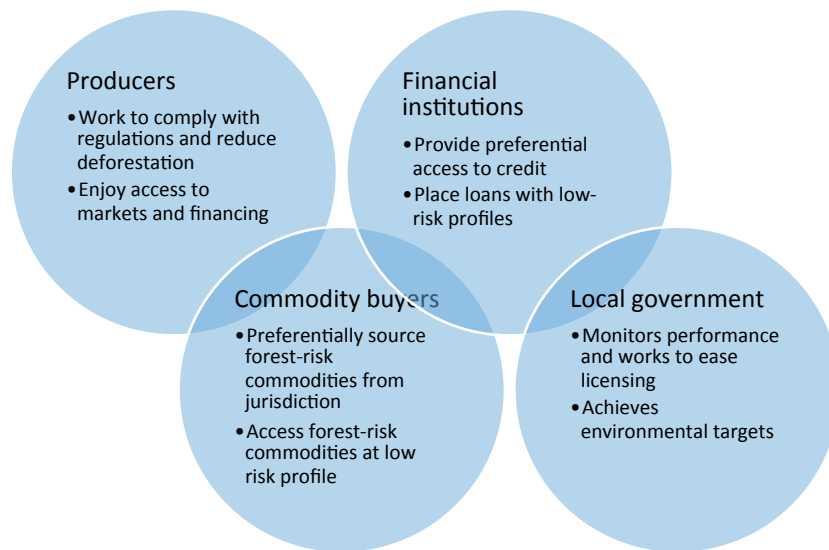


Figure 11: Contributions and benefits of producers, commodity buyers, financial institutions and local government from jurisdictional zero-deforestation initiatives

In some locations, the public sector and companies already jointly work to create low-risk jurisdictions for the preferential sourcing of forest risk commodities, giving rise to positive experiences that are being collected [81,99,100]. Several NGOs provide technical support for monitoring jurisdictional performance against environmental targets, usually putting reduced deforestation at the core [48–50]. The Consumer Goods Forum’s sourcing guidelines refer explicitly to jurisdictions for timber and pulp and paper; for palm oil they rely on a risk-based verification mechanism that could also be met by jurisdictions [27,28]. Some large companies have committed recently to ‘Produce–Protect’ – the preferential sourcing of forest-risk commodities from jurisdictions with ambitious environmental and sustainable development targets, combined with appropriate monitoring [112].

At the landscape level, zero deforestation cannot sensibly aim to reduce forest conversion to zero, aiming instead to introduce better production standards. Doubts may therefore be raised about preferential sourcing from low-risk jurisdictions as a means to achieve ‘zero’ deforestation [100]. Nonetheless it is an effective way in which governments and companies can usefully collaborate and mainstream better business practices across entire landscapes. In this, zero deforestation may be maturing from a buzzword to a concept that can guide corporate and governmental decision-making.

	Regular producers	Certified producers	Producers in low-risk jurisdiction
Regulatory agencies	<p>Often have difficulties in complying with rules of regulatory agencies (or certification Standards)</p> <p>License producers to operate with onerous rules and procedures</p>	<p>Comply with rules of regulatory agencies and certification standards</p> <p>License producers to operate with onerous rules and procedures</p>	<p>Mostly comply with rules of regulatory agencies, self-control</p> <p>License producers to operate with simplified rules and procedures, jurisdictional monitoring for preferential sourcing</p>
Commodity buyers	<p>Supply commodities with significant reputational risk to buyers</p> <p>Offtake commodities, restricting terms on payments, legality and management</p>	<p>Supply commodities with low reputational risk</p> <p>Offtake commodities offering better terms</p>	<p>Supply commodities with low reputational risks</p> <p>Offtake Commodities offering better terms under preferential sourcing agreements</p>
Finance institutions	<p>Repay loans with reputational risks or default</p> <p>Provide loans, restricting terms on repayment, legality and management</p>	<p>Repay loans with low reputational and repayment risk</p> <p>Provide loans under better terms</p>	<p>Repay loans with low reputational and repayment risk</p> <p>Provide loans under better terms</p>

Figure 12: Breakdown of regular producers, certified producers and producers in low-risk jurisdictions to regulatory agencies, commodity buyers and finance institutions

Key points

- Collaborating governments and companies can create impacts at scale.
- Government engagement in zero deforestation at a landscape level could safeguard progress on zero deforestation and create wide-ranging and long-lasting impacts.
- Many governments have zero-deforestation targets of their own, largely aiming to improve governance and promote higher production standards.
- Despite the shared objective of reducing deforestation, there are few positive examples of effective collaboration between governments and companies.
- Collaboration between the public and private sectors towards zero-deforestation targets may improve the business environment for the production of forest-risk commodities.

8 Conclusions

Definitions have big implications for the feasibility and stringency of zero-deforestation commitments. Pledges refer to net or gross deforestation, to supply chains or landscapes, and to some level of ‘acceptable deforestation’. The zero-deforestation initiatives of companies usually refer to their supply chains, while governments often look at the landscape level. Most momentum is around zero net deforestation, which means no change in the total forested area, and new forests can compensate for converted forests. Operationalizing zero net deforestation requires defining ‘acceptable deforestation’ – that is, the types of standing forests that are off-limits to conversion, and what types of new forests can compensate for cleared forests. For the verification of zero-deforestation commitments, company pledges often refer to standard agricultural and forest certification, which implies definitions of ‘acceptable deforestation’.

Procuring certified commodities is a common proxy for eliminating deforestation from supply chains, despite concerns about the adequacy of this measure. Companies use three common approaches to implementing zero-deforestation pledges: 1) certified procurement; 2) direct area monitoring; and 3) procurement from low-risk jurisdictions. The latter allows companies to earmark products as zero-deforestation-compliant, based on origin. Some zero-deforestation initiatives directly monitor production areas, including for conversion time points and ‘high carbon stock’ to identify ‘acceptable deforestation’. Mostly, however, companies consider certification under the leading schemes, in particular RSPO, FSC, PEFC and RTRS, as good evidence of zero deforestation, which may include commodities originating from converted secondary forests, degraded forests, or forests with low height. All these implementation approaches for zero-deforestation commitments have implications for actors along the supply chain.

Zero deforestation affects actors along the supply chains, which are not always coordinated effectively. Companies may compete for business through the sustainability indicators used by supply chains, and working towards zero deforestation can reduce the risk of criticism from activist NGOs. Producers and processors are mostly indirect participants in the zero-deforestation initiatives of their downstream off-takers, which involve procuring zero-deforestation products. Nonetheless, it is producers who carry most of the burden for complying with zero-deforestation pledges. There is a risk of excluding small producers when supply chains reorient to comply with downstream zero-deforestation pledges. To safeguard the positive impacts of their zero-deforestation initiatives, companies should run compliance programmes across their supply chains involving small producers, local communities and other stakeholders.

The zero-deforestation movement has focused on certain commodities and locations over others. Most zero-deforestation pledges are by consumer-facing companies in Europe and North America. Zero-deforestation initiatives have focused on palm oil and have also had some traction for timber and pulp and paper; they have been less relevant for beef, and soy has been neglected. The current supply of certified forest-risk commodities does not appear to match the potential demand from companies aiming to comply with zero-deforestation pledges.

Comprehensive supply-chain management for social and environmental impacts makes zero deforestation feasible and safeguards its benefits. The zero-deforestation movement place a heavy burden on the producers of forest-risk commodities and introduces uncertainties into their business environments. Zero-deforestation initiatives are most likely to succeed if they engage producers, because collaboration will enhance effectiveness and reduce the risks involved in reorienting supply

chains. To safeguard positive impacts and make zero deforestation feasible, comprehensive approaches to supply-chain management are needed.

Collaborating governments and companies can create impacts at scale. Governmental engagement in zero deforestation at the landscape level could safeguard the progress made towards zero deforestation and create wide-ranging and long-lasting impacts. Many governments have zero-deforestation targets of their own, largely aiming to improve governance and promote higher production standards. Despite the shared objective of reducing deforestation, there are few positive examples of effective collaboration between governments and companies. Collaboration between the public and private sectors on zero-deforestation targets may improve the business environment for the production of forest-risk commodities.

9 Implications of zero-deforestation initiatives for forest product value chains

Although forest products are omnipresent in global supply chains, palm oil – not timber and pulp and paper – has been the focus of zero-deforestation initiatives. Much NGO campaigning has focused on palm oil as a forest-risk commodity, and several company zero-deforestation pledges receiving attention also focus on palm oil [81]. Pulp and paper is omnipresent in global supply chains through its use in packaging, including for consumer goods. Some campaigns have targeted pulp and paper, and timber has received less attention.

Although timber and pulp and paper are forest-risk commodities, significant parts of their global markets are shielded from deforestation risk. Most of the timber and pulp and paper consumed in Europe and North America originate from low-risk jurisdictions in developed countries. Tropical countries have a smaller share of global markets than for other forest-risk commodities, notably palm oil [86]. Timber imports from developing countries to North America and Europe are highly regulated under the EU Timber Regulation and the US Lacey Act [51,53].

In the forest sector, zero-deforestation campaigns and related corporate action focus on pulp and paper, not timber. Recent advocacy action against well-known brands has focused on tropical pulp and paper, notably in Indonesia [66,68,76,80,86]. One reason for this is the omnipresence of pulp and paper in the supply chains of consumer-goods companies (because of its use in packaging), making it an easier target for environmental campaigning. Another reason is that a portion of the global supply of tropical timber originates from natural forest management and is not a direct cause of deforestation (as opposed to pulp and paper, which is mostly derived from plantations that could have replaced natural forests). For natural forest management, the risk of deforestation is less acute than the risk of unsustainable logging, which is beyond the scope of most zero-deforestation action. Third, timber markets are generally more fragmented than those for pulp and paper and other forest-risk commodities, hampering supply chain-based action [86].

The environmental impacts of forest management and the forest-based industry received attention long before the concept of zero deforestation emerged. For decades, debate on forests has focused on progress towards sustainable forest management, which was set out in the Forest Principles of the United Nations Conference on Environment and Development as early as 1992 [113]. The FSC was established in 1993, and forest management certification schemes are now relative mature compared with those of other forest-risk commodities, such as the RTRS and the RSPO, which were established 10–20 years later. With such a long history of attention on forest management from policymakers and NGOs, environmental concerns and sustainable management practices have already been mainstream in large parts of the forest-based industry. This may explain why most major companies involved in the global timber and pulp and paper supply chains have sustainable sourcing policies in place [20].

Although timber and pulp and paper have not been the focus of zero-deforestation campaigns, there remains much potential for enhancing sustainability. Despite the successes of forest management certification, only about 2% of tropical forests are certified [94]. Natural forest management does not typically lead to deforestation, but unsustainable logging practices can lead to destructive forest degradation. Tropical plantation forestry for the production of pulp and paper can drive deforestation in a similar way to other forest-risk commodities. This is why timber and pulp and paper are included by NGOs campaigning for zero deforestation and in the zero-deforestation pledges of companies.

Decades of experience in the sustainable production of timber and pulp and paper can provide important lessons for other forest-risk commodities. Some companies in the forest-based industry have learned important lessons they could share with their peers involved in the supply chains for other forest-risk commodities. In some countries, the forest-based industry has taken a leadership role in cross-sectoral processes for enhanced environmental governance [114].

10 Literature

1. United Nations. New York Declaration on Forests. 2015.
2. Forest Trends. *Firm Commitments: Tracking Company Endorsers of the New York Declaration on Forests.*, 2015.
3. GEF. *Taking Deforestation Out of Commodity Supply Chains.* Washington, DC, USA: Global Environment Facility (GEF)
4. Gerrits R. Sustainability in the Supply Chain. In: Ahmed K (ed.). *Getting to Green—A Sourcebook of Pollution Management Policy Tools for Growth and Competitiveness.* Washington, DC, USA: The World Bank, 2012, 194–204.
5. Smit H, McNally R, Gijsenbergh A. *Implementing Deforestation-Free Supply Chains – Certification and Beyond.*, 2015.
6. Forest Trends. *Corporations, Commodities, and Commitments That Count.*, 2015.
7. CDP. *Deforestation-Free Supply Chains: From Commitments to Action - CDP Global Forests Report.* Carbon Disclosure Project (CDP), 2014.
8. Bregman T, Mitchell A, Lachaux C et al. *Achieving Zero (Net) Deforestation Commitments - What It Means and How to Get There.* Oxford, UK: Global Canopy Programme, 2015.
9. CDP. *Deforestation-Free Supply Chains: From Commitments to Action - Policy Briefing.*, 2014.
10. CDP. *Realizing Zero-Deforestation: Transforming Supply Chains for the Future.* London, UK: Carbon Disclosure Project (CDP), 2015.
11. TFD. *Scoping Dialogue on Understanding Deforestation-Free (UDF) - Co-Chair Summary Report.* New Haven, CT, USA, 2014.
12. Meijer K. *Can Supply Chain Initiatives Reduce Deforestation? A Comparative Analysis of Cases from Brazil and Indonesia.*, 2014.
13. Fishman A. *Understanding “Deforestation-Free”: The State of Play and Issues to Consider during TFD’s October 2014 Dialogue.*, 2014.
14. Rainforest Alliance. *Halting Deforestation and Achieving Sustainability.*, 2015.
15. TFA 2020. *Reducing Supply Chain Deforestation - Civil Society Backgrounder and Inventory.*
16. Seymour F. *Corporate Commitments to Deforestation-Free Supply Chains: An Expedition.*, 2015.
17. CGF. *Deforestation Resolution.* 2010.
18. TFA 2020. *Tropical Forest Alliance 2020 Overview.*
19. BEI. *The BEI & CGF’s “Soft Commodities” Compact: Technical Guidance.*, 2015.

20. GCP. *The Forest 500*. 2015th ed. Oxford, UK: Global Canopy Programme, 2015.
21. ACSFI. *Executive Summary Report of the Fifty-Sixth Session*. Washington, DC, USA, 2015.
22. Brown S, Zarin D. What does zero deforestation mean? *Science (80-)* 2013;**342**:805–7.
23. Alvarado P. WFC 2009: Zero Deforestation by 2020 a Utopia; Net Deforestation Reduction, not that Much. *TreeHugger* 2009.
24. FAO. *Forest Resources Assessment 2015: Terms and Definitions*. Rome, Italy, 2012.
25. WWF. Global Network Position: Deforestation-free production and finance. 2015:7.
26. CGF. *The Sustainable Soy Sourcing Guidelines*.
27. CGF. *CGF Pulp, Paper & Packaging Guidelines June 21, 2013.*, 2013.
28. CGF. *Sustainable Palm Oil Sourcing Guidelines*. Consumer Goods Forum (CGF), 2015.
29. GCP. *The Forest 500*. 2014th ed. Rautner M, Lawrence L, Bregman T, et al. (eds.). Oxford, UK: Global Canopy Programme, 2015.
30. Sam Lawson. *Consumer Goods and Deforestation: An Analysis of the Extent and Nature of Illegality in Forest Conversion for Agriculture and Timber Plantations*. Washington, DC, USA: Forest Trends, 2014.
31. Meyer C, Miller D. Zero Deforestation Zones: The Case for Linking Deforestation-Free Supply Chain Initiatives and Jurisdictional REDD+. *J Sustain For* 2015;**34**:559–80.
32. Rod Taylor. Deforestation-free supply chains & investment: progress and challenges. In: FAO (ed.). *The Economics of Climate Change Mitigation Options in the Forest Sector*. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO), 2015.
33. WWF. Zero Net Deforestation by 2020 - A WWF Briefing Paper. 2008.
34. Gibbon A, Baroody J, McNally R. The Role of Voluntary Agricultural Certification Standards in Quantifying and Reducing Greenhouse Gas Emissions: Exploring the Cocoa, Coffee, Palm Oil and Shrimp Aquaculture Sectors. 2014:74.
35. Greenpeace. *Identifying High Carbon Stock (HCS) Forest for Protection.*, 2013.
36. Sustainable Palm Oil Manifesto. *High Carbon Stock (HCS) Study of the Sustainable Palm Oil Manifesto: A Detailed Description.*, 2014.
37. Golden Agri-Resources. *High Carbon Stock Forest Study Report.*, 2012.
38. FSC. *FSC Principles and Criteria for Forest Stewardship*. Bonn, Germany: Forest Stewardship Council (FSC), 2015.
39. RSPO. *Principles and Criteria for the Production of Sustainable Palm Oil*. Kuala Lumpur, Malaysia: Round Table on Sustainable Palm Oil (RSPO), 2013.

40. RTRS. *RTRS Standard for Responsible Soy Production*. Version 2. Round Table on Responsible Soy (RTRS), 2013.
41. FAO. Second Expert Meeting On Harmonizing Forest-related Definitions for Use by Various Stakeholders. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO), 2002.
42. Greenpeace. *The High Carbon Stock Approach: "No Deforestation" in Practice.*, 2014.
43. FAO. Sustainable Forest Management.
44. United Nations General Assembly. Non-legally binding instrument on all types of forests. 2008.
45. PEFC. *Sustainable Forest Management Requirements*. Geneva, Switzerland: Programme for the Endorsement of Forest Certification Schemes (PEFC), 2010.
46. WWF. WWF Open Letter to the Indonesian Forestry Certification Cooperation. 2015.
47. Greenpeace. Greenpeace, RAN Warn of Forest Certification Greenwash. *Press Release*. <http://www.greenpeace.org/seasia/Press-Centre/Press-Releases/Greenpeace-RAN-Warn-of-Forest-Certification-Greenwash/>. Published June 24, 2015.
48. Forest Trends. Public Private Co-Finance Initiative.
49. EII. Territorial performance system. 2015.
50. VCS. Jurisdictional and Nested REDD+ (JNR).
51. EC. Timber Regulation. *Eur Comm* 2010.
52. EC. FLEGT Voluntary Partnership Agreements (VPAs). *Eur Comm* 2008:93.
53. USDA. Lacey Act. *United States Dep Agric*.
54. IPOPOP. Indonesia Palm Oil Pledge (IPOP). 2014.
55. National Wildlife Federation. A Path to Zero-Deforestation Cattle. 2015.
56. Soy Moratorium. *Mapping and Monitoring Soy Planting in the Amazon Biome Seventh Year.*, 2014.
57. Sustainable Palm Oil Manifesto. Sustainable Palm Oil Manifesto.
58. UoCS. *A Business Guide to a Deforestation-Free Supply Chain.*, 2013.
59. TFT. *Good Wood, Good Business*. The Forest Trust (TFT), 2003.
60. TFT. *Guide to Legality: Practical Advice for Timber Producers, Processors and Exporters*. The Forest Trust (TFT)
61. Karsenty A. Using PES to achieve "zero deforestation" agriculture. *Perspective* 2015;**36**.

62. Equator Principles. *Equator Principles. About equator Princ* 2013:23.
63. WWF. *Don't Flush Tiger Forests*. Washington, DC, USA, 2012.
64. Greenpeace. *Slaughtering the Amazon*. Amsterdam, Netherlands, 2009.
65. Eilperin J. Asian paper giant agrees to stop cutting Indonesia's natural rain forests. *The Washington Post*. February 5, 2013.
66. Rainforest Action Network. *A New Chapter for the Publishing Industry: Putting Promises into Practice*. San Francisco, CA, USA, 2014.
67. Greenpeace. *Caught Red Handed: How Nestle's Use of Palm Oil Is Having a Devastating Impact on Rainforest, the Climate and Orang-Utans*. Amsterdam, Netherlands, 2010.
68. Greenpeace. *Sinar Mas Under Investigation - How APP Is Toying with Extinction.*, 2011.
69. TFA 2020. Overview and Frequently Asked Questions.
70. WWF. *Zero Net Deforestation: Status Report - How Far Do Current National Targets Get Us?*, 2015.
71. Nestlé. Nestlé Commitment on Deforestation and Forest Stewardship. 2013:3.
72. Nestlé. Nestlé open forum on deforestation, Malaysia.
73. Nestlé. Annex to the General Responsible Sourcing Guideline: Palm Oil. 2013.
74. Chain Reaction Research. *The Chain: 96% of Global Palm Oil Trade Covered by Zero-Deforestation*. 2014.
75. CDP. *Forest risk commodities*. 2014.
76. Greenpeace. *How KFC Is Junking the Jungle by Driving Rainforest Destruction in Indonesia*. Amsterdam, Netherlands, 2012.
77. Greenpeace. *Driving Destruction in the Amazon How Steel Production Is Throwing the Forest into the Furnace*. Amsterdam, Netherlands, 2013.
78. Greenpeace. *Eating Up the Amazon*. Amsterdam, Netherlands, 2006.
79. Greenpeace. *Cooking the Climate*. Amsterdam, Netherlands, 2013.
80. Greenpeace. *The RAMIN Paper Trail*. Amsterdam, Netherlands, 2012.
81. CLUA. *Disrupting the Global Commodity Business*. San Francisco, CA, USA: Climate and Land Use Alliance (CLUA), 2014.
82. Greenpeace. *Licence to Launder*. Amsterdam, Netherlands: Greenpeace, 2014.

83. Fundación Avina, Instituto Ethos, Rede Nossa São Paulo *et al.* *Combate À Devastação Ambiental E Trabalho Escravo Na Produção Do Ferro E Do Aço*. Fundación Avina, Instituto Ethos, Rede Nossa São Paulo, Worldwide Fund for Nature (WWF), 2012.
84. Amigos da Terra. *A Hora Da Conta*. São Paulo, Brazil, 2009.
85. UoCS. *The Root of the Problem*. Union of Concerned Scientists (UoCS) (ed.), 2011.
86. Rautner M, Leggett M, Davis F. *The Little Book of Big Deforestation Drivers*. Oxford, UK: Global Canopy Programme, 2013.
87. Greenpeace. *Frying the Forest: How India's Use of Palm Oil Is Having a Devastating Impact on Indonesia's Rainforests, Tigers and the Global Climate*. Bengaluru, India, 2012.
88. Greenpeace. *Palm Oil's New Frontier*. Amsterdam, Netherlands, 2012.
89. GCP. *Analysis: Companies - Measuring Progress to Zero Deforestation.*, 2015.
90. Sustainable Palm Oil Manifesto.
91. CDP. *Soybean Overlooked? The Investor Case for Deforestation-Free Soy*. London, UK, 2015.
92. Potts J, Lynch M, Wilkings A *et al.* *The State of Sustainability Initiatives Review 2014 - Standards and the Green Economy*. International Institute for Sustainable Development (IISD) and International Institute for Environment and Development (IIED), 2014.
93. Gibbs HK, Rausch L, Munger J *et al.* Brazil's Soy Moratorium. *Science (80-)* 2015;**347**:377–8.
94. Fernholz K, Kraxner F. Certified forest products markets, 2011-2012. *UNECE/FAO Forest Products Annual Market Review, 2011-2012*. UNECE/FAO, 2012, 107–16.
95. Myers N. The Hamburger Connection: How Central America's Forests Became North America's Hamburgers. *Ambio* 1981;**10**.
96. Gibbs HK, Munger J, L'Roe J *et al.* Did Ranchers and Slaughterhouses Respond to Zero-Deforestation Agreements in the Brazilian Amazon? *Conserv Lett*, DOI: 10.1111/conl.12175.
97. McDonald's. McDonald's Corporation Commitment on Deforestation. 2015.
98. GRSB. GRSB Background. 2014.
99. Nepstad D, Irawan S, Bezerra T *et al.* More food, more forests, fewer emissions, better livelihoods: linking REDD+, sustainable supply chains and domestic policy in Brazil, Indonesia and Colombia. *Carbon Manag* 2013;**4**:639–58.
100. Nepstad DC, Mcgrath D, Stickler C *et al.* Slowing Amazon deforestation through public policy and interventions in beef and soy supply chains. *Science (80-)* 2014;**344**:1118–23.
101. Godar J, Gardner TA, Tizado EJ *et al.* Actor-specific contributions to the deforestation slowdown in the Brazilian Amazon. *Proc Natl Acad Sci* 2015;**111**:15591–6.

102. Vermeulen S, Goad N. *Towards Better Practice in Smallholder Palm Oil Production*. London, UK: International Institute for Environment and Development (iied), 2006.
103. IBGE. *Censo Agropecuário*. 2006th ed. Rio de Janeiro, Brazil: Instituto Brasileiro de Geografia e Estatística (IBGE), 2006.
104. ZSL. Smallholders. *Sustain Palm Oil Transpar Toolkit*.
105. Bissonnette JF, De Koninck R. Large Plantations versus Smallholdings in Southeast Asia: Historical and Contemporary Trends. *Land Grabbing, Conflict and Agrarian-Environmental Transformations: Perspectives from East and Southeast Asia*. Chiang Mai, Thailand: Chiang Mai University, 2015.
106. Chomitz K, Buys P. *At Loggerheads?: Agricultural Expansion, Poverty Reduction, and Environment in the Tropical Forests.*, 2007.
107. Eliasch J. *Climate Change: Financing Global Forests*. London, UK, 2008.
108. Grassi G, Dentener F. *Quantifying the Contribution of the Land Use Sector to the Paris Climate Agreement.*, 2015.
109. Jong HN. Govt opposes zero-deforestation pledge by palm oil firms. *Jakarta Post*. <http://www.thejakartapost.com/news/2015/08/29/govt?opposes?zero?deforestation?pledge?palm?oil?firms.html>. Published August 29, 2015.
110. Phillips T. Brazil election sees breakthrough for Greens and environmental agenda. *The Guardian*. <http://www.theguardian.com/world/2010/oct/04/brazil-election-breakthrough-greens>. Published October 4, 2010.
111. Boucher D. *Brazil's Success in Reducing Deforestation*. Washington, DC, USA: Union of Concerned Scientists (UoCS), 2011.
112. CGF. *Statement from Consumer Goods Forum Co-Chairs, Acting Individually: Production Protection*. Paris, France, 2015.
113. Forest Principles. *United Nations Conference on Environment and Development (UNCED)*. Rio de Janeiro, Brazil, 1992.
114. Coalizão Brasil. *Coalizão Brasil Clima, Florestas E Agricultura.*, 2014.

Annex 1: Major certification schemes and their principles with relevance to deforestation

FSC Principle 6.9 with relevance to deforestation [38]

The Organization shall not convert natural forest to plantations, nor natural forests or plantations on sites directly converted from natural forest to non-forest land use, except when the conversion:

- a) affects a very limited portion of the area of the Management Unit, and
- b) will produce clear, substantial, additional, secure long-term conservation benefits in the Management Unit, and
- c) does not damage or threaten High Conservation Values, nor any sites or resources necessary to maintain or enhance those High Conservation Values.

Natural forest: A forest area with many of the principal characteristics and key elements of native ecosystems, such as complexity, structure and biological diversity, including soil characteristics, flora and fauna, in which all or almost all the trees are native species, not classified as plantations.

‘Natural forest’ includes the following categories:

- Forest affected by harvesting or other disturbances, in which trees are being or have been regenerated by a combination of natural and artificial regeneration with species typical of natural forests in that site, and where many of the above-ground and below-ground characteristics of the natural forest are still present. In boreal and north temperate forests which are naturally composed of only one or few tree species, a combination of natural and artificial regeneration to regenerate forest of the same native species, with most of the principal characteristics and key elements of native ecosystems of that site, is not by itself considered as conversion to plantations.
- Natural forests which are maintained by traditional silvicultural practices including natural or assisted natural regeneration.
- Well-developed secondary or colonizing forest of native species which has regenerated in non-forest areas.
- The definition of ‘natural forest’ may include areas described as wooded ecosystems, woodland and savanna.

[further details follow]

Plantation: A forest area established by planting or sowing with using either alien or native species, often with one or few species, regular spacing and even ages, and which lacks most of the principal characteristics and key elements of natural forests. The description of plantations may be further defined in FSC Forest Stewardship Standards, with appropriate descriptions or examples, such as:

- Areas which would initially have complied with this definition of ‘plantation’ but which, after the passage of years, contain many or most of the principal characteristics and key elements of native ecosystems, may be classified as natural forests.
- Plantations managed to restore and enhance biological and habitat diversity, structural complexity and ecosystem functionality may, after the passage of years, be classified as natural forests.
- Boreal and north temperate forests which are naturally composed of only one or few tree species, in which a combination of natural and artificial regeneration is used to regenerate forest of the same native species, with most of the principal characteristics and key elements of native ecosystems of that site, may be considered as natural forest, and this regeneration is not by itself considered as conversion to plantations.

PEFC Criterion 1, item 5.1.11 with relevance to deforestation [45]

Conversion of forests to other types of land use, including conversion of primary forests to forest plantations, shall not occur unless in justified circumstances where the conversion:

- a) is in compliance with national and regional policy and legislation relevant for land use and forest management and is a result of national or regional land-use planning governed by a governmental or other official authority including consultation with materially and directly interested persons and organisations; and

- b) entails a small proportion of forest type; and
- c) does not have negative impacts on threatened (including vulnerable, rare or endangered) forest ecosystems, culturally and socially significant areas, important habitats of threatened species or other protected areas; and
- d) makes a contribution to long-term conservation, economic, and social benefits.

The requirement for the “conversion of forests to other types of land use, including conversion of primary forests to forest plantations” means that forest plantations established by a forest conversion after 31 December 2010 in other than “justified circumstances” do not meet the requirement and are not eligible for certification.

RSPO Principle 7.3 with relevance to deforestation [39]

New plantings since November 2005 have not replaced primary forest or any area required to maintain or enhance one or more High Conservation Values.

Primary Forest: A primary forest is a forest that has never been logged and has developed following natural disturbances and under natural processes, regardless of its age. Also included as primary, are forests that are used inconsequentially by indigenous and local communities living traditional lifestyles relevant for the conservation and sustainable use of biological diversity. The present cover is normally relatively close to the natural composition and has arisen (predominantly) through natural regeneration [41].

RTRS Principle 4, Criterion 4.4, Indicator 4.4.1 with relevance to deforestation [40]

After May 2009 expansion for soy cultivation has not taken place on land cleared of native habitat except under the following conditions:

It is in line with an RTRS-approved map and system (see Annex 4.) or

Where no RTRS-approved map and system is available:

- a) Any area already cleared for agriculture or pasture before May 2009 and used for agriculture or pasture within the past 12 years can be used for soy expansion, unless regenerated vegetation has reached the definition of native forest (see glossary).
- b) There is no expansion in native forests (see glossary)
- c) In areas that are not native forest (see glossary), expansion into native habitat only occurs according to one of the following two options:

Option 1. Official land-use maps such as ecological-economic zoning are used and expansion only occurs in areas designated for expansion by the zoning. If there are no official land use maps then maps produced by the government under the Convention on Biological Diversity are used, and expansion only occurs outside priority areas for conservation shown on these maps.

Option 2. A High Conservation Value Area (HCVA) assessment is undertaken prior to clearing and there is no conversion of High Conservation Value Areas.

There is no conversion of land where there is an unresolved land use claim by traditional land users under litigation, without the agreement of both parties.

Native forest: Areas of native vegetation of 1ha or more with canopy cover of more than 35 % and where some trees (at least 10 trees per hectare) reach 10m in height (or are able to reach these thresholds in situ (ie. in that soil/climate combination)).

Annex 2: Chain-of-custody approaches for palm oil

Book and claim

Certificate trading, or “book and claim”, is technically not a chain-of-custody method because beyond the crude palm-oil mill the certified product is not separated from the physical supply chain and the end product does not necessarily contain certified palm oil. For the palm-oil industry, this option is also known as GreenPalm certificates (after the name of the company managing the system for the RSPO). It is a certificate trading system separate from the physical trade in palm oil. If the mill, for example, produces 100 tonnes of certified Crude Palm Oil, then it issues volume certificates for that same amount, which goes into the global supply chain. The benefit of Certificate Trading is that no paper trail or physical separation of oil along the supply chain is needed, and therefore it is a much cheaper than other options requiring physical separation. It also means that companies using derivatives of palm oil that are not yet available as traceable Certified Sustainable Palm Oil can still buy certificates to support the production of Certified Sustainable Palm Oil. The downside is that companies that buy certificates to claim certified Crude Palm Oil could continue sourcing from producers who are not acting responsibly. Due to the low costs and easy access, downstream firms still largely adopt Certificate Trading, which only costs an extra 0.3% compared with conventional palm oil sold on the international market. Even though Green Palm is considered an important step towards traceable crude palm oil, the question arises as to whether such a transition is likely to occur.

Mass balance

Mass balance allows the mixing of certified and non-certified oil derivatives in any step of the process; therefore, palm oil present in end products cannot be traced back to the plantation or even to the crude palm oil mill. This method balances the volume of certified product that goes into the processing chain with the volume of end product labelled as certified. It is the least-expensive chain-of-custody method, and the most commonly used. The advantage of mass balance is that it can accommodate a transition to fully traceable products at vast industrial scales that would be nearly impossible to do with more stringent methods, such as segregation or identity preserved. Simple improvements in recordkeeping can provide increased traceability.

Segregated

This method treats certified and non-certified palm oil as separate products and does not allow the mixing of the two at any stage of processing, although the mixing certified oil from different mills is allowed. Costs are higher than for mass balance because shipping containers and storage tanks need to be segregated for certified product. Although a mill could choose to facilitate the segregation of certified and non-certified palm oil during processing (by running certified batches at a certain time, or having separate processing lines), economies of scale would most likely dictate that the mill would need its entire supply source to be certified.

Identity preserved

Identity preserved goes a step further than segregation in that it does not allow the mixing of certified oil derivatives from different mills; therefore, certified palm oil can be traced back to the mill, even at the end product stage. Validating whether deforestation occurred as a result of plantation establishment or expansion could be done on the entire area of the ‘supply shed’. Of all the chain-of-custody methods, identity preserved is the most costly; given the economies of scale that govern commodities, this method is likely to be possible only if a mill’s entire supply source is certified.

Source: [34]

